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Letter from the Editor



Dear Readers,

The UW-Madison Economics Department and the staff of Equilibrium are proud to present the ninth volume of Equilibrium: The Undergraduate Journal of Economics. Our goal is to bring a spotlight to some of the incredible work that our department is doing, especially that of our undergraduate students. Many of the articles in the journal are based upon the research of our undergraduates, and the journal serves as a showcase for both the researchers and the writers that made this year's journal possible. The research is robust, the writing remarkable, and it brings me great joy to be a platform to show the world the ways in which my peers are confronting economic problems and searching for solutions. To our students, faculty, alumni, and outside readers, I can only hope that this publication leaves you as impressed with my fellow undergraduates as I have been working with them these past few months. Their work has been exceptional, and I thank each of them for their contributions to this year's publication.

As you continue into the pages of this year's volume of Equilibrium, I suspect that you will find the wide variety of topics to be engaging. The uses of economics as a tool of study are boundless, and I think that this journal is a testament to that. Our staff and contributors have been creative in their

use of what is a rigorous tool for analysis, prediction, and problem solving. This fact is even further exemplified by the publications on Equilibrium's website: equilibriumecon.wiscweb.wisc.edu, which I implore you to explore.

I would like to thank Susan Hering for her tireless work as our faculty advisor. This journal's success is due in large part to her guidance and promotion. Additionally, I would like to thank Amy Schultz of the Digital Studies program for allowing Digital Studies and Equilibrium to partner in the design and publication of this volume, as well as Pedro Goulart and Matthew Stout for their work as our graphic designers. The creation of Equilibrium is a team effort, and without any one of these individuals, this year's volume would not have been possible. Although I will be graduating from the Wisconsin Economics Department, I look forward to continuing to watch Equilibrium grow and explore the world of Economics as an alumnus.

Sincerely,

Jonathan Kim
Editor in Chief

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The Search for an Efficient and Clean America: Traffic Congestion and Carpooling

By: Bobby Pfefferle



Photo by Tony Webster

THE RAPID GROWTH OF URBAN AREAS AND economic prosperity in the United States following World War II brought newfound investments into infrastructure across the country, including massive expansions of roadways. The rapid development also ushered in a wave of expansion outward in the form of sprawling suburbs, and the commuters, congestion, and traffic that come with them. Fast forward to 2018, where daily commutes to work in these urban areas feature exciting new concepts such as bike-sharing, scooter-sharing, and most importantly, Uber and Lyft vehicles available to pick you up at the touch of a fingertip. In contrast to these new transportation options, Americans have lost trust in their once heralded subway and bus systems due to a lack of reliability as the nation's infrastructure ages, des-

perate for upgrades. Despite the influx of bikes and scooters, an overwhelming number, 76.3 percent, of Americans use cars to commute to work (U.S. News and World Report). However, only nine percent of commuters choose to carpool, and that number has been steadily declining for decades. When the U.S. Census Bureau started collecting commuting data back in 1980, the average commute was 21.7 minutes. In 2015, it was 26 minutes. As commuting lengths continue to rise, the U.S. government is struggling to implement innovative and economically efficient ways to incentivize carpooling and reduce roadway congestion.

AMERICA'S LOVE AFFAIR FOR CARS HAS A long history and is now stronger than ever. The number of Americans with access to three or more

cars rose by 2.5 percent over the last decade (Brookings, 2015). Cars offer people privacy, especially when compared to the subway or a bus. Being able to control the temperature, noise, and shamelessly eat breakfast or finish getting dressed on the drive to work are little factors that make big impacts on commuters' decisions. In addition, owning certain types of cars are often seen as status symbols. Americans however, have been slow to accept the drawbacks of high car ownership rates, and their negative impact on the global climate, commuting times, and economic productivity. An INRIX study found that in 2017, congestion on US roads cost \$305 billion in lost productivity of workers sitting in traffic and the increased cost of transporting goods through heavily congested areas.

UBER AND LYFT ARE ALMOST CERTAINLY going to be a large part of future American workers' commute to work. However, they also are going to continue to be a large piece of the problem as to why roads around U.S. cities are constantly congested. Solutions to these congestion problems, is the main task at hand for many district legislators. While Americans have yet to see the benefits of congestion pricing schemes in big cities, several European countries have enacted congestion pricing plans. In fact, London's congestion charge system has been in place since 2003, and today the number of vehicles driving into Central London are a quarter lower than they were in 2008 (CityLab, 2018). Stockholm has also experienced benefits from a similarly structured congestion pricing scheme. The idea of a congestion pricing mechanism is something that has repeatedly resurfaced for decades in the U.S., yet it has struggled to become implemented into law. In January of 2018, New York Governor Andrew Cuomo introduced outlines of a congestion pricing plan in Manhattan, where it has been estimated that a third or more of cabs, Ubers, and Lyfts are empty at any given point. Cuomo's plan however, failed to be put into law. Empty ride-hailing vehicles worsen congestion and release emissions into the atmosphere without any benefit or economic gain in return. According to the Center for Environmental Research and Technology at UC-Riverside, Greenhouse gas emissions are at their worst

in stop-and-go traffic of cities, as cars spend time emitting carbon while sitting idly. Delivery services also face higher labor costs as trucks and suppliers sit in traffic for longer periods of time.

MORGAN KLAESER, AN UNDERGRADUATE Economics student at UW-Madison, quantified the factors that influence travelers' decisions to carpool to work in her research paper, "Carpooling Behavior in Congested Areas." Klaeser decided to take a look at many factors that influence people's commuting decisions, including income, age, gas prices, congestion costs, and social capital. The main focus of her analysis is to provide data that can help government officials make effective decisions when deciding between economic returns and efficiency. For her data, Klaeser used the Integrated Public Use Microdata Series (IPUMS-USA) database, and the American Community Survey (ACS) from 2000 to 2012. While there are many options for governing bodies to help reduce congestion, such as improving subway systems, Klaeser seeks to determine an explicit response for people's decisions between only driving to work alone and carpooling. This is because commuters across different metropolitan areas considered in this research simply do not all face the same initial choice set of transportation modes.

KLAESER CREATED A DISCRETE CHOICE logit model to understand the roles of each factor. Created by renowned Econometrician Daniel McFadden and his test on the BART subway system in San Francisco, discrete choice modeling has been one of the most pivotal steps forward in urban travel demand measurement since 1974. Discrete modeling observes the behavior or preferences of individual people and draws conclusions by aggregating across groups. In Klaeser's own discrete choice model, she uses the coefficients to determine the effect of her dependent variables (income, age, gas prices, etc.) on the probability or extent to which a given individual is going to choose carpooling over driving by themselves.

KLAESER'S RESULTS WERE CONSISTENT with most theory about consumers and income, in that individuals value privacy and status as in-

come increases, and once they are able to afford privacy and gas, these individuals choose to commute on their own. In other words, carpooling and bus rides are viewed as inferior goods. Once an individual can afford to purchase the privacy of their own vehicle, they tend to do so. Klaeser's data finds that as mean income increases by \$1000 increments each year, the probability an individual chooses to carpool instead of making the same trip to work in a private vehicle decreases by 0.09 percent. In contrast, her results also show that as the costs of commuting in congested areas increase, people seek to exploit economies of scale by carpooling. For a one-dollar increase in cost per commuter, the marginal effect on demand for carpooling increases by 0.019 percent. In addition, she found that as the real price of gasoline increases by a dollar, an individual is eight percent more likely to carpool. Relative to the significance of a full dollar increase in gas prices, the corresponding eight percent increase carpooling is quite small.

