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FROM THE LAB

IN THIS ISSUE

1st Annual Junior Workshop in Macroeconomics
conference held November 18–19, 2022

Racial Inequality in Macroeconomics
conference held March 3–4, 2023

FROM THE LAB



- 03 **Director's Message**
Finn Kydland

1st Annual Junior Workshop in Macroeconomics

- 04 **Conference Participants**

Presentation Summaries

Note: speakers are highlighted in author listings

- | | |
|---|--|
| 05 Strategic Complementarities in a Dynamic Model of Fintech Adoption
David Argente, Fernando Alvarez, Francesco Lippi, Esteban Mendez and Diana Van Patten | 09 The Global Race for Talent: Brain Drain, Knowledge Transfer and Growth
Marta Prato |
| 06 Innovation Networks and R&D Allocation
Ernest Liu and Song Ma | 10 Revisiting Retirement and Social Security Claiming Decisions
Neha Bairoliya and Kathleen McKiernan |
| 07 Tax Incidence and Optimal Taxation with General Equilibrium Effects and Transition
Yena Park | 11 Fiscal Rules and Discretion with Risk of Default
Chiara Felli, Facundo Piguillem and Liyan Shi |
| 07 A Q-Theory of Inequality
Matthieu Gomez and Émilien Gouin-Bonenfant | 12 Asymmetric Information and Capital Accumulation
Aime Bierdel, Andres Drenik, Juan Herreño and Pablo Ottonello |
| 08 Outsourcing, Inequality, and Aggregate Output
Adrien Bilal and Hugo Lhuillier | 13 A General Characterization of Capital Accumulation Amplification
Hannes Malmberg |



Racial Inequality in Macroeconomics

14 Conference Participants

Presentation Summaries

Note: speakers are highlighted in author listings

- | | |
|--|--|
| <p>15 Slavery and the British Industrial Revolution
Stephan Heblich, Stephen J. Redding and Hans-Joachim Voth</p> <p>16 Race and Economic Well-Being in the United States
Jean-Felix Brouillete, Charles I. Jones and Pete Klenow</p> <p>17 The Dynamic Effects of Co-Racial Hiring
Conrad Miller and Ian Schmutte</p> <p>18 Beliefs and Affirmative Action in Employment
Benjamin S. Griffy and Eric Young</p> <p>19 An Equilibrium Analysis of the Effects of Neighborhood-based Interventions on Children
Eric Chyn and Diego Daruich</p> <p>20 Who Benefits from Retirement Saving Incentives in the U.S.? Evidence on Racial Gaps in Retirement Wealth Accumulation
Taha Choukhmane, Jorge Colmenares, Cormac O'Dea, Jonathan Rothbaum, and Lawrence Schmidt</p> <p>21 The Effect of Political Power on Labor Market Inequality: Evidence from the 1965 Voting Rights Act
Abhay Aneja and Carlos Fernando Avenancio-Leon</p> | <p>22 Monetary Policy with Racial Inequality
Makoto Nakajima</p> <p>23 The Color of the American Dream: Segregation and Endogenous Racial
Alessandra Fogli, Veronica Guerrieri, and Marta Prato</p> <p>24 The Boss is Watching: How Monitoring Decisions Hurt Black Workers
Costas Cavounidis, Kevin Lang and Russell Weinstein</p> <p>25 What Accounts for the Racial Gap in Time Allocation and Intergenerational Transmission of Human Capital?
George-Levi Gayle, Limor Golan and Mehmet A. Soytaş</p> <p>26 Accounting for Black-White Wealth Gaps: Earnings, Demographics, and Rates of Return
Kartik B. Athreya, Grey Gordon, John Bailey Jones and Urvi Neelakantan</p> <p>27 On the Dynamics of the Racial Wealth Gap
Dionissi Aliprantis, Daniel R. Carroll and Eric Young</p> <p>28 Explaining Racial Disparities in Personal Bankruptcy Outcomes
Bronson Argyle, Sasha Indarte, Ben Iverson, and Christopher Palmer</p> |
|--|--|

Director's Message

Finn Kydland



I'm sorry to announce that LAEF's Business Manager, Laurie Preston, has retired. We are very happy for her, though! She provided many years of masterful and friendly service. In addition to her obvious duties such as scheduling, reservations, reimbursement, and newsletter work, she remained "on-call" for special requests. She was an able problem-solver and we really appreciate all she did to make dozens of LAEF meetings run smoothly. Laurie was (and still is!) a friend and a fellow bird-lover. Cheers, Laurie!

I'd like to introduce our new Business Manager, Andrew Hanebutt. Andrew has over 11 years of marketing and project management experience. During his career he has worked with notable companies such as Albertsons, Food Network, and most recently Lamb Weston, developing and marketing Arby's and Sonic items in retail grocery stores throughout North America. Andrew graduated from Boise State University in 2012 with bachelor's degrees in Marketing and Business Management. Andrew recently moved to Santa Barbara to be near his family. In his free time, he likes to rock climb, hike, play music, and woodworking. We look forward to working with him.

In this issue we report on our *Racial Inequality* conference, held March 2-4, 2023. The conference centered around the causes and consequences of racial inequities in the macroeconomy. It is an incontrovertible fact that Black households in the US have experienced substantially worse economic outcomes than White households, even during the Civil Rights Era. The sources of these inequities are not entirely clear, nor are the remedies. Papers at

the conference explored questions such as the effectiveness of affirmative action at closing skill and wage gaps, the dynamics of the racial wealth gap, and the consequences of the Fed announcement that relative unemployment rates are a potential target for monetary policy actions. The conference was organized by Ben Griffy (Assistant Professor of Economics at SUNY-Albany), Karen Kopecky (Research Economist and Advisor at the Federal Reserve Bank of Atlanta), Nick Pretnar (Post-Doctoral Scholar at UCSB-LAEF), and Eric Young (Professor of Economics at the University of Virginia and Senior Research Economist at the Federal Reserve Bank of Cleveland).

The other LAEF conference we report on is the *1st Annual Junior Workshop* in Macroeconomics, held November 18 and 19, 2022. We were proud to bring together junior researchers across various subfields of macroeconomics to present and discuss papers relevant for both theory and policy. There were quite a variety of papers, including on capital accumulation, social security, and optimal taxation, among others. The academic organizers were Job Boerma, Paolo Martellini (both Assistant Professors of Economics at the University of Wisconsin-Madison), and Nick Pretnar (Post-Doctoral Scholar at UCSB-LAEF). The conference took place at the Upham Hotel Garden, Santa Barbara, as per tradition.

In other news, this issue of FROM THE LAB may be the last one printed on paper. I personally enjoy the feeling of paper, however there are many advantages of LAEF moving to a digital newsletter. These benefits include instant cost-savings on distribution and printing, enhanced interactivity with content, and less lead times between conferences and newsletters. To receive the new digital newsletter please visit laef.ucsb.edu to register.



1st Annual Junior Workshop of Macroeconomics

November 18–19, 2022

David Argente – Penn State University
Neha Bairoliya – USC Marshall
David Berger – Duke University
Anmol Bhandari – University of Minnesota
Adrien Bilal – Harvard University
Job Boerma – University of Wisconsin-Madison
Émilien Gouin-Bonenfant – Columbia University
Juan Herreño – UC San Diego
Rishab Kirpalani – University of Wisconsin-Madison
Finn Kydland – UC Santa Barbara
Ilse Lindenlaub – Yale University

Ernst Liu – Princeton University
Hannes Malmberg – University of Minnesota
Paolo Martellini – University of Wisconsin-Madison
Kathleen McKiernan – Vanderbilt University
Yena Park – Seoul National University
Marta Prato – Yale University
Nick Pretnar – UC Santa Barbara
Peter Rupert – UC Santa Barbara
Liyan Shi – Carnegie Mellon Tepper
Venky Venkateswaran – New York University Stern
David Wiczer – SUNY Stonybrook

Strategic Complementarities in a Dynamic Model of Fintech Adoption

David Argente, Fernando Alvarez, Francesco Lippi, Esteban Mendez, and Diana Van Patten



Fintech innovations like Venmo are being introduced and used in daily life, but adoption is not universal. To explain the slow adoption of new

technology, David Argente and his co-authors propose a dynamic model of technology adoption with strategic complementarities calibrated to data on SINPE Móvil, a mobile payment app launched by the Central Bank of Costa Rica in 2015.

The model consists of heterogeneous agents with idiosyncratic potential benefits from using technology that follow a Brownian process. The novel characteristic introduced in the model is that the share of agents who have adopted the technology in the economy positively affects the individual flow benefit of adoption.

A participant raised a point that the agent may consider the entire distribution of adoption, and not merely the share of adopters. The speaker responded that although he and his co-authors focus only on the adoption share, essentially a mean, they might consider additional data features for the benefit function to handle more scenarios in the future.

The authors first discuss the results of the deterministic case. If nobody has the app initially, there only exist jumps to steady state from zero adoption rather than slow dynamic diffusion. A participant raised a question on whether full adoption can be a steady state where everyone has the app at first. No, the speaker replied, because there is death in the model and because agents may not want the technology even if they have it. The steady-state stochastic case, in contrast, allows for the option value of waiting for higher adoption benefit and exhibits smaller density of non-adopters below the benefit thresholds.

Some agents may cross the benefit threshold and then go back, since the flow benefit moves dynamically. The no- and low-adoption steady states are locally stable and unstable, respectively, from perturbation analysis, while the high-adoption steady state is globally stable. The authors proceed to solve a planner's problem after characterizing the decentralized equilibrium. The planner chooses the benefit thresholds, a problem similar to the agent's except that the planner cares about the adoption externality.

At this stage, a participant asked about the point of this experiment. The speaker said that they could find an optimal subsidy to achieve optimal

adoption. Another participant gave an example that the planner could make the app free for everyone in the first period and provide subsidies subsequently. The speaker argued that their planner problem was constrained by choice of thresholds.