ANOTHER FACTOR THAT DIRECTLY RELATES to commuting behaviors is age. Age signifies a lot more than just the number itself. As age increases, people are more likely to get married and start families, and thus more likely to move outside city limits into neighboring suburbs. Klaeser found that for every one-year increase in an individual's age, the probability of carpooling decreases by 0.17 percent.

KLAESER ALSO DECIDED TO LOOK INTO how racial makeup of geographic neighborhoods impact an individual's propensity to carpool. Her results actually contradicted a previous report conducted by Kerwin Charles and Patrick Kline in 2002. Charles and Kline found that racial makeup in neighborhoods is the strongest determining factor for whether or not an individual decides to carpool. They concluded that if an individual lives in a neighborhood with many people of the same race, they are more likely to make connections with the people living around them, and thus more likely to carpool. Klaeser however, found the opposite. Her data suggests that a one-percent increase in the percent of people of the same

race as the commuter that take the same route to work correspond to a 4.2 percent decrease in the probability of an individual carpooling. This contrast in conclusions is significant, and Klaeser admits that her contradicting results call for further analysis. When grouped solely by race, Klaeser found that Blacks, Hispanics, Asians, and people of Native American descent are all up to six percent more likely to carpool than Whites.

KLAESER'S EXTENSIVE RESEARCH AND model take a pivotal step in trying to understand the factors that impact an individual's decision to carpool. Given her somewhat limited resources as an undergraduate student, Klaeser said she would love to conduct more expansive research on the issue if more funds, resources, and time were possible. Klaeser states in the final section of her paper that the next step for research on carpooling incentives would be attempting to quantify the effect of presence of High Occupancy Vehicle (HOV) lanes on commuting paths.

AMERICA'S AGING INFRASTRUCTURE AND congestion problems will likely become increasingly political over time as they are some of the single most important factors when considering the future of American cities, their economies, and climate change. If local, regional, and national government systems in the U.S. continue to ignore the congestion issues and research like Klaeser's on American roadways, people will look to the tech industry and ride-sharing companies like Uber and Lyft for solutions. These companies have already toyed with fleets of autonomous vehicles that cycle around cities picking up and dropping off passengers. These cars would be able to communicate with one another via signals and choose efficient routes that reduce commuting times and energy wasted. However, just like carpooling, people would need to be willing to share those vehicles. For the time being, Americans are going to have to try to escape traffic via one of the many electric scooters that have flooded city sidewalks.

Myopic Best Responding in Spatial Networks: Making Uber Efficient

Written By: Wilson Horn
Research By: Rebekah Dix



THROUGH APPLICATIONS SUCH AS UBER and Lyft, we now have access to transportation twenty-four seven. How has the rise of ride-sharing apps, breaking away from the taxi tradition, shaped drivers' choices as they operate within their app's network? Truthfully, it hasn't. Currently, those apps don't allow drivers to see each other as they decide where to locate themselves in high rider-traffic areas despite how other drivers' choices would affect their own. Rebekah Dix in her paper, "Myopic Best Responding in Spatial Networks," examine the effect of others' spatial allocations on a myopic agent's choice within a given spatial network, arguing myopic best responding leads to greater efficiency.

DIX DEFINES EFFICIENT SPATIAL ALLOCATION as the average distance between each node and the nearest agent in the spatial network, as average distance decreases efficiency increases. Applied to a ride-sharing context, the expected wait-time for passengers would be inversely proportional to the average distance between passengers and the nearest driver in an area. The researchers were able to model the complex, dynamic environment in which this unfolds as a sequential, static game of an individual agent's choices. The goal of the players is to maximize the size of their Voronoi diagram, a subset of the entire spatial network which changes in size depending on their distance from other drivers, akin to the territory of passengers a driver is responsible for. The game sought to test the behavioral assumption that agents maximize their current pay-off at the time of their choice, myopically best respond-

ing, when faced with allocation in dynamic spatial games. An individual's myopic best response is a move that would maximally increase their Voronoi diagram in the current turn, without accounting for the moves that rival agents may make in the future. In complex games such as this, myopically best responding (MBR) will lead to suboptimal outcomes, but in the face of costs associated with sophisticated strategization, myopically best responding may be rational as a decision-making heuristic, especially in regard to cost.

IN THE EXPERIMENT, THERE ARE FIVE PLAYERS whose turn orders are selected randomly. In each trial players started from this distributed allocation across a 21 x 21 grid. Players were allowed to make a single move during their turn in one of four cardinal directions or to remain in the same location, only restricting movement to an occu-

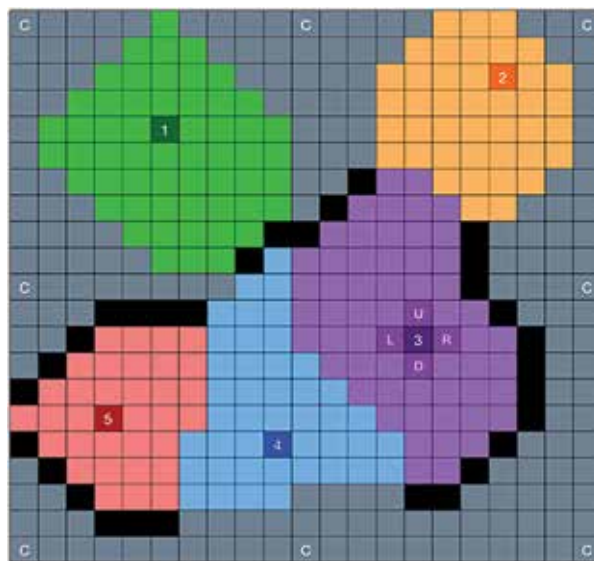


Figure 2: Initial allocation of players on grid

pied space. Additionally, eight non-moving computer players were positioned along the borders of the grid to model the presence of boundaries. Each player is provided a move calculator that calculates a Voronoi diagram that could account for other players' moves. This calculator was provided for two reasons: calculating Voronoi diagram area is time-consuming for players and providing observable insights into players' thought-processes for the experimenters as the game evolves by recording the calculations they made. Turns are limited to two minutes. A move's flow payment is calculated as the area of the player's Voronoi region after their move is made. The experimenters rank order available moves, FP1 being the move option with the highest flow payment.

THE FIRST RESULT OF THEIR RESEARCH WAS that players chose the FP1 move 60% of the time, rising to 63% when excluding the first ten minutes of the game. While this could be attributed to the majority of players operating under the MBR assumption, it is likely indicative of sophisticated consideration of later moves or luck. Upon further examination of player's calculations who made the FP1 move, very few calculations were made that would suggest higher-order reasoning and most calculations were made on a player's turn, only evaluating their movement options and opponents' current static allocation. Another illuminating finding was in 82% of player calculations, opponents were in the same place as the current iteration of the experiment, with 76% of calculations being solely move options. This reveals that most of the time players were not acknowledging potential moves opponents could make in the future, instead focusing on their own move options for the iteration during their turn. Experimenters next found that 92% of calculations made by players were within one space of that player's current position. This is used as jumping off point to analyze non-FP1 moves and whether those moves were suggestive of higher-order reasoning on opponent choices. Parsing moves players have made into an interval of all moves made between a player's current turn and previous turn reveals when the FP1 move was not chosen. It was often not calculated, more indicative of a failure to consider

this move rather than higher-order thinking.

THE RESEARCHERS FURTHER PARTITIONED non-FP1 moves into two different types, Highest Scoring Calculated Move (HSCM) and Suggestive of Higher-order Reasoning (SHO). The HSCM is a move in which the player did not calculate the FP1 move, instead choosing the highest scoring option of those they calculated as their move. On the other hand, SHO moves refer to those players that calculated the FP1 move and the move chosen, this is suggestive of Higher-order Reasoning because it reveals that despite knowing their best move they chose otherwise which could imply other strategic considerations were at play when they opted against the FP1 move. Player behavior when selecting the HSCM supports the myopic best responding assumption, choosing the best move they could for those they thought of. Of the 307 SHO moves (2178 total moves) players were correctly using the calculator when not selecting the FP1 move. Interestingly, 24% of all SHO moves were selected by less than 7% of players which was interpreted as an intuitive move by the players when flow payments between moves were close. When comparing average flow payment differences between SHO and FP1 moves (.82 grid squares) versus that of non-SHO, non-FP1 moves and their FP1 alternative (1.74 grid squares) the former was found to be significantly smaller than the latter, further supporting the thought that players rely on intuition and higher-order reasoning when evaluating similar flow payments. Despite indications of wider considerations in SHO moves there was not a significant relationship between number of SHO moves and session scores although number of FP1 moves and session score were found to have a significant positive relationship. Clearly FP1 moves were the best move set, but researchers found that the closer players adhered to the MBR assumption, the better they performed within the experiment, given that they only played against similar players and not against sophisticated agents. Although this experiment does not definitively prove players myopically best respond, there is no significant evidence providing support that players violate the MBR assumption.

IN APPLICATION, MYOPICALLY BEST RESPONDING IS PERHAPS THE MOST USEFUL AVENUE OF choice given the low stakes in ride-sharing apps and the high cost relative to benefit of reasoning at a higher level. To evaluate the efficacy of myopic best responding, researchers tested MBR behavior in a transportation network model built from a real-life city. First reconstructing the transportation network of the German city of Oldenburg as a spatial network, then creating an Agent-Based Model of myopic best response trained on the data collected from the games previously played by participants were able to reduce spatial inefficiency within the model from 2.02 in the initial allocation to .55 in the final allocation, after 5,000 iterations. Although nearly a 75% reduction in inefficiency, it does not converge to an optimal allocation mainly due to a barrier called boundary behavior. Boundary behavior is the interaction of opposing incentives to move inward in the network to increase market share while not going so far as to lose the area around the boundary of the network. Addressing this, researchers fixed 14 of the 60 model drivers around the network periphery decreasing spatial inefficiency from .34 initially to .2 in the final allocation after 3,000 iterations. This allowed for MBR behavior in the center to continue yet reducing boundary behavior, further increasing efficiency.

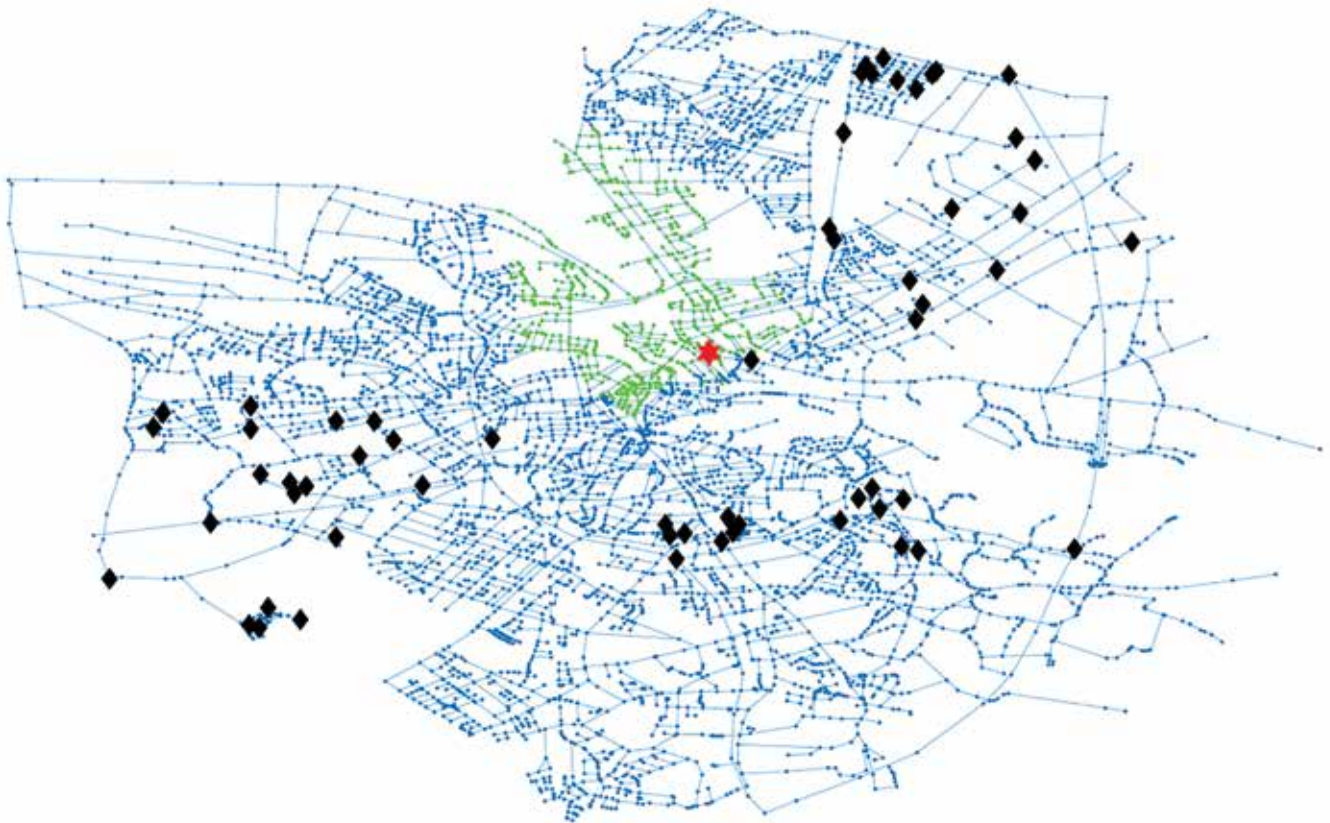


Figure 2: Voronoi Region of Lyft Driver on Transportation Network

Notes: Green nodes belong to Voronoi Region of Red star Lyft driver. Black diamonds are other Lyft drivers.

IN SUM, WITHIN AN EXPERIMENTAL SETTING players myopically best responding may not be choosing the strictly best move option but this method of heuristic decision-making is best when accounting for the small marginal benefit between MBR and FP1 choices and the cost of sophisticated reasoning. This behavior, modeled within real spatial models, decreases inefficiency particularly when planting riders along the network periphery. Given the low stakes game of ride-sharing, a strategy that works well most of the time is better than calculating the strictly best option when incurring its related costs in this context.