Leveraging individual- and transaction-level data, the authors document several stylized empirical facts: the technology diffused slowly, with strong evidence of strategic complementarities. Intensity of app use, as measured by transactions and value, increased with the share of adopters in the user's network. A participant raised a concern about a confound: app features being updated and thus technology improving over time, driving more use. The speaker answered that they could control for this factor in the regression by adding a time fixed effect, but could not control it in the model. Another participant suggested that there should be two-way complementarities between technology use and adoption rate, and that such feedback could be included in the model. The calibrated quantitative model replicates the main empirical patterns and is thus able to generate a solution for a planner who prefers a higher adoption level than that of a decentralized economy.

Innovation Networks and R&D Allocation

Ernest Liu and Song Ma



Innovation drives long-run growth. In contrast to existing literature focusing on over-time or within-sector allocation of research and development

resources, Ernest Liu and his coauthor study the cross-sector allocation of R&D resources in the presence of an innovation network. A participant asked whether the innovation network setting applies only to advanced economies. The speaker answered that this research could also have important implications for developing countries.

The authors first characterize a closed-economy, multi-sector, quality-ladder model with innovation spillovers. The sectoral innovation process depends on exogenous innovation productivity, R&D, and the prior knowledge useful for R&D in the given sector. The novel feature in the model lies in an innovation network matrix composed of weights of all sectoral knowledge stocks in contributing to the prior knowledge useful for R&D in a specific sector, due to the existence of cross-sector knowledge spillovers. That firms ignore future spillovers created by their own innovation leads to inefficient R&D allocations in their stylized, decentralized setting. One participant asked about the possibility of including more sources of externalities in the model, for example, too few scientists in the semiconductor industry. The speaker responded that

different inefficiency channels only worked through the decentralized firm setting rather than the planner solution, which was the central focus of the paper. Their goal was to compare optimal R&D allocation to the observed data and thus account for misallocation, but not to take a stand on the decentralized economy or bring up optimal policies.

The question led to the discussion on the optimal R&D allocation from the planner's optimal control problem. The optimal allocation of resources is time-invariant and how the future is discounted matters for allocation across sectors. For example, more patience leads to more R&D in electrical engineering. The speaker gave confirmative answers when a participant asked whether the loglinear specification of technology is crucial for making sectoral optimal allocation independent of R&D efficiency or existing knowledge stock. Another participant raised concerns about the discreteness of industries in the network. The speaker replied that an R&D or innovation network was more harmonized across industries compared to other network structures, like a production network. The optimal R&D is a weighted average between decentralized discount factor and growth-maximizing R&D, which is essentially the eigenvector centrality of innovation network matrix. Moreover, they derive sufficient statistics for consumption-equivalent welfare loss from any R&D misallocation. They further extend the misallocation

accounting to an open-economy model, where they only care about their own economy, rather than globally optimal allocations. Countries with a more self-contained network should invest more in innovation-central sectors, while those reliant on foreign knowledge should choose R&D as if they are impatient and have less to gain from optimal allocations.

The theoretical results can be mapped to empirical applications. The innovation network is empirically constructed by patent citations. One participant asked why not choose measures like licenses issued. The speaker replied that license data was harder to incorporate in the model and could not capture the knowledge spillovers. Descriptive results show that innovation centrality is heterogeneous, and that the U.S. and Japan are large knowledge exporters, which can be thought of as closed economies, while others are open economies depending on knowledge importing. Finally, R&D misallocations across countries are assessed. The large dispersion in actual versus optimal sectoral R&D allocations despite a good line of fit serves as a strong signal of misallocation in most countries. Japan suffers the least welfare cost from R&D misallocation and moving to "Japan's efficiency" leads to consumption-equivalent gains of 28.8 percent in the U.S. in 2010, according to their model.

Tax Incidence and Optimal Taxation with General Equilibrium Effects and Transition

Yena Park



Do general equilibrium, or GE, effects favor progressive reform? Park derives formulas for the tax incidence and optimal

tax under a restrictive tax system and finds summary statistics for the GE effects and transition. The research investigates the effects of local transition, led by a small tax perturbation, and global transition, attributed to optimal steady state. The study finds that pecuniary and fiscal externalities determine the GE effects, and a tax reform which lowers interest rates achieves indirect redistribution. A more redistributive reform is made by a decrease in labor in the short run, while a long-run increase in capital induces a less redistributive reform. The GE effects provide forces for a more pronounced U-shaped optimal

tax schedule, and ultimately local transition makes the GE effects favor more progressive reform.

A participant asked why we want to know whether GE effects favor progressive reforms. The presenter said that, with only qualitative results on the matter, we have limited understanding on the exact shape of an optimal tax. The presenter received a question about the implication of this study for policy makers, since policy makers typically use micro elasticities. The presenter answered that we needed to know the market structure even if we already knew the elasticity of saving because we cannot know whether elasticity itself has welfare effects. The participant responded that the study seemed to take into account whether more substitutable capital and labor was appropriate.

Another participant asked why the author did not consider human capital responses. The presenter said that, in addition to saving, human capital

accumulation is sluggish. The presenter agreed with the participant's comment that human capital responses would be more sluggish than savings rates due to over-the-generation effects.

A participant said the paper assumed a lack of borrowing constraints, and Park responded that she made no assumptions on this. The participant replied that the interest rate was endogenous, so that assumption would be strict, and that he was willing to talk about it afterward.

Another audience member wondered why there was no time subscript in the welfare incidence formula. Park replied that without global transition, the paper assumed the economy was steady-state before tax perturbation. The audience member then added that interest rates and wages also changed, so distributions may be changing over time. The presenter agreed that it was a good point.

A Q-Theory of Inequality

Matthieu Gomez and Émilien Gouin-Bonenfant



What determines wealth inequality? The classical view is that high rates of return tend to increase it, but we have seen declining rates of return

and rising top wealth inequality in the U.S. Gouin-Bonenfant explains how low rates tend to increase wealth inequality, and models entrepreneurs with concentrated portfolios and rentiers with diversified portfolios. The model results indicate that wealth inequality is higher in a low-rate environment. The sufficient statistic

for the effect of interest rates on the Pareto tail suggests that it depends on equity payout yield, leverage, and duration of individuals who are in the top wealth group. This study provides empirical evidence on the effect of a decrease in the interest rate on top wealth inequality based on data from a Forbes list and several filing records. Their quantitative finding is that a two percent decline in interest rates is associated with one-third of the rise in inequality.

A participant pointed out that in the late 1980s top wealth inequality was driven by not just interest rates but also other factors. Gouin-Bonenfant answered that high equity prices

meant the cost of business was low because of less equity. An audience member asked about the importance of selecting starting points in the study and about how the authors consider wealth is evolving over time. The presenter responded that the focus of the study was to derive permanent-level effects, so the authors did not take into account short-run time-varying fluctuations, and that the study assumes that wealth is being revalued over time, and that more investment lowers interest rates.

Gouin-Bonenfant's modeling approach involves a stylized concept of "trees" that provide returns. A participant asked if the

presenter considers the case of when entrepreneurs cannot hold trees. He replied that this was why this no-arbitrage assumption was made. Eventually trees blossom and entrepreneurs become rentiers. And this no-arbitrage assumption pins down the value of one of the trees by equating the interest rate to the sum of returns, conditional on tree growth and tree blossoming, one of the key conclusions.

A participant raised a concern about the borrowing rate: if one's borrowing rate goes down, then the rate of return goes up, in this world. The presenter said that it was conditional growth, and the key idea was that a decline in interest rates lowered the expected return of owning a tree

and increased the return conditional on the tree growing. An audience member wondered why the presenter assumed an aggregate response to the interest rate, arguing that it should be differentiated. He answered that there were no aggregate risks, nor compensation for idiosyncratic risks. This was because the effects would be heterogeneous if the tree growth rate affected the volatility of the firms. However, this paper assumed that the tree growth rate did not affect the volatility. The same participant mentioned a paper that assumed different rates of returns for the same asset. The presenter agreed that this was an important point that he would take into account.

Another participant asked if the figure regarding the expected return on wealth was also driven, not only by the interest rates, but the risk premium. Gouin-Bonenfant said that since aggregate wealth was only given by businesses, it would not be driven by the risk premium. The questioner asked whether government bond prices affected the rate of returns. The presenter said that return on wealth would be invariant to public bond prices because the government did not contribute to individual wealth. The key point was that top wealthy people tended to own firms that had issued a lot of equity and debt.

Outsourcing, Inequality, and Aggregate Output

Adrien Bilal and Hugo Lhuillier



Firms increasingly outsource labor, relying on external contractors rather than in-house employees. Bilal and his co-

author explore whether outsourcing is driven by comparative advantage or by cost savings, and then develops a theory of inequality and output when outsourcing is available.

Upon hearing about the candidate drivers of outsourcing, a participant asked whether unionization was also a factor. Bilal explained that he folded unionization into the cost-saving mechanism. Another participant asked whether the paper differentiated between outsourcing high- and low-skilled workers. Bilal responded that the model was agnostic, but that, in the French administrative data he used, he focused on low-skilled workers who faced a wage

penalty from outsourcing. Only the comparative advantage view could explain the decision to outsource highly skilled workers, such as lawyers and consultants, because they earned a wage premium rather than a penalty from outsourcing.