AS AUTONOMOUS VEHICLE TECHNOLOGY continues to improve it is not a stretch to say self-driving cars could be in commercial production within the next decade. Investments in Uber's driverless car technology are substantial and look to increase in coming years. To make the best use of these cars they should position driverless cars along the boundaries in regions where rider demand is not uniformly allocated, this would allow the human drivers to remain in high rider-traffic areas increasing individual pay while also decreasing inefficiency in their ride-sharing system.

GIVEN HIGH WORKER TURNOVER RATES IN ride-sharing labor markets it is important that new drivers can acclimate to strategies of efficient allocation. As worker pay is driven in part by quantity of rides given, it is important that new drivers can allocate themselves to high ride-seeking areas to maximize their income. When researchers excluded the first ten minutes of the game the number of FP1 moves made by players rose to 60% to 63% which has implications for driver retention rates. In a short amount of time players began to choose the FP1 option more often which could come as a result of learning and applying the MBR decision-making heuristic. If drivers can adopt MBR behavior sooner, they will begin to make more money in less time than they had anticipated and be more content with their job than had they started their new job less lucratively.

SIMILAR TO RIDE-SHARING, EMERGENCY transport services and food trucks face similar problems of spatial allocation. Transport services often make trips between hospitals and retirements homes but are also responsible for transporting other people in need of medical attention. Although it may seem intuitive to wait around retirement homes for an emergency call given their relative frequency compared to other location, the choice of many ambulances to act similarly has an implicit cost to others who need to get to the hospital. By allocating themselves near each other, they would leave the person who was in an automobile accident on the highway waiting longer for help than if ambulances were uniformly distributed around the region. Alternatively, food trucks want to allocate themselves in dense areas of people to capture as much of the local market share as possible while avoiding other food trucks that could steal potential customers away. There may be some benefit to grouping in a location where people will know to go for different cuisines, but with too chefs in the proverbial kitchen the quantity of trucks will reach a prohibitive level where it will no longer be profitable to be near other food carts. In both cases, there is an incentive for multiple agents to allocate to the same area, but if too many agents do this it results in a Tragedy of the Commons. With knowledge of the location of competing agents ride-sharing drivers, emergency transport services, and food trucks are a few of the many industries that could benefit from adopting a myopic best response in spatial competition.

Optimal Timing: The Federal Reserve's Difficult Decision

By: Iris Park

"AS THE ECONOMY HAS STEADILY GAINED strength, the Federal Reserve has been gradually returning interest rates closer to levels that are normal in a healthy economy. We took another step on that path today with a quarter-point increase in short-term interest rates." It was hardly a surprise when Jerome Powell, the chair of the Federal Reserve bank (Fed), took another step on increasing the interest rate. However, what followed this press conference were numerous controversies fueled by ambiguity of the effect of the Federal Reserve's decision. Despite the fact that the Federal Reserve is independent of any source of political power, President Donald Trump was the one who spearheaded the opposition of the Fed's decision, claiming that the "Fed has gone crazy." As stock prices dramatically dropped on October 11th, 2018, the dispute and concerns regarding the increasing interest rate grew. Yet, with the current American economic level, the increase in the interest rate is largely accepted by most economists as not a choice, but rather a necessity. The question, however, is the timing. Was it irresponsible to increase the interest rate when the country is having a trade war and economic confusion?

THE AMERICAN ECONOMY HAS BEEN DOING exceptionally well as of late, but this performance may be unsustainable. Factories have been operating above potential at about 104.5 percent¹ while the unemployment rate has been at 3.7 percent which is below the natural rate of unemployment.² When the economy is overheating while the Fed keeps the interest rate very low, it means that the Fed is putting its foot on the accelerator of a car already going too fast, which can lead the economy into risk of crisis. Working environment can

deteriorate with an unnatural rate of production. The Fed's decision to raise the interest rate can solve this problem by mitigating some of the risk caused by companies running over its capacity and can in the long-run increase people's welfare.

IN A SHORT-TERM, HOWEVER, FOR CORPORATIONS that were benefiting from Trump's tax cut, an increase in the interest rate was not good news. As the interest rate for bonds went up, the relative yield from these bonds became more profitable compared to stocks, with stocks prices have a higher variability compared to bonds. This, along with America's imminent trade war with China, was one of the main reasons why stock prices crashed on October 11th.³ Additionally, an increase in the interest rate would raise the cost of lending for firms, leading to fewer opportunities for investment. Even if firms are able to maintain their original investment amount, the profit of each firm will decrease as consumers will also have to bear the burden of the high-interest rate to consume causing a decrease in consumption and an increase in savings. Even though the Fed believes that the "system today is stronger," it is certain that the increase in the interest rate would cancel out some of the short-term boost of Trump's corporate tax cut.

AN INCREASE IN THE INTEREST RATE affects banks the most, as it brings heavy effect on the shape of the yield curve, one of the most important indicators in banking. Today the Federal



Funds rate for one year is about 2.25 percent while the ten-year long-term interest rate is about 3.25 percent, forming an optimal upward sloping yield curve which provides banks with a one percent difference to create profit. If the Federal Reserve aims to raise the interest rate to three percent over time and if the ten-year interest rate stays constant, the yield curve would become a “flat yield curve” which would not be beneficial for banks to invest in carry trade to earn profits. The fact that the European Central Bank is giving an end to the Quantitative Easing, of the Central Bank printing out money to purchase bonds, at the end of 2018 might possibly increase the long-term interest rate, shifting up the current upward sloping yield curve. To conclude what is going to happen on the long-term interest rate and on the shape of the yield curve is premature. However, it is inevitable that the alteration of the interest rate is putting banks into an ambiguous future risk.

THIS BEGS THE QUESTION, WHY DID THE FED raise the interest rate despite all the effects on consumers, firms, and banks? Is solving the problem of an overheating economy worth all the risk that individuals have to take? Until now, the American economy has been constructed with high consumption and investment with low savings rates due to the low-interest rate; the real interest rate was lower than the growth rate while the average return on capital was higher than the growth rate, and this was one of the factors that fostered the growth of the American economy. However, if the increase in investment and consumption keeps on growing exponentially with lower savings, there are two possible imbalances that the economy can pace, the rate of demand can exceed the rate of supply leading to an inflation rate of more

than run into. First, when consumption grows rapidly as individuals use not only their own income but also loans from the bank due to low-interest rates, if the investment rate does not grow at the same two percent. On the other hand, there could be a moment when the growth of consumption halts and begins to drop rapidly. This is because the capital that individuals can consume is limited due to inadequate income. When there is excess supply with low demand, firms would start to lose profits and as the economy recedes, those firms' stock prices would also fall, leading to risk of bankruptcies. All of these effects on corporations would not only lead to a decrease in the growth rate but also a massive decrease in employment rate and increase in default risk, causing the potential of another recession to rise.

THE FEDERAL RESERVE BANK'S MONETARY policy can be a metaphor of a flu shot. Even though at the moment of the injection, it brings pain and some side effects, in the long-term it prevents much more severe issues from arising. Yes, the interest rate can cause some problems in the short-term such as decreases in corporation's profits or risks to bank management, especially in this timing with the trade war between China and America. However, in the situation where Trump's tax cut is boosting the corporate earnings and European Banks slowing down quantitative easing, an increase in the interest rate will not hurt the economy but rather the negative effect will cancel out with the timing, reducing the possibility of a potential threat. Napoleon Hill always said, “Don't wait. The time will never be just right.” America has been procrastinating since the recovery from the recession and right now is the time to call a halt in that habit.

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The Unintended Consequences of “Ban the Box”

Research by Jose Larrain | Written by Faisal Al Yaseen



Photo by Flazingo

JOB SEARCHING IS A STANDARD BUT STRESSFUL procedure that individuals have to consider once they're ready to join the workforce. Many people have the opportunity to go to college and prepare for employment, but there is important research being done into those that don't pursue higher education and the challenges that they may face. For many incarcerated individuals, the opportunity to be released and re-enter society is one of the harshest obstacles to overcome. Ex-convicts may have difficulty finding work opportunities even if they are suitable for the specific job's task, as many job applicants are forced to disclose the existence of a criminal history in their initial application. A consequence of this hurdle to employment is that ex-convicts unable to find work may be much more likely to re-offend, and as a result face re-incarceration. To tackle these issues, many states have passed “Ban the Box” (BTB) poli-

cies which aim to help ex-offenders get further in the job application, by delaying criminal record questions until later in the hiring process. In doing so, policymakers hope that a relationship can be established between hirers and applicants, and that when criminal history becomes a question, it will be harder for employers to deny these applicants. While the policy aims to positively impact the lives of ex-convicts, there are concerns that the lack of information can lead employers to make assumptions based on stereotypes and characteristics, statistically discriminating against individuals holding these certain characteristics: in particular, Black and Hispanic people who may not have a criminal record. Jose Larrain, an undergraduate Economics major at UW-Madison, researched the impacts of BTB with his paper “The Unintended Consequences of ‘Ban the Box’” attempting to understand the effects of BTB and the net effects of such policies.

THE PAPER NOTES RESEARCH DONE BY previous scholars on the topic of statistical discrimination and employment: Agan and Starr’s 2016 studies BTB effects on minorities. Their study involved creating 15,000 fake job applicants, where they randomized the criminal records and sent them out in pairs (one Black and one White) to employers. There was a notable difference in the callback gap between Black and White men, with a 7% difference between Whites and Blacks before BTB. After BTB, we see this gap grow to a whopping 45%.¹ Doleac and Hansen similarly looked at the variation in BTB between states and cities to find its effects on minority employment, and their results showed that BTB decreased the probability of being employed by 2.9% for Hispanics and 5.1% for Blacks.² These effects are hard to ignore, and with that, Larrain provides strong motivation for his case to consider the role of statistical discrimination.

THE DATA USED IN LARRAIN’S STUDY COMES from the monthly current population survey (CPS) conducted by the US Census Bureau. CPS is a monthly survey consisting of 60,000 U.S. households, but there are restrictions on who is eligible to take the survey, excluding incarcerated individuals, many of whom may be repeat offenders, facing BTB policies between infractions. If BTB does decrease employment chances, individuals negatively affected who re-offend might not be in the data, making the policy seem more positive and creating potential for upward bias.

LARRAIN ALSO USES DATA FROM THE NATIONAL employment law project to look at certain effects of BTB policies before and after the implementation. The individuals in Larrain’s sample are between the ages of 16-35 and are comprised of White, Hispanic and Black individuals who are not in school. Three levels of education are looked at: No high school, high school, and college. The study also looks at those who are employed as well as discouraged workers.

AN IMPORTANT ASPECT OF THIS ANALYSIS to take note of is that BTB policies are more likely to be in urban areas. Larger minority populations

exist in these urban areas as opposed to suburban, and both income and employment are higher. Larrain runs two models in his study: the first is the general model including variables such as the race of the individual, their metropolitan statistical area, and an x variable that considers unknown characteristics that might affect the regression. The second model takes into consideration the impact of having a GED in addition to race.

THE GENERAL MODEL REGRESSES THE employment of the whole sample. In areas where BTB is implemented, there is 10.12% decrease in employment for black males, implying that statistical discrimination is likely contributing to a decrease in employment. It also increases White employment by 1.02%, supporting the hypothesis that discrimination may be an outcome of BTB. What comes as a surprise, however, is that BTB policies increase Hispanic employment by 2.36%, and running different regression models yields similar results. There are several possibilities for this, including the selection bias previously mentioned.

FOR THE GED MODEL WE SEE THAT THE total effect of BTB on individuals with a GED is a 1.4 percentage point increase for Whites, no change for Blacks, and 0.5 percentage point decrease for Hispanics. GED is considered as an indicator that one might have been convicted of a crime since some convicts obtain their GED while in prison. Looking at the overall effect, the results show that Blacks and Hispanics GED recipients are not helped by BTB policies while White males with GEDs seem to be helped. This points to race as a deciding factor in the employment of these individuals, a result that runs consistent with past studies into the effects of race on unemployment.

LARRAIN CONCLUDES THAT THE REGRESSIONS yield a result that supports the argument that black men are hurt by BTB policies. However, the effect that it has on the probability of employment for Hispanics differs from the study that provided the basis for Larrain’s work, conducted by Doleac and Hansen, and Larrain acknowledges that further research is required to understand

the true effect on Hispanic men. Many policies meant to be beneficial to society can sometimes have unpredictable effects, harming groups of individuals that the policy was designed to help, while assisting those who may not need it.

THE PAPER PROVIDED SUBSTANTIAL EVIDENCE for the correlation between BTB and the employment of individuals based on the characteristic of race. While the results do coincide with other studies such as the ones mentioned above, the data used in the regression had conditions that likely effected the results. The idea that Hispanics aren't harmed by BTB has several explanations. The result could in fact hold, and it could be that Hispanic individuals are no worse off under BTB than before, a result contradicting that of Doleac and Hansen. If Larrain's results are incorrect, this is most likely a product of bias in the sample population, or an omitted variable. The argument of selection bias as the root of this result doesn't seem like a strong argument. The specificity of the group that have been removed from the regression and their relativity to the population, makes it difficult to see the group's impact on the results. The dataset excludes individuals that have been incarcerated, in turn omitting reoffenders. So, the data excludes criminals who have recommitted, and those are a specific group of individuals. We are interested in those who have recommitted a crime because BTB policies have caused them to lose job opportunities, and because of the specificity of the group, it doesn't seem like it would have a huge impact on the results found in the regression. As a result, we could be looking at some sort of omitted variable bias that might we might not be taking into consideration. An example would be how employers view Hispanics in the population where our sample was derived from. We assumed that employers might statistically discriminate similarly against Hispanics and Black if we implement BTB. That might not be the case if the employer prefers Hispanics over Blacks. We might be forgetting employer's preconceived view of each race as a variable that might affect our regression.

THE PAPER PRESENTS THOUGHT-PROVOKING results regarding the unexpected effects of

policy changes like BTB. For example, Larrain presents results showing the changes in the way employers look at GED holders in the hiring process. This research, and similar studies supporting it, suggest that if the true intention of policy-makers is to make the hiring process fairer, that BTB requires either serious alteration or reconsideration. Based on the amount of discrimination that seems to be rooted in BTB, repealing BTB and implementing a different policy that looks to curb other institutions that statistically discriminate against minorities and ex-convicts as an appropriate alternative. Such policies could tackle unemployment in minority communities, although just as with BTB, as is inherent in the unpredictability of policy, these new policies could release a string of unintended effects worsening the equity in the hiring process for ex-convicts.