Bilal introduced a theory of domestic labor outsourcing in which monopsony power leads to wage dispersion, incentivizing high-paying firms to outsource. A participant asked why large firms faced high costs of hiring. Bilal explained that larger firms in his model were unable to expand their human resources departments due to a finite supply of human resources employees in the labor force. Another participant asked whether the model allowed free entry of firms. Bilal clarified that free entry was permissible in the model but not necessary to obtain his results. A third participant asked whether the cost of firing was also a factor in the outsourcing decision. Bilal responded that firms with high turnover did not

seem to outsource at higher rates, suggesting that firing costs were not a major driver of outsourcing. Another audience member asked what assumptions would imply the same equilibrium with and without outsourcing. Bilal replied that having the same degree of hiring frictions for in-house and outsourced labor would likely lead to the same equilibrium, but he had not fully worked out which assumptions would be required.

The empirical analysis includes data on the amount French firms spent on outsourcing from 1997 to 2007. A participant asked whether money a firm spent renting space in a WeWork is classified as spending on outsourcing. Bilal replied that such spending would not be included because it was not for labor. The participant pressed that labor was embodied in the WeWork rent, which includes janitorial services. Bilal conceded that this spending could be considered outsourcing and presented a difficult measurement problem.

Descriptive statistics showed that larger firms were more likely to outsource and that outsourcing was associated with a wage penalty. Instrumental variable analysis using export shocks as a source of exogenous variation confirmed a causal relationship between higher revenue and a higher share of

outsourcing. A participant asked Bilal to explain the exclusion restriction in this case. Bilal said the exclusion restriction was that firms receiving export shocks weren't systematically experiencing a decline in the cost of outsourcing at the same time. The paper concluded that outsourcing was driven by a cost-saving rather than a

comparative advantage motive and that it created a cap on wages for workers at the bottom of the wage distribution. While outsourcing was good for the economy as a whole, increasing output by six percent, it had negative effects on low-skilled workers that could be fixed by implementing a minimum wage.

The Global Race for Talent: Brain Drain, Knowledge Transfer and Growth

Marta Prato



An inventor's migration could affect her productivity and collaboration networks, as well as cause knowledge spillovers onto

residents of her new home. Prato develops a theoretical model of migration and constructs a micro-level dataset of inventors who move from the European Union to the United States for empirical analysis.

One participant asked whether the results generalized to migrants from India and China. Prato replied that her general setup could be applied to many settings but analyzes only European migrants.

Prato uses a common setup for innovation-based endogenous growth models within a single country and expands it to include two countries connected by trade and migration. A participant asked whether migration was mainly driven by individuals employed by multinational corporations who are sent to a location in a different country. Prato explained that while two-thirds of the migrants in her data moved within the same multinational firm, the results would also hold for those who switched firms.

An audience member wondered whether the ability to trade intermediate goods made migration less important, as trade would allow firms to benefit from innovation taking place in a different country. Prato responded that total factor productivity remained unequal across countries, demonstrating the presence of frictions in the diffusion of new innovations across borders. A third participant asked whether Prato's model included individuals who moved to the United States for graduate school and remain there as inventors. Prato replied that she focused on migrants who moved after starting their careers because she could observe them in her data, but that other types of migrants would be important to study in future work.

Prato's model includes two policies: a tax on inventors' profits and an immigration cap. A participant asked how the model would change if she added a tax incentive to return to the country of origin. Prato explained that adding such a policy would be a very simple extension of her model. Another participant asked how labor is taxed in the model for workers who are not inventors. Prato clarified that only inventors' wages were taxed because other workers in the model were very stylized: they supplied a fixed amount of labor

and did not make any decisions. In Prato's setup, the European Union and the United States have the same fundamental parameters except that the European Union charges higher taxes. A participant suggested that if the tax rates were equal, diffusion would lead to the two countries being identical. Prato explained that her model would not have a unique equilibrium in that case.

Migration provides access to new collaborators. Prato discussed evidence from patent filings that European inventors are much more likely to work with Americans after moving to the United States. A participant pointed out that the model describes meetings between inventors, but in the data Prato can only observe patents, not initial meetings. Prato agreed but argued that if a constant fraction of meetings lead to patents, the general pattern in her data is likely to hold for meetings as well as patent collaboration. She concluded with a policy counterfactual in which the European Union implements a tax cut for incoming migrants. She provided evidence that output would decrease in the United States, while output in Europe would increase for a few decades before declining.

Revising Retirement and Social Security Claiming Decisions

Neha Bairoliya and **Kathleen McKiernan**



Workers deciding when to claim Social Security benefits face a trade-off between receiving a pension for a longer period of time and

receiving a higher payment each month. Many workers claim Social Security early, even when waiting would very likely allow them to maximize lifetime benefits. McKiernan and her co-author investigate why workers claim Social Security early and how they would respond to an increase in the normal retirement age. Individuals can collect Social Security without a penalty at the normal retirement age, which is 65 for the cohort McKiernan studies.

A participant asked whether workers can borrow against their future Social Security income before they retire. McKiernan explained that they legally cannot, and therefore financial markets are incomplete in this setting. Another participant pointed out that individuals' discount rates determine whether claiming Social Security early maximizes utility and argued that McKiernan could answer her research question by simply finding the discount rate that explains the claiming pattern in the data. McKiernan responded that she used a discount rate of two percent, but that

her model could explain behavior over a range of discount rates.

The paper documents frictions that affect the decision to claim early, including incorrect beliefs about health shocks, the penalty for claiming early, and lifespan. A participant asked whether the fear of Social Security becoming insolvent could be another friction motivating individuals to claim early. McKiernan replied that she studied a cohort that retired before the possibility of insolvency became salient in 1998. Another audience member wondered whether beliefs about the penalty for claiming early gradually became more accurate as the individual approached retirement. McKiernan explained that this misbelief is stable from age thirty until retirement.

McKiernan introduced a life-cycle model of consumption, savings, retirement, and Social Security. The model included a bequest motive, as well as exogenous shocks to health, labor productivity, and employment status. A participant asked whether medical spending should be included as a separate shock in the model. McKiernan responded that she lacked data on medical spending, but that the shock was already present in the bequest motive. A second participant asked whether agents in the model were permanently misinformed. McKiernan explained that agents could realize that they made a mistake

after claiming Social Security but cannot update their beliefs before claiming benefits.

An audience member asked whether employers motivated early benefit collection by encouraging older people to retire, but other audience members responded that such encouragement would be considered illegal age-based discrimination. Another asked whether people decided to retire early to enjoy life with their grandchildren. McKiernan replied that she did not model changes in the value of leisure as people aged, but that the model was able to match retirement decisions in the data.

McKiernan presented the simulated results of a policy experiment, in which the normal retirement age increased to 70. The policy change would decrease claims among individuals 65 and under, while increasing claims among individuals aged 66 to 70. The change in claiming behavior is driven by married people, who are able to adjust because they have extra income through their spouses. A participant asked why McKiernan chose this policy change. She explained that this policy change was more extreme than the changes being seriously discussed by policymakers, and still it led to only small shifts in claiming behavior, which shows that the one-year increase being seriously considered is unlikely to substantially reduce early claiming.

Fiscal Rules and Discretion with Risk of Default

Chiara Felli and Facundo Piguillem and **Liyan Shi**



Governments have a tendency to overspend, which can lead to unsustainable debt and a risk of default. Fiscal rules, such as the European Union's

debt limit for its member nations, have the potential to improve welfare when governments are present-biased and capable of default. Shi and her coauthors investigate optimal fiscal rules to govern debt accumulation, spending, and default decisions.

A participant asked how default and spending interacted. Shi explained that default risk increased the interest rate, a market mechanism that puts downward pressure on debt-financed spending. However, that market mechanism may be insufficient to limit spending to the optimal amount.

Shi presented her model, in which present-biased governments issued bonds, collected tax revenue, spent money, and decided whether to default on their debts. A participant asked Shi to describe the sources of shocks in the model. Shi explained that governments received shocks in the form of political turnover, where the probability of losing power was independent and identically distributed across governments. Another audience member asked why

governments would choose to borrow. Shi responded that governments were present-biased and therefore wanted to spend more than they earned in tax revenue, leading to borrowing. A participant asked how governments chose tax revenue. Shi clarified that tax revenue was exogenous. The participant then asked why Shi would model a government as being unable to choose taxes. Shi explained that an alternative interpretation of the model is of present-biased citizens making a collective decision without the tax-rate-setting power of a government. Another participant suggested that Shi could have government spending assigned exogenously and let the government choose both debt and taxes to finance it.

The model includes an equation for the interest rate, which is higher when the government is more likely to default. A participant argued that the interest rate equation held only under a certain debt threshold because lenders would not provide a loan at any interest rate when debt is so high that default is guaranteed. Shi agreed that she should rewrite the equation to include two cases: one in which debt is under a certain threshold and another in which default is inevitable due to high debt. Another participant asked whether multiple equilibria could arise in this model. Shi explained that by using

continuous time, she guarantees a unique continuous Markov equilibrium. Multiple participants raised concerns about the conditions Shi imposed in the model to ensure a unique Markov equilibrium, arguing that by artificially restricting the type of equilibrium that could occur, she might have found results that do not generalize. Shi responded that without these restrictions, she could not draw any conclusions from the model because she could not characterize an equilibrium.

The model implies optimal rules for debt, spending and default. Default should be forbidden at low levels of debt and required at high levels of debt, with discretion given to the government when debt is moderate. Spending limits should be imposed on governments at risk of default. Debt limits should be imposed when governments can regain access to the market after a default; if their exclusion from the market is permanent, no debt limit is needed. A participant pointed out that present bias causes governments to undervalue the benefits of repaying debt. Shi agreed and explained that the current government did not value repayment because the benefits might accrue to the successor government.

Asymmetric Information and Capital Accumulation

Juan Herreño, Aime Bierdel, Andres Drenik, and Pablo Ottonello



Asymmetric information in capital markets may be capable of producing distortions for individuals, but the aggregate effects have not

been well-explored. Herreño and his coauthors build a general-equilibrium capital-accumulation model, in which capital is traded in decentralized markets, with sellers having more information about capital quality than buyers. Asymmetric information distorts the terms of trade for sellers of high-quality capital, who list higher prices and are willing to accept lower trading probabilities to signal their type.