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Belabored Unions - The Crux of Inequality

By: Michael Sauer

LABOR UNIONS HAVE HISTORICALLY BEEN the mainstay against the distortions of economic inequality. Princeton economists discovered this much, finding ten to twenty percent higher wages in union households since the 1930s (Farber et al. 2018). While we are grappling with stagnating wages and intense concentrations of wealth among the highest income earners of today, this study serves as a powerful insight into the potential of labor unions – of what once was and what can be made again.

TO 'RIGHT-TO-WORK' OR NOT?

RIGHT-TO-WORK (RTW) LAWS, FOUND TODAY in 27 states, permit workers to forgo paying union dues despite receiving the fruits of union negotiations. Unions have been weakened as a result of these measures, dropping from a 34% share of the labor force in 1973 to just over 10% today. But what have been the effects on wages ever since?

TO QUANTIFY THE SIGNIFICANCE OF LABOR unions today, Gould and Shierholz (2011) set out to examine annual wage differences between RTW and non-RTW states. After formulating a rigorous regression model accounting for state economic characteristics, demographics, and worker characteristics, they deduced that RTW states suffer 3.2% in lost wages annually. This deprives workers in RTW states of approximately \$1,500 compared to similar workers in non-RTW states. What's more, their data uncovered a disparaging 4.8% and 2.6% reduction in the rate of employer-sponsored pensions and employer-sponsored health insurance within RTW states, respectively.

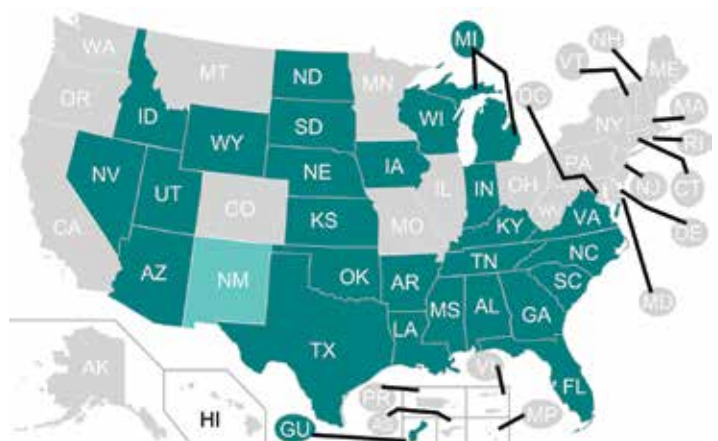
OUR ASSEMBLAGE OF DATA FEATURES THE additional assertion that unions bolster the pay of nonunion and union workers jointly. Indus-

tries outside the direct purview of unions raise wages and benefits to stymie initiatives of their own workers to unionize or vacate their work in exchange for a union job. By practice, businesses disregard these incentives when unions no longer pose a sufficiently competitive threat. Thus, strong rates of unionization reduce inequality across the spectrum; receding unionization emboldens inequality.

BEYOND STRENGTHENING WAGES AND benefits, labor unions have proven to be levers of negotiation to restrict excessive executive compensation. As Huang, Jiang, Lie, and Que (2017) documented, there exists a convincing inverse relationship between the degree of unionization and executive compensation. And this makes sense: unions leverage CEO compensation in negotiations to contend for a relative increase. Likewise, firms have been documented to alter CEO pay to improve their bargaining position. Non-RTW states exhibit a more pronounced inverse relationship than do RTW, adding further evidence to the detrimental inequality effects RTW initiatives generate.

THE CORROSION OF COLLECTIVE BARGAINING has been described as “the single largest factor suppressing wage growth for middle-wage workers” (Mishel et al. 2012). This is no surprise because as we have seen, collective bargaining, made possible by robust labor unions, dips into the three founts of economic inequality simul-

● Statewide Right-to-work law ● No Right-to-work law
● Local Right-to-work laws Graph by Scott Nazelrod



taneously: wages, benefits, and executive compensation. Boosting wages and benefits while restraining exorbitant salaries provide labor unions the key distinction of being the trifecta – the crux of inequality.

POLICY PRESCRIPTIONS

FROM OUR ANALYSIS, WE HAVE COME TO THE conclusion that labor unions are an indispensable tool to combat inequality and improve the plight of the middle class. To complete this discussion, we can apply our understanding to engineer several positive policy prescriptions.

FIRST, ROLLBACK RIGHT-TO-WORK LEGISLATION where it exists. Policymakers need to enact the modus operandi of following established economic fact. Gould and Shierholz (2011) forcefully proved the legitimacy of their study through its rigorous and timely regression models. RTW laws sap the compensation of both nonunion and union workers in one broad stroke. Legislators should restore sound economic policy by repealing RTW laws and impede further economic distress wrought by inequality.

SECOND, COLLECTIVE BARGAINING RIGHTS should be expanded to encompass public sector employees. States have engaged in undermining this after the onset of the financial crisis. These states, among them Wisconsin and Michigan, have suffered from a weakening middle class and swelling income disparity. Reasserting collective bargaining here is imperative to repair the inequality divide because unionization positively affects workers beyond its own direct scope. Reforming public sector collective bargaining rights, perhaps a more politically palatable option, diffuses benefits implicitly to other industries by way of wage and benefit competition, as we've seen.