The researchers propose an identification strategy to measure the degree of asymmetric information based on the relationship between listed prices and selling probabilities. In addition, they apply it using a unique dataset on a panel of individual capital units listed for trade. By combining the model and empirical measurement, they show that the degree of asymmetric information has quantitatively large effects on aggregate income levels and operates through three channels: aggregate investment, capital

unemployment rate, and average quality of employed capital.

When Herreño began his talk, a participant raised a question about whether the presenter thinks that all forms of capital goods have this asymmetric information feature. Herreño answered that they want to present a model that is quite general, with applications for structures, an important part of the capital stock. He added that he thought asymmetry existed for equipment and machinery but lacked data to confirm that.

The presenter continued to introduce a theoretical framework similar to the neoclassical capital-accumulation model with discrete infinite time, and final and capital goods. He emphasized that the interesting additional ingredients in their model were capital-equality heterogeneity, decentralized capital markets, and asymmetric information. A participant wondered what happens with the service flows people get from living in a house. The presenter clarified that it was completely commercial real estate, and households had no use for capital.

As the presenter explained the capital-quality heterogeneity, a participant asked about the joint distribution of observed and unobserved qualities. Herreño

answered that he is going to introduce a joint distribution function linking observed and unobserved qualities and describe how it looks in the data. Another participant wondered about an assumption in the decentralized capital market and asked whether multiple types of capital combine linearly. The presenter explained that there was going to be some separability in the problem of each type and that there was no complementarity between the types of capital.

When multiple participants and the presenter discussed the role of announced quality, which works as a proxy for unobserved quality, one participant described the model as a sort of curse of the asymmetric information model. He pointed out that one can design a trading protocol to be sufficiently harsh so that if one is forced to report announced quality, everyone reports it equal to the actual quality, resulting in no asymmetric information problem. Herreño admitted that it is a fair concern and said that they are trying to confront that concern by recovering similar macro effects and parameters using numerical models and showing the robustness of the results.

A General Characterization of Capital Accumulation Amplification

Hannes Malmberg



An important question in development economics is which country characteristics – such as industries, markup levels,

and capital taxes – affect output in the long-run. A stylized framework is that effects on output are divided into short-run direct effects by the change in parameters and indirect effects through capital stocks. Malmberg's project explores the economic logic of capital amplification and studies how capital amplification depends on input-output structure, depreciation rates, rates of return, growth rates, and more. He exploits the mathematical connection between capital amplification and static misallocation, showing that takeaways from simple neoclassical benchmarks do not generalize. He finds that a steady-state in a dynamic economy, which is a non-golden-rule economy, looks distorted from a static perspective and results in bigger capital compensation compared to investment. Therefore, undistorted logic still works for welfare, but output effects require distorted calculus. Malmberg also shows that upstream capital sectors have an outsized effect on long-run output, and the long-run output effect of labor reallocation is larger than wage effect if reallocation complements capital.

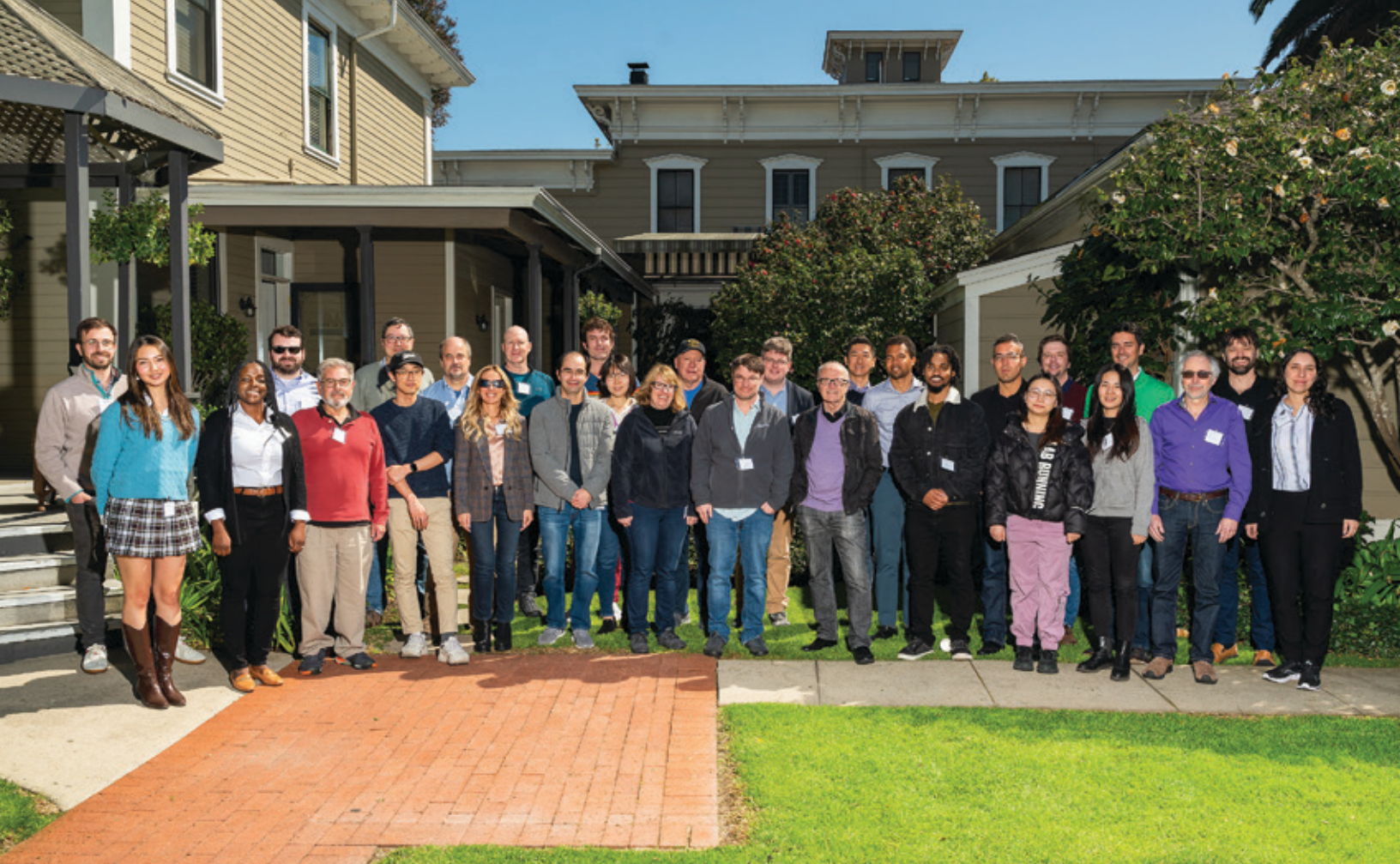
At the beginning of the talk, one participant raised a question about why he adopted a chain model of capital accumulation made with a sequence of labor and capital. Malmberg answered that it was going to highlight some economic mechanisms that will be useful for explaining his general results. The same participant asked how this would relate back to the normal neoclassical growth model that he showed would not generalize, and the presenter answered that the question will be responded to throughout the presentation. Another participant asked a clarifying question about whether there was no value added except for the initial stage in the chain model. The presenter answered that there will be value added in every stage, but there won't be a labor part except for the first stage.

Malmberg sought to highlight two results of his model — the effects of the marginal investment of labor and the marginal consumption of capital on steady-state output and on aggregate total factor productivity.

When Malmberg explained consumption elasticity with respect to the marginal investment of labor and marginal consumption of capital, a participant said it looked like there was dynamic complementarity in human capital production. The presenter answered that he hadn't thought about that analogy, but agreed. When Malmberg showed that the elasticity of total factor productivity with respect

to the marginal investment of labor and marginal consumption of capital equals Dornar weights of sectors, a participant questioned the definition of total factor productivity in the context of his study. The same questioner suggested that total factor productivity should be defined, rather than calling it a Dornar weight. They discussed how to define total factor productivity in the context of this study, and Malmberg wrapped up the discussion by explaining how it was consistent with his original definition.

While Malmberg was introducing equations and calculations, a participant wondered whether it was the right calculation to do because his study has a dynamic economy. He argued that if one measures the impact of change in marginal investment of labor and marginal consumption of capital on welfare, and measures prices and capital in that dynamic economy, steady-state will hold anyway and it is not an apples-to-apples comparison. Malmberg agreed with the opinion and said the questioner is completely right in terms of welfare. However, he said, he comes from a literature where people try to explain output differences. For this reason, he emphasized that to answer the question about output differences, he wanted to develop a mathematical model that allows him to answer the question in a steady-state, output-relevant way.



Racial Inequality in Macroeconomics

March 3–4, 2023

Dionissi Aliprantis – Federal Reserve Bank of Cleveland

Carlos Avenancio-Leon – UC San Diego

Noimot Ayoub – Federal Reserve Bank of Atlanta

Daniel Carroll – Federal Reserve Bank of Cleveland

Diego Darius – University of Southern California

Alessandra Fogli – Federal Reserve Bank of Minneapolis

George-Levi Gayle – Washington University at St. Louis

Ben Griffy – University of Albany

Stephan Heblich – University of Toronto

Sasha Indarte – University of Pennsylvania

John Bailey Jones – Federal Reserve Bank at Richmond

Pete Klenow – Stanford University

Karen Kopecky – Federal Reserve Bank of Atlanta

Finn Kydland – UC Santa Barbara

Kevin Lang – Boston University

David McMillon – Emory University

Conrad Miller – UC Berkeley

Makoto Nakajima – Federal Reserve Bank of Philadelphia

Cormac O'Dea – Yale University

Nick Pretnar – UC Santa Barbara

Peter Rupert – UC Santa Barbara

Eric Young – University of Virginia

Slavery and the British Industrial Revolution

Stephan Heblich, Stephen J. Redding and Hans-Joachim Voth



A central debate in the economic history literature is whether wealth accumulation from the triangular slave trade enabled the

British Industrial Revolution. This paper provides new theory and evidence on the role slavery played in the British Industrial Revolution, using new data from the Legacies of British Slavery Database that eliminates the small sample issues faced in the previous literature. The authors use geographic variation in wealth from slavery within Britain, measured through compensation payments made to slaveholders when slavery was abolished, as well as micro data on British economic activity from 1086-1843, to construct a spatial general equilibrium model of economic development and structural transformation from an agricultural economy to an industrial one. Weather conditions on the voyage from Africa, which affected the profitability of slave trading, are used as an instrument for slavery wealth.

Heblich provided historical background information about the slave trade in Britain, which began in the 1560s and continued until 1833. A participant asked whether the paper accounts for the role of serfdom, which

existed alongside slavery. Heblich explained that while white workers in British factories could be considered serfs, slaves performed agricultural work rather than manufacturing and therefore had an entirely separate role in the economy. Another participant pointed out that indentured servants played a role in agricultural work and should be included in the model. Heblich agreed that data on indentured servants would be a useful addition to the paper.

Next, Heblich introduced a dynamic specific factors model, in which the economy consists of many domestic locations and overseas colonies that function as small, open economies. There are four types of agents: landlords, who are immobile and own domestic land; capitalists, who are immobile and own local wealth; free workers, who are mobile across domestic locations; and enslaved workers. A participant asked whether capitalists and landowners, which are separate agents in the model, were empirically different groups of people. Heblich answered that there was likely some overlap, which is mechanically removed from the model, but the majority of capitalists came from a new class of merchants rather than the historical aristocracy that owned land. The three economic sectors in the model are colonial plantations, which use enslaved labor; domestic agriculture; and domestic

manufacturing. Geographic variation plays a key role in the model: regions with better information about slavery investments accumulate more capital and then have more money to invest in the capital-intensive manufacturing sector, triggering a structural transformation in which labor moves from agriculture to manufacturing. The main winners in this transformation are the capitalists, and the losers are landowners.

The authors use an instrumental variables strategy to provide causal evidence of slavery's impact on the British Industrial Revolution. Their main finding is that Britain became wealthier and more industrialized during its Industrial Revolution than it would have been in the absence of slavery. Specifically, slavery increased GDP by 3.5%, with slave holding playing a larger role than slave trading. Capitalists' income increased by 11%, while landowners experienced smaller losses of less than 1%. Geographic heterogeneity analysis reveals that these effects were distributed unevenly: in areas with the highest levels of slavery, total income rose by over 40% and capitalists' income increased by over 100%. These findings are consistent with the argument that slavery played a key role in enabling the British Industrial Revolution.

Race and Economic Well-Being in the United States

Jean-Felix Brouillete, Charles I. Jones and **Pete Klenow**



When evaluating racial progress, it is important to be able to comprehensively model well-being. Klenow and his co-authors attempt

to do just that. Klenow starts with the observation that welfare for Black Americans was 43% of that for White Americans in 1984 and rose to 60% by 2019. Going back further in time (albeit with more limited data), the gap was even larger, with Black welfare equal to just 28% of White welfare in 1940. They explore this gap and its convergence by constructing a measure of consumption-equivalent welfare for Black and White Americans, which incorporates life expectancy, consumption, leisure, and inequality, with mortality rates playing a key role quantitatively.

Klenow began the presentation by presenting the overall trends in well-being, or utility. Then, he presented a mathematical formula to express this utility, incorporating consumption, leisure, and mortality rates. He discussed the calibration process, describing how they came up with values for key parameters in the utility function, such as the discount rate and the elasticity of intertemporal substitution. The measure of welfare is based on this expected utility framework, which allows them to capture the impact of mortality rates on economic well-being.

The authors draw from several sources of data, including the National Center for Health Statistics, the Consumer Expenditure Survey, and the American Time Use Survey. They use these data to estimate life expectancy, consumption, leisure time, and inequality for each racial group. The authors then combine these estimates into a single measure of welfare that incorporates all four dimensions of economic well-being. Finally, they use regression analysis to examine the contributions of different factors to the welfare gap between Black and White Americans over time.

Klenow also discussed the political implications of their study, suggesting that policies aimed at reducing consumption and life expectancy gaps between Black and White Americans could help to further reduce the welfare gap.

The authors use their expected utility framework and data from various sources to construct a measure of welfare that captures differences in economic well-being between the two racial groups. They find that Black Americans have lower levels of welfare than White Americans, and that this gap has persisted over time. They also find that differences in life expectancy, consumption, leisure time, and inequality all contribute to the welfare gap between the two groups. Finally, they discuss some possible extensions to their analysis, such as adjusting for morbidity, incarceration, and unemployment, and note the consumption-equivalent loss due to

deaths from COVID-19. Overall, this section provides a comprehensive analysis of the factors driving differences in economic well-being between Black and White Americans over time.

Several questions were raised during the presentation. One participant asked if the analysis is specific to race or if other characteristics could be studied in a similar fashion. Klenow responded that nothing in the analysis limits it to race. For example, gender gaps could also be studied using this method. Another person in the audience asked about leisure, wondering what was included under the authors' definition of leisure. For example, is commute time and time spent unemployed considered to be leisure? Klenow answered that any time spent not working was considered leisure time. Although it's certain that this misclassifies time spent on home production and other non-leisure activities, the point is that nonwork time is valuable, regardless of how it's spent. Finally, someone asked whether the model assumes that people who consume a lot are just as likely to die as those that consume less. Klenow explained that, actually, the data they use accounts for this so that risk of dying varies depending on consumption.

The Dynamic Effects of Co-Racial Hiring

Conrad Miller and Ian Schmutte



Hiring underrepresented groups may depend on which groups are already well-represented at a firm. Conrad Miller and his

coauthor examine the dynamic effects of co-racial hiring on the racial composition of firms in Brazil. They find that firms are more likely to hire from groups already well-represented at the firm, though with some decay. At entry, firms with White founders are about 30% less likely to hire non-White employees than comparable firms with non-White founders. After 400 hires, these firms nearly converge in their composition of subsequent hires. They also find that referral hiring can contribute to the lack of diversity in firms, as referral networks tend to be racially segregated. Their study suggests that co-racial hiring can have complex and dynamic effects on diversity in firms, and that policies like affirmative action and active recruitment from diverse sources can help reduce racial inequality in labor demand.

One participant asked, “Do you have any suggestions on how firms

can reduce their reliance on referral hiring and increase diversity?”

Miller provided several strategies to increase diversity among a firm's workers. One strategy is to actively recruit from diverse sources, such as job fairs or online job boards that target underrepresented groups. Another strategy is to use blind hiring practices, such as removing identifying information from resumes or conducting blind auditions for certain positions. Firms can also implement diversity training programs for their employees and managers to raise awareness of unconscious biases and promote a more inclusive workplace culture. Finally, firms can set diversity goals and track their progress over time to ensure that they are making meaningful progress toward increasing diversity in their workforce.

Another person asked if Miller had any hypothesis for why White founders are less likely to hire non-White employees. Miller replied that they conjecture that firms may have a preference for employees who are similar to their founders or managers in terms of race, ethnicity, or culture. This preference may be driven by a desire for social cohesion or a belief that employees who are similar to the

founders or managers will be a better fit for the company culture. Another hypothesis is that firms with White founders may have less exposure to non-White job candidates, either because of their social networks or because of structural barriers in the labor market. This lack of exposure may make it more difficult for these firms to identify and hire qualified non-White candidates.

Finally, someone asked Miller how the authors define co-racial hiring and how it affects diversity in firms. Miller answered that they define co-racial hiring as the tendency of firms to hire employees of the same race as their founders or managers. Furthermore, they argue that co-racial hiring can have both positive and negative effects on diversity in firms. On one hand, co-racial hiring can lead to a lack of diversity in the workplace, as firms may be less likely to hire employees from different racial backgrounds. On the other hand, co-racial hiring can also lead to increased diversity if firms with diverse founders or managers are more likely to hire employees from diverse racial backgrounds.

Beliefs and Affirmative Action in Employment

Benjamin S. Griffy and Eric Young



Discrimination can be based on taste or on statistics. While both reasons are problems, they have different ethical and policy implications.

The paper presented by Benjamin S. Griffy explores how asymmetric information can lead to Black workers to attribute poor employment outcomes to taste-based discrimination, when in reality it may be statistical discrimination by firms.

The paper suggests that Affirmative Action can increase Black human capital investment by revealing information about the degree of discrimination they face, leading to long-term increases in human capital investment. The authors develop a model to show how Affirmative Action can have this effect and use the model to evaluate the effectiveness of Affirmative Action policies. They also discuss circumstances in which Affirmative Action may backfire and provide avenues for future research. Overall, the paper highlights the importance of understanding how information frictions can affect labor market outcomes and the potential role of policy interventions such as

Affirmative Action in addressing these frictions.

The paper relies on several assumptions. First, firms and workers have asymmetric information about the qualifications of workers. Second, Black workers may attribute poor employment outcomes to taste-based discrimination that are actually a result of statistical discrimination by firms. Third, Affirmative Action can increase Black human capital investment by revealing information about the degree of discrimination they face. Fourth, the model assumes a static environment with no changes in preferences or technology over time. Fifth, the model assumes that all workers have the same ability and productivity, except for differences in human capital investment. And the paper assumes that firms are profit-maximizing and will hire workers based on their expected productivity.