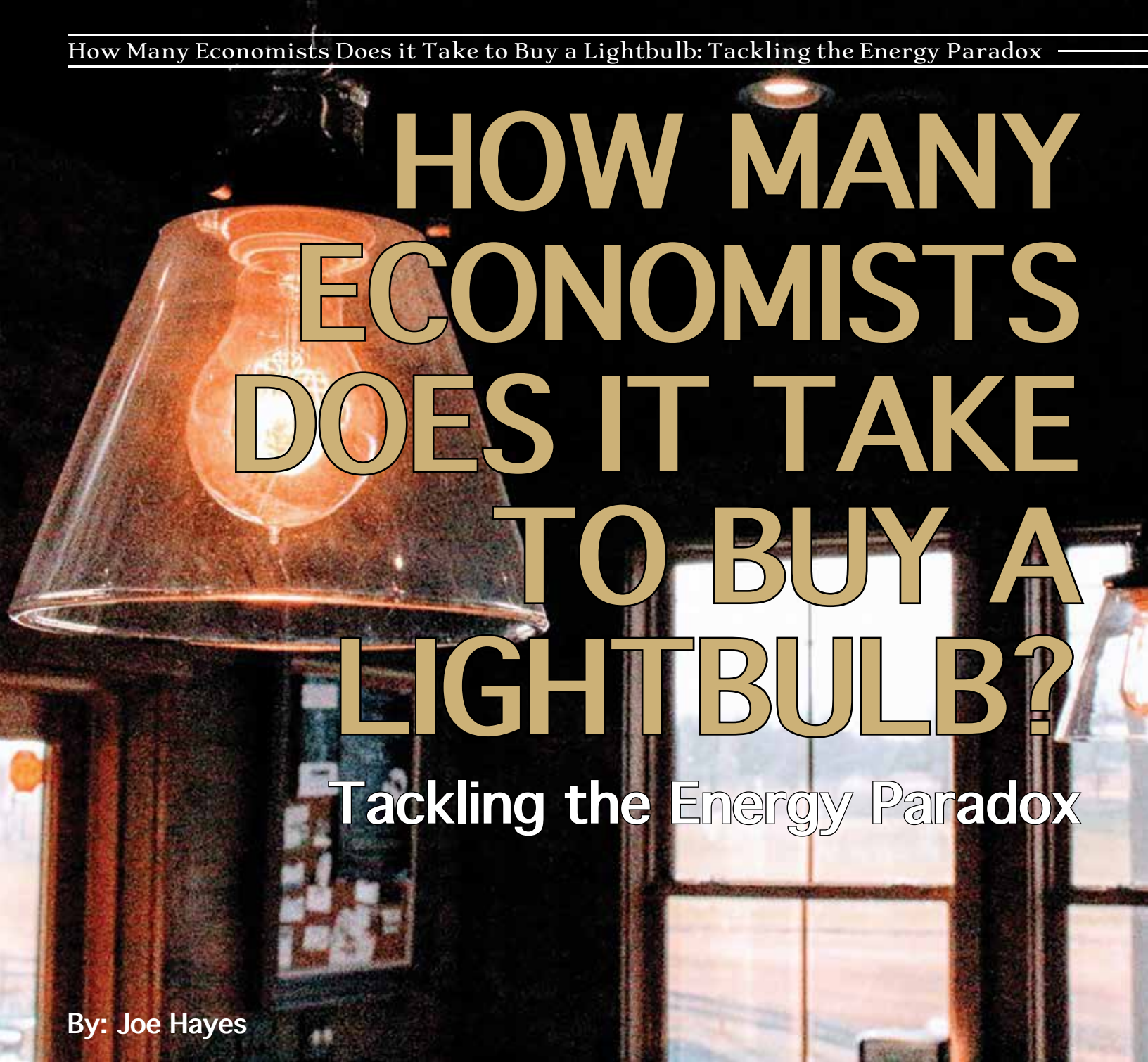
FINALLY, FORTIFY THE NATIONAL LABOR RELATIONS BOARD (NLRB). The NLRB is the labor union's guardian through its work of preserving collective bargaining rights and contesting unfair labor practices. In recent years, Congress has attempted to defund new rules that would protect unions from

employers encroaching upon their sovereignty. A resilient NLRB is a powerful ally in guaranteeing that unions can be afforded the security to do what they do best – protecting the American worker.

COLLECTIVE BARGAINING, MADE POSSIBLE by labor unions, has been an opposing instrument to economic inequality from the dawn of modernity to present day. Notwithstanding political opposition and economic transformations over time, labor unions have consistently delivered comparatively superior livelihoods. Right-to-work laws have demonstrated negatively to this effect. Thus, policymakers should be encouraged to make labor unions the priority, once again.

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HOW MANY ECONOMISTS DOES IT TAKE TO BUY A LIGHTBULB?

Tackling the Energy Paradox

By: Joe Hayes

SELECTING A PRODUCT SHOULD BE EASY. Economists (and your parents) believe that the one product that will give you the best bang for the lowest buck should be the one you select. However, this doesn't seem to be the case for energy efficient products. People tend not to invest in energy efficiency, even though it would pay off in the long run with lower energy costs. This is the basis for the "energy paradox" (Jaffe and Stavins, 1994). The energy paradox is the apparent

reality that some energy-efficiency technologies (and thus cheaper alternatives in the long run) are perplexingly not adopted. This paradox is true for lightbulbs, and lightbulbs serve as a lightning rod of debate. LED (Light Emitting Diode) lighting is vastly more efficient compared to traditional incandescent lightbulbs, and yet historically their rate of adoption has been low. However, the energy paradox masks the straight forward cost savings, and makes for irrational behavior.

Identifying the extent and trying to solve the energy paradox is an important step in our sustainable energy future.

THIS CONTRADICTION IS AN EXPANDING area of research due to its complexity and irrational failings. It spans almost all energy efficient reductions from refrigerators (Gately, 1980), air conditioners (Hausman, 1979), and more recently heavy-duty trucking (Klemick et al. 2015). There must be some reason for the disconnect between the future savings of energy efficiency and consumer choices. Economists generally believe that the reason for the irrational behavior is due to heuristics (Gillingham and Palmer, 2013). In other words, people have ingrained experiences that affect their choices. Nonstandard preferences are an example of these. For example, these could be thought of as beneficial investments for the future that you want to do but keep putting off, analogous to eating healthier foods. You know you should, but you just don't want to. This could be a similar story to investing in energy efficient products (Tvetanov and Segerson, 2011). As the time to invest in energy efficient product nears, the consumer puts it off "until next time". Another possible explanation is the behavioral aspect of people, including imperfect information regarding the savings earned or economic myopia. It seems that consumers choosing products are less attentive to additional costs. Research has found that people are less elastic to shipping and handling on eBay than to the price of the item itself (Hossain & Morgan, 2006). This may be a corollary to lower prices with the upfront cost of the incandescent bulbs, even though their future electricity bills would go up. Or, an uninspiring last possibility, the energy paradox is the result of economists overestimating the benefits of switching to energy efficient technologies (Fowlie et al., 2018).

LEDS PRODUCE LESS HEAT THAN INCANDESCENT light bulbs ("Learn about LED lighting"), which allows them to emit more light, last longer ("The Lightbulb Revolution"), yet are only slightly more expensive. Since these energy efficiency savings are not being realized, some governments have initiated energy efficiency standards,

effectively phasing out the incandescent lightbulb. However, LEDs have gotten some surprising pushback in the United States. It seemed that the US would follow the lead of other countries, such as Argentina, Australia, Brazil, Canada, China, Cuba, the European Union, Israel, Malaysia, Russia, and Switzerland banning the incandescent lightbulb after the "Energy Independence Act" of 2007. This legislation sought to make lightbulbs 25 to 30 percent more efficient than the 2008 standards by 2012-2014. The bill was passed overwhelmingly in Congress and signed by George W. Bush. Yet, the ban on low efficiency incandescent lightbulbs has faced considerable opposition. This is evidenced by the failed bills: "The Better Use of Light Bulbs Act" of 2011 and the "Lightbulb Freedom of Choice Act" of 2011. Since 2011, when LEDs became available for residential usage, there has been a widespread push for LEDs to be more readily available. According to the U.S. Department of Energy, 34.6% of households owned incandescent lightbulbs in 2015, compared to the 48.1% of LEDs and CFL lighting (Bucitelli, 2017). LEDs have a large share of the residential lighting marketplace, but it seems many people still want to hold onto the least efficient incandescent bulbs. This leads us to the heuristics conclusions that the economists have put forward.