The outcome of the model depends on the parameters involved. The authors find that under certain conditions, such policies can lead to significant increases in Black human capital investment and reduce the impact of discrimination on employment outcomes. However, they also identify circumstances in which Affirmative Action may backfire and lead to unintended consequences.

Overall, Griffy stressed the importance of understanding how information frictions can affect labor market outcomes and the potential role of policy interventions such as Affirmative Action in addressing these frictions.

One person asked about the assumptions being false. Griffy responded that the assumptions are necessary to develop the model and evaluate the effectiveness of Affirmative Action policies in addressing labor market frictions caused by asymmetric information and discrimination. However, they may not hold in all real-world situations, and he acknowledged that further research is needed to explore the implications of relaxing these assumptions.

Another participant asked Griffy how affirmative action reveals information about discrimination faced by Black workers. Griffy explained that Affirmative Action can reveal information about discrimination faced by Black workers by decoupling the link between biased firm priors and employment outcomes. This means that Affirmative Action can provide Black workers with information about the degree of "true" discrimination in the labor market, which can lead to increased human capital investment.

An Equilibrium Analysis of the Effects of Neighborhood-based Interventions on Children

Eric Chyn and **Diego Daruich**



To address racial and socioeconomic disparities, policymakers have at times pursued interventions based on

geographic factors. Diego Daruich presented a quantitative assessment of policies that aim to shape neighborhood quality for children. He and his co-author incorporate neighborhood effects into a general equilibrium heterogeneous-agent overlapping-generations model with endogenous location choice and child skill development. They have analyzed the impact of two types of government policies that aim to shape neighborhood quality for children: housing vouchers and location-specific wage subsidies. The authors find that these policies can have significant long-run and large-scale impacts on children's outcomes, but the effectiveness of these policies depends on various factors such as the size of the subsidy, the targeting of disadvantaged neighborhoods, and the duration of the intervention. The authors also highlight the importance of considering equilibrium effects when evaluating policy interventions.

In the context of their analysis, the authors define equilibrium as a

state in which all markets clear and agents optimize their behavior, given prices and policies. This includes endogenous determination of housing costs, as well as neighborhood effects. Daruich discussed several assumptions that their model is built upon. For instance, the long-run outcomes of children depend on parental choices, and an individual's earnings depend on skills that are determined in childhood. Parents affect the skills of their children by choosing neighborhoods and making time investments. Neighborhoods matter for children due to endogenous local spillovers, which occur because the skills of children increase when they grow up in an area with higher income per capita. The economy is modeled using a general equilibrium life-cycle Aiyagari framework that features wage uncertainty and incomplete markets. Finally, the model features distortive taxation by allowing for endogenous labor supply.

From the analysis, the authors are able to draw a number of conclusions. They find that housing vouchers and location-specific wage subsidies can have significant long-run and large-scale impacts on children's outcomes. Furthermore, the effectiveness of these policies depends on various factors, such as the size of the subsidy, the targeting of disadvantaged neighborhoods,

and the duration of the intervention. The authors also find that housing vouchers are more effective than location-specific wage subsidies in improving children's outcomes. Finally, Daruich highlighted the importance of considering equilibrium effects when evaluating policy interventions.

A participant asked Daruich about search frictions and transaction costs, and if they are considered in the analysis. Daruich explained that their model assumes that housing markets are perfectly competitive, and that there are no frictions such as search costs or transaction costs. Another audience member asked how children choose to invest in their human capital. Daruich replied that children's skills are fully determined by parental investments and neighborhood effects and does not account for other factors such as genetics or peer effects.

One person raised the objection that parents are not fully informed about neighborhood characteristics. Daruich agreed, saying that parents may not have access to this information or may face other constraints that limit their ability to make optimal choices. However, the assumption is necessary in order to derive the results.

Who Benefits from Retirement Saving Incentives in the U.S.? Evidence on Racial Gaps in Retirement Wealth Accumulation

Taha Choukhmane, Jorge Colmenares, **Cormac O'Dea**, Jonathan Rothbaum, and Lawrence Schmidt



The design of plans meant to encourage retirement saving, while well-intentioned, may not be equitable. It's an important

topic, constituting as much as 1.5% of the U.S. GDP through employer and government incentives. Using novel data on employer retirement plans, Cormac O'Dea and his coauthors study the distributional impact of the retirement saving incentives, focusing on differences across racial groups.

Retirement assets contribute to the racial wealth gap. The authors identify channels for wealth inequality arising from retirement saving incentives along both the extensive and intensive margin of workers' saving choices. Their main findings suggest that White workers contribute at least 40% more than Black and Hispanic workers, and that at most half of this gap is attributed to individual characteristics like income. Liquidity needs and family background help explain the residual gap.

The authors combine employee survey data with new employer data on retirement plans, in particular the matching schedules in regulatory form 5500. Descriptive evidence shows salient gaps in retirement

savings by race due to differential employee contributions and amplified effects from employer matching contributions. A participant raised questions on whether the racial gap in contribution rates was conditional on having access to the plan, firm sector, or firm size. The speaker responded that the gap was unconditional and mostly driven by differential participation in the retirement savings plan. Nevertheless, the gap remains after controlling for a rich set of individual characteristics including income, education, occupation, and others. Furthermore, effects of the gap exist at both extensive and intensive margins, or, in other words, the participation rate and contributions out of total income conditional on participation.

The authors propose two mechanisms to account for the racial gap in retirement savings. First, evidence of penalized withdrawals suggests that liquidity constraints bind more for Black workers than for White and Hispanic workers, such that illiquidity of plans may deter participation and lower contribution rates ex-ante. Black retirement savers are much more likely to take an early withdrawal. One participant asked whether borrowing was an option in their context, and the speaker answered, no, and that withdrawals simply meant taking their own money

out. Another participant raised a question on whether the racial gaps in early withdrawals varied over the income distribution. The speaker illustrated in a graph that Black-White gaps remained sizable throughout the income growth distribution, especially for those with the largest income declines.

Then another question came up about the racial gaps over wealth or housing equity rather than income distribution. The speaker replied that they might be able to do wealth capitalization within a smaller data sample given data availability. Also they had no access to housing value data, the main reason why they only considered homeownership in the analysis. Second, family structure and parental income together explain between a third and half of the racial gap in savings that remains after individual controls, adding to evidence that immediate needs are driving some of the documented gaps. One participant pointed out that parental wealth might better capture parental resources compared to income. The fact that those with richer parents contribute more also speaks to the intergenerational wealth persistence. Lastly, policy counterfactuals are conducted to examine the quantitative importance of each proposed mechanism.

The Effect of Political Power on Labor Market Inequality: Evidence from the 1965 Voting Rights Act

Abhay Aneja and **Carlos Fernando Avenancio-Leon**



What are the economic consequences of political engagement? Carlos Fernando Avenancio-León and his co-author study

the impact of political power on labor market inequality, specifically focusing on the instrumental value of the enfranchisement of socioeconomically disadvantaged minorities. The authors use the 1965 Voting Rights Act (VRA) as a natural experiment to investigate whether political empowerment produces tangible economic gains for poor black Southerners.

Well-documented improvements in economic status experienced by African Americans after 1950 coincide with the civil rights movement and increased political participation. However, it is unclear whether this correlation reflects a causal relationship between political power and economic outcomes. To address this question, the authors use county-level political and economic data from the 1950 and 1980 censuses to examine changes in Black-White earnings inequality before and after the implementation of federal election oversight under the VRA. That county VRA status may not be random leads to the use of a spatial regression discontinuity design where they compare adjacent county pairs, in

which one county is protected under the VRA and the other is not. One participant asked how county VRA status was determined. The speaker stated it was based on political rules. Another participant proposed that matching might be better than spatial regression discontinuity in their setting since geographical proximity did not necessarily indicate similar economic conditions. Finally, the speaker gave an affirmative answer in response to another question on whether pre-VRA voting registrations were similar in neighboring county pairs.

The first stage results show that the VRA successfully mobilizes black voters as evidence of black political incorporation. In the second stage, they find that counties subject to the VRA witness reductions in the Black-White earnings gap of around 5.5% between 1950 and 1980. This causal effect between Black political power and economic status is driven primarily by rising Black wages and comes at no significant cost to Black employment.

One participant raised concerns over migration of Black workers from non-VRA-covered to VRA-covered counties. The speaker answered that there was no strong evidence of such migration in the data. Another participant asked how to relate the VRA to labor market inequality. This question naturally led to the discussion of potential economic mechanisms from political empowerment to labor market outcomes. The direct channel

through which the wages of Black Americans are elevated is government employment. Results suggest that in VRA-covered counties, Black Americans are 2-4% more likely to receive a government job than White workers. An indirect channel is that both the increased likelihood of government employment and the wage premium within the public sector put upward pressure on Black earnings in the private sector. Results show that the VRA's largest private sector earnings effects take place in occupations where private firms face competition with the government for Black labor.

One participant asked whether the VRA explicitly included labor market regulations. The speaker explained that hiring more Black workers in government jobs was explicitly emphasized during political campaigns, which created spillover effects in the private sector. The increased public sector Black employment boosted previously low Black wages by improving the Black Americans' bargaining power, both by dampening private labor supply and improving the outside-option wage. These findings highlight the importance of increasing minority representation in politics for current policies aimed at reducing labor market inequality across racial groups.

Monetary Policy with Racial Inequality

Makoto Nakajima



Racial inequality has become increasingly important, even for the Federal Reserve Bank. Motivated by this fact, Makoto Nakajima studies

heterogeneous effects of monetary policy on different racial groups. In the paper, the author documents stylized facts of racial inequality in income and wealth, with a specific focus on labor market risks and hand-to-mouth households that are more vulnerable to economic shocks.

The specific question the author seeks to address is which racial group gains the most from an expansionary monetary policy shock. He finds that Black workers gain the most, due to both the labor market risk channel and a higher chance of being hand-to-mouth. A participant raised concerns over employment opportunities endogenously responding to policy shocks. The speaker clarified that he only focused on short-run effects, rather than long-run labor market differences.

A question came up on whether effects of higher inflation could be different across racial groups, particularly given their differential asset composition. The speaker responded that this was not

considered in the model. The participant pointed out that the model misses an important channel by neglecting such a large issue.

Stylized facts were then presented on the racial inequality in income and wealth. First, Black and Hispanic workers face higher labor market risks. The volatility and average level of unemployment rates are higher for Blacks and Hispanics. Additionally, their job does not last long, and it takes longer for Black workers to find a job. One participant asked if sectors were affected differently by monetary policy, such that policies may have a larger impact on industries with more White workers. The speaker recognized that this potential fact could be captured by targeting the moments of transition rates directly in the calibration. Second, Black and Hispanic households are more likely to be hand-to-mouth. Hispanic and Black median wealth is only about a tenth of the White median. The fraction of hand-to-mouth households is 49% and 47% for Hispanics and Blacks, respectively, in contrast to 25% for Whites. The speaker confirmed that the marginal propensity to consume was indeed higher in those hand-to-mouth households, in response to a question from the audience.

The author builds a heterogeneous agent New Keynesian model that captures the stylized facts of racial

inequality. The model allows for heterogeneity across households based on their income level, wealth level, and race. It introduces labor market frictions with race-specific job-finding and separation rates in segmented labor markets and hand-to-mouth households via type-specific premium to return to savings. One participant asked about the form of assets and borrowing costs in the model. The speaker clarified that there was only one asset: agents held shares of mutual funds, and borrowing was not allowed in the model.

In response to a question on the wage determination, the speaker replied that it was mainly affected by productivity across groups. The model appears to capture the empirical response of the Black-White unemployment rate gap to an accommodative monetary policy shock and the higher marginal propensity to consume for Black and Hispanic workers. The labor market risk channel makes welfare gains from an accommodative monetary policy shock 25% larger for Blacks and Hispanics and that a monetary policy rule targeting the Black unemployment rate is a more accommodative version of policy rule targeting the overall unemployment rate.

The Color of the American Dream: Segregation and Endogenous Racial

Alessandra Fogli, Veronica Guerrieri, and Marta Prato



There have been persistent racial gaps in economic outcomes, and they are worse in areas with more residential segregation.

Alessandra Fogli and her coauthors question whether this residential segregation has contributed to the persistence of these gaps and suggests a model of residential segregation driven by endogenous local spillovers and racial bias.

Neighborhood spillover makes future wages higher in neighborhoods with richer parents and higher-ability children via peer effects, public schools, and social norms. Fogli showed that the model could be enriched with endogenous belief formation to capture segregation by race, as well as by income. With this endogenous belief, initial gaps trigger racial bias which in turn generates residential sorting and persistent gaps. In the paper, the authors provide some empirical evidence of the connection between race gaps and segregation along with a theory of racial beliefs and segregation.

Near the beginning of the talk, a participant asked whether racial bias discussed in the study was inaccurate statistical discrimination or taste-based discrimination. Fogli responded that it was solely information-based

discrimination. She explained that they are modeling how people with imperfect information about the mechanism of the spillover effect on wages attribute to the wrong things when they observe initial differences. The presenter showed a figure about the mobility of children who are in the lowest quarter of income distribution by race and segregation level, and a participant asked whether it was based on national or local income distribution. Fogli clarified that it was based on national distribution.

A participant asked about the standard of determining low and high segregation, and the presenter answered that they used a dissimilarity index between zero and one that shows the extent of segregation and defined low segregation as the bottom 50% of these indices and high segregation as top 50% of these indices. She added that they calculated this index by measuring the deviation from average income at the metro level. A participant sought to clarify whether there is a correlation between this index and segregation level of school systems. Fogli said that there was endogeneity in the index and that it is also correlated with other outcomes, such as the size of districts.

The presenter showed a figure about how the trend of residential segregation has been changed by income and race. A participant asked whether racial segregation is defined purely

as Black and White, not considering a third racial category, like Hispanics. Fogli responded that they could accommodate the other categories, but it forces them to confront a question about whether this third group is more similar to the White or Black groups. Therefore, she said the observations from the other groups of races were dropped for this presentation.

Fogli introduced the model with the key point that the marginal wages for Whites stochastically dominate the one for Blacks, although marginal ability is the same across all races. One participant asked about how the society in this model judges the ability of multiracial individuals, and the presenter answered that the model would output something in the middle. She said the model can just shift the parameter for the race matched with the third race and run the same regression.

Fogli moved on to explain beliefs in the model. She introduced assumptions for the model that Blacks are rational and have full information, while Whites are behavioral and do not know the local spillover that agents were exposed to. Therefore, Whites in the model use average spillover to infer a wage. A participant asked what happens if Blacks are also behavioral. The presenter answered that they played with all possible cases, including the case that Whites are also wrong about Whites, and the results were the same.

The Boss is Watching: How Monitoring Decisions Hurt Black Workers

Costas Cavounidis, **Kevin Lang** and Russell Weinstein



Because black workers are more closely scrutinized, they face shorter employment durations than similar whites. Based

on the hypothesis that employers discriminate in either acquiring or acting on ability-relevant information, Lang and coauthors construct a model in which firms may monitor workers. Since productivity is correlated across jobs, the black unemployment pool is weaker than the white unemployment pool and workers hide their employment histories to some extent. When race serves as an indicator of expected worker productivity, it makes monitoring newly hired black workers but not whites optimal for firms and causes discrimination in monitoring. They confirm the model's prediction that the layoff hazard is initially higher for blacks but converges to that for whites as seniority increases. In addition, they confirmed that the hazard declines more rapidly with the unmeasured ability of black than for white workers.

Lang started the talk by mentioning that there is a lack of modern evidence of monitoring workers across races since there were few black workers having more than a high school education in the old data. One participant raised a question about whether student evaluations in universities could be more modern settings since it is well-known that

there are racial, age, and gender disparities. Lang pointed out that such cases are about real bias since evaluations are sent out to everyone. He clarified that the equivalent case with his study would be the setting where only some women or black professors are the target of monitoring while evaluations are not sent out to white faculties. The same questioner suggested an idea about the case that some universities send a senior faculty member to watch classes held by the other faculty member, and Lang agreed that it is an interesting idea.

Lang moved on to introduce a wage bargaining model with asymmetric information. Their model assumes that potential wages are drawn uniformly from the set of wages both worker and firm would accept. The key in the model is that even though bad workers who are expected to be monitored will accept lower wages than good workers since they have worse outside options, firms will not accept those lower wages. Lang said that this is the Groucho Marxism theory of wage bargaining. As a result, it ends up producing a Nash bargaining solution in which everybody pretends to be the good type. One participant wondered whether there is shirking, and Lang clarified that workers do not shirk but just do not tell they are not good. He added that firms are monitoring worker quality in the model, not disciplining workers.

When Lang showed that discrimination is persistent and equal skill levels are insufficient to eliminate

the discrimination, one participant asked about what happens if black workers are discovered to be good by firms. Lang said then there should be a model of renegotiation. He explained that, in the model that is consistent with what they are doing, the discovered information becomes public information and the contract curve for black workers is going to shrink towards the white contract curve over time. The presenter added that the wages of black workers rise faster than the wages of white workers in such cases, and there is some evidence for that. The other participant wondered why the equal monitoring policy is not adapted to get rid of such discrimination. Lang answered that it is because it is too costly to monitor these people who you shouldn't be monitoring. He said what could be worse is that such a policy could leave us in the inefficient monitoring equilibrium for everybody instead of in the efficient no-monitoring equilibrium. At the end of the presentation, the same questioner asked whether such discrimination can be eliminated if there are some aggressive data collection policies to overcome symmetric information. Lang agreed that perfect information about employment history would certainly get rid of discrimination, which is great, but it would be a very hard thing to realize.

What Accounts for the Racial Gap in Time Allocation and Intergenerational Transmission of Human Capital?

George-Levi Gayle, Limor Golan and Mehmet A. Soytas



Racial gaps in labor market outcomes are partially driven by differences in skill formation, which can arise from a child's family environment

and structure. This paper studies the role of marriage and labor markets in the formation and intergenerational persistence of racial skill gaps, accounting for the relationship between parental time investments and children's outcomes. The authors depart from the previous literature by incorporating a dynastic concern for parents and by endogenizing fertility and child development.

Gayle began by documenting descriptive evidence of racial differences in family environments. Black mothers spend less time with their children than White mothers, even when they are not single parents. A participant asked whether another family member, such as a grandmother, compensates for the mother spending less time with children. Gayle responded that this paper includes a control for whether a grandmother lives in the same state as the child and does not find a substantial gap between Black and White families in that measure of a

grandmother's proximity. There may be a racial gap in the intensity of grandmothers' involvement in child care. But grandmothers appear to be imperfect substitutes for parents because the gap in parental time still leads to a gap in education outcomes. Another participant asked about Black fathers' time investments in children. Gayle explained that household specialization differs by race, and that Black fathers spend more time with their children than White fathers, while Black mothers work more than White mothers. A third participant asked whether the parents' age when their first child is born helps explain children's outcomes. Gayle answered that it does, and that age at first birth is therefore endogenous in the model.

The authors develop a dynastic model, in which altruistic individuals choose whether to have a child, labor supply, parental time, whether to marry, and whether to divorce, in each period. A race-specific social cost of divorce is included to account for racial differences in divorce rates that the model cannot generate otherwise. One participant asked whether the model differentiates between marriage and cohabitation. Gayle explained that the model includes both cohabitation and marriage as a single form of partnership, but acknowledged that in reality cohabitation has a

different commitment device and can therefore have different consequences for allocation decisions within the household. Married couples decide how to allocate their household income between children and each spouse's consumption in a noncooperative simultaneous game. The model has a stationary Markov Perfect Equilibrium in pure strategies. While multiple equilibria are possible, the equilibria can be Pareto ranked and the authors assume that the highest-ranked equilibrium is played by both spouses.

The calibrated model is able to replicate racial differences in distributions of marriage rates, singlehood, age at first birth, and matching in the marriage market. One participant asked why the authors match entire distributions rather than medians. Gayle responded that the tails of distributions have substantial effects in this setting, and important information would be lost by using only the median. The main sources of the racial gap in children's education outcomes are fathers' education and the social cost of divorce. Changing the initial education distribution for Black men to match the distribution for White men would reduce the racial gap in a child's probability of attaining a college education by 31.5%.

Accounting for Black-White Wealth Gaps: Earnings, Demographics, and Rates of Return

Karmic Athreya, Grey Gordon, **John Bailey Jones** and Urvi Neelakantan



What are the most direct drivers of the Black-White wealth gap? John Bailey Jones and his coauthors study this research

question and investigate whether these drivers differ over the life cycle and across the wealth distribution. The authors construct and calibrate a life-cycle consumption/saving model using estimated measures of potential drivers including earnings, demographics, endowment and transfers, and rates of return on asset portfolios.

Motivation for this research stems from the persistent and significant Black-White wealth gap over the life cycle. The median and mean net worth per adult are lower for Black Americans, and the chance of having zero net worth or less is higher. There is still much to be understood about the underlying mechanisms driving this racial disparity. In the paper, the authors focus on four key mechanisms: labor market outcomes, including earnings, nonemployment, and incarceration; demographic transitions including marriage, fertility, and mortality; other income such as means-tested assistance, Social Security and inheritances; assets and returns including, rate-of-return heterogeneity and credit limits.

These mechanisms are embedded in a rich life-cycle model. In the demographics block, the unit of analysis is an individual defined over race, education, and gender, and couples maintain “separate books” where each spouse manages his or her own assets and receives half of non-asset income. A participant asked why the asset income could not be shared. The speaker replied that this assumption made it computationally easier to model agents coming in and out of the marriage market. In the earnings and asset income block, the key component is the rate of return on net worth, whose dependence on assets captures differences in asset portfolios. Means-tested transfers in the asset accumulation equation are used to produce a per capita consumption floor. One participant asked whether borrowing was allowed in the model. The speaker then showed that individuals not receiving transfers faced a borrowing constraint where the borrowing limit was proportional to non-asset income. Lastly, raising kids is expensive in the preferences block.

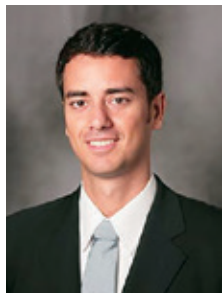
In the model calibration, the authors employ a Markov-chain demographic transition and a rich earnings-nonemployment-jail process, where transitions for each race, sex, and education grouping are separately estimated. The model-generated mean earnings across racial groups

match those observed in the data over the life cycle. Having ever been jailed results in a mean earnings reduction by nearly half. A participant asked whether the probability of going to jail depended on age. The speaker confirmed that it varied with age in a graph of life-cycle incarceration rates. Another question came up on what happened to assets when the person was in jail. The speaker answered that it kept generating interest but could be negligible for the low-income groups. Using data on the Survey of Consumer Finance, the authors calibrate household portfolio shares as a function of net worth. The mean returns vary by asset type, but not by household. Hence the overall rates of return heterogeneity stems from the net worth gap across racial groups.

Lastly, the model successfully replicates empirical patterns on the Black-White gap in life cycle wealth and wealth rank gap. In the counterfactual experiments, they quantify the contribution of various factors to the Black-White wealth gaps. Results suggest significant roles for Black-White differences in nonemployment earnings and inheritances in the presence of amplification mechanisms including bequests, consumption floor and wealth-related returns.

On the Dynamics of the Racial Wealth Gap

Dionissi Aliprantis, Daniel R. Carroll and Eric Young



The persistent racial wealth gap may be at the root of many challenges, but its causes are still unclear. Dionissi Aliprantis and his coauthors study

the importance of the racial earnings gap for understanding the wealth gap. In addition, they investigate how the earnings gap stacks up against other drivers proposed in the literature, and which factors could generate sustained reductions in the wealth gap over time.

The authors present three key facts observed in the data that their model should aim to reproduce. First, the racial wealth gap has been large and flat for the last 60 years. Second, the racial earnings gap has also been flat but is less than half the size of the wealth gap. Third, conditional on earnings, Black households have less wealth than their White counterparts. One participant asked about the moments used to measure the gaps and the speaker clarified they calculated the mean level of earnings and wealth in the cross sections. The speaker then mentioned that the possibility of a poverty trap, which would make the model computationally complicated to solve, was not considered, in response to another question from the audience. These facts motivate the questions on whether the combination of unequal initial conditions and a persistent average earnings gap can account for

the large persistent wealth gap, and which factors, if eliminated, would induce a rapid and sustained closure in the gap.

To answer these questions, the authors set up a model with a life cycle and different races. All households face uninsurable labor productivity and mortality risks and receive warm-glow utility from storing up an estate. Bequests are incorporated in the model. One participant raised a question on whether the probability of getting inheritance could be correlated with income or other factors. The speaker replied that they assumed independence for now to keep the model simple. The household problem is standard, depending on age and race. The racial earnings gap can be generated from an exogenous race-specific earnings parameter in the budget constraints, and this persistent earnings gap leads to a bequest gap and return gap. In the permanent earnings gap experiment, the model endogenously reproduces the three key facts, together with the racial bequests differential observed in the data.

Finally, counterfactual experiments are run to measure the model contributions of various factors to the racial wealth gap. They study the transition paths to a long-run steady state with equality by race, assuming different paths for the closure of exogenous gaps. An immediate elimination of the earnings gap leads to a gradual closure in the wealth gap in 100 years. In contrast, earnings and wealth gaps are reduced by 75% and

70% in the long run after equalizing education achievement. Regarding a one-time reparation in equalizing wealth, experiment results indicate that equalizing initial wealth has no lasting effect on the wealth gap unless it rapidly addresses the earnings gap.

One participant asked whether equalizing education outcomes was free or costly in their setting. The speaker replied that it was free and that it would exacerbate the gap if equalizing education were costly in wealth. The authors proceed to examine the effects on wealth gaps from reduction in racial return gaps. Results show that the effects are small with a permanent earnings gap. With an eliminated earnings gap, narrowing return gaps results in salient effects in narrowing wealth gaps. One participant suggested that to better understand the channel, instead of varying White-Black return ratios, it might be more explicit to give exact numbers of interest rates and to vary White returns while holding Black returns constant. In conclusion, the racial earnings gap is the central driver of the persistent racial wealth gap, and closing the wealth gap will likely take a long time. Policies that do not close the earnings gap will be ineffective in closing the wealth gap.

Explaining Racial Disparities in Personal Bankruptcy Outcomes

Bronson Argyle, **Sasha Indarte**, Ben Iverson, and Christopher Palmer



Personal bankruptcy is a major source of debt relief for American households, with one in ten Americans filing at some point in

their life. When a bankruptcy case is dismissed, the filer is given a credit report flag that limits future access to credit but does not receive debt relief from bankruptcy. This paper examines the extent and causes of racial disparities in dismissal of personal bankruptcy cases. Indarte showed that Black filers are more likely than non-Black filers to have their cases dismissed, with a 167% higher chance of dismissal for Chapter 7 bankruptcy and a 41% higher chance of dismissal for Chapter 13 bankruptcy. Chapter 7 bankruptcy can lead to debt being discharged in about three months, while Chapter 13 bankruptcy results in discharge only after the completion of a court-ordered five-year repayment plan.

A participant asked which type of bankruptcy Black filers tend to choose. Indarte responded that attorneys typically steer Black filers toward Chapter 13, even when their chances of dismissal would be lower with Chapter 7. However, this paper focuses on what happens after filing

rather than on the choice of which type of bankruptcy to file. Another participant asked how much these racial disparities dissuade Black people from filing in the first place. Indarte explained that she does not have evidence on that for this paper, but she would be interested in seeing survey evidence on how people make the bankruptcy filing decision.

The three important decision makers in the bankruptcy process are the judge, who decides the case outcome; the trustee, who evaluates the filer's honesty and accuracy; and the attorney, who advises the filer on chapter choice and reporting. Indarte introduced a model in which each decision maker's expected utility depends on the outcome of the case and on her beliefs, which could be inaccurate. A participant asked how race enters the decision. Indarte responded that race is part of the decision maker's identity, and that the model is flexible enough to accommodate correlations between race and preferences for certain case outcomes.

Decision maker bias can be decomposed into three parts: accurate statistical discrimination, inaccurate statistical discrimination, and taste-based discrimination. This paper focuses on estimating racial bias due to taste-based and inaccurate statistical discrimination. A participant asked why a judge would discriminate based on statistics about a person's

racial group when the judge has access to plentiful information about the individual from her case. Indarte explained that the judge has to predict whether the filer can complete a Chapter 13 payment plan, and that accurate statistical discrimination could play a role if the judge knows that Black workers face labor market discrimination and decides that a lower repayment plan is therefore more realistic for a Black worker.

The authors find that homophily, the tendency to favor one's own racial group, plays a substantial role in determining whether a Black filer assigned to a White trustee will have her case dismissed. Forty percent of the twenty-one percentage point racial disparity in dismissal of Chapter 13 bankruptcy cases can be explained by taste-based or inaccurate statistical discrimination, meaning that for a Black filer, being assigned to a White trustee is almost half as bad for her case outcome as filing without an attorney.

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