UNIVERSITY OF WISCONSIN UNDERGRADUATE Travis Cao set out to try to model this behavior. Using a Monte Carlo simulation, Cao attempted to explain why people are not as willing to switch to LED lightbulbs. He modeled middle class U.S. consumers who are interested in buying a lightbulb for home use. He tried to find with what lightbulb would consumers would be better off with. For this, he used data from Walmart and Target to get the average prices and price difference between the two bulbs, and corrected for brightness. Cao used many other inputs into his model including: the price for electricity, discounting for the future, an "unfamiliarity of using the LED bulbs" cost, along with how long the bulb would be on for and the probability of it failing. He used all this information to try to predict where the income cutoff was for people switching from incandescent bulbs to LEDs.

Using these multiple factors and running the statistical simulation 500 times to reduce bias, we arrive at Figure 1.

EACH POINT IN THE FIGURE 1 GRAPHS REPRESENT AN INCOME CUTOFF POINT GIVEN A DISCOUNT RATE, meaning that each point is the income where consumers switch from incandescent lightbulbs (INC) to LEDs. As the discount factor (x axis) goes up, the more patient the person would be. The more you value your future, you save over the long run, but to the increased of price in the present. The 40-Watt bulbs converge faster than the 60-Watt lightbulbs due to the lower prices of the 60-Watt LED bulbs. 60-Watt bulbs are only 1 to 1.50 dollars more than their incandescent counterparts, while the 40-Watt bulbs are about 3 dollars more. The shaded blue color on each of the points demonstrates how long each consumer has the lightbulb on for. With the larger cost difference, only the high income and patient consumers would buy LEDs.

IF WE ASSUME THAT THE HOURS WITH THE LIGHTS ON ARE THE SAME FOR ALL BULBS, WE GET the graphs in Figure 2. If consumers even slightly discount the future, they will buy incandescent light bulb. The line does not cross the average US income for 2016 (Current Population Survey 2017). There-

Figure 1:

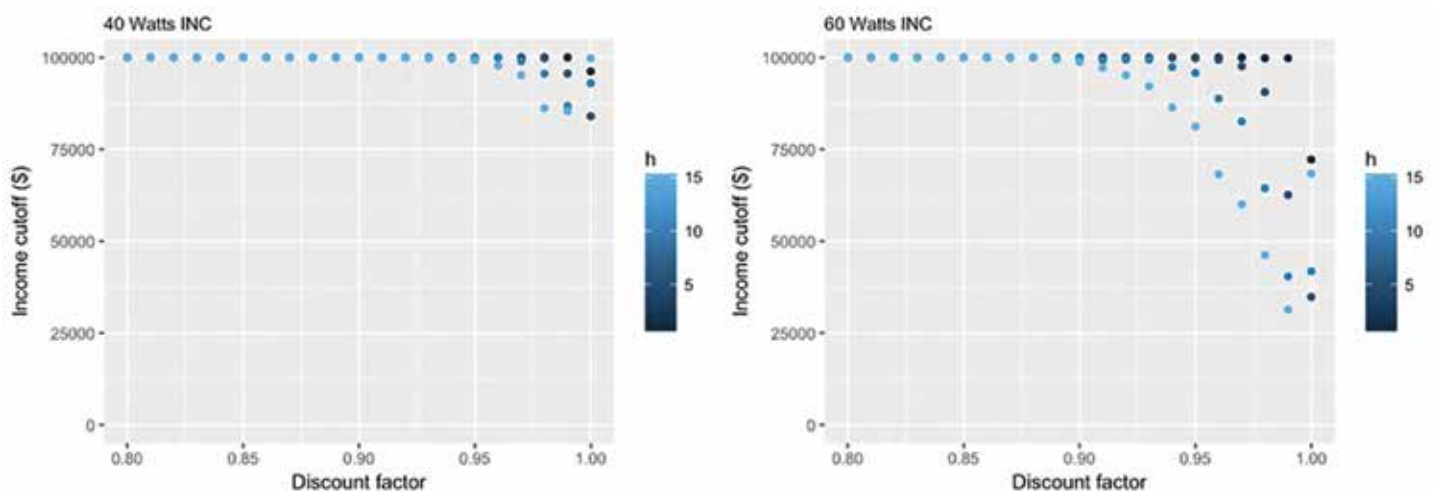
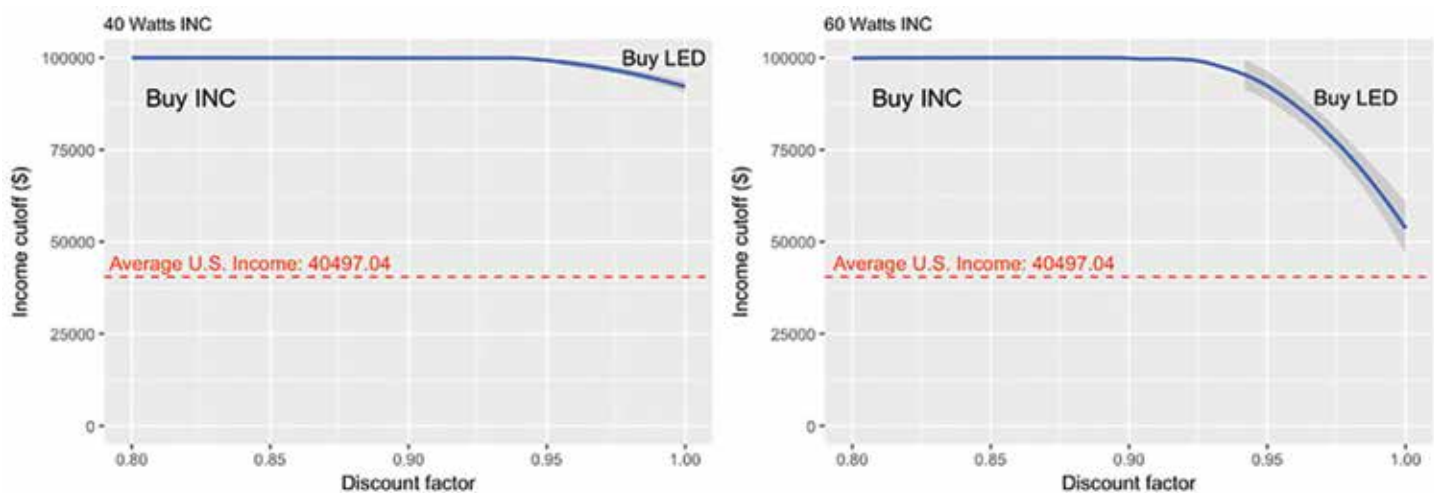


Figure 2:



fore, only a small, high income, and patient fraction of consumers will purchase LEDs. This shows the energy paradox in action! Since people do not value the future as much as current costs, they are missing out on savings that could be bought using an LED, and instead go for the cheaper upfront option.

ON THE OTHER HAND, ASSUMING THE PRICES OF THE LED AND INCANDESCENT LIGHTBULBS were the same, you would get the graphs in Figure 3. Using the model, the income cutoffs for switching to LED drastically changes. When consumers perceive future savings, or the discount factor is close to one, almost everyone would prefer the LED lightbulb. Essentially, as LEDs get cheaper, the more people will buy them (supply and demand, right?). If the lightbulbs were cheaper, then they could be adopted by the average income, but patient, US consumer. Although this seems to be very optimistic given what we've seen, it isn't without merit. According to the Department of Energy in 2013, LED prices have dropped 85% from 2008 to 2013. (Buccitelli et al, 2017). With the falling price, Cao predicted more people would buy LEDs, as shown by the cutoff line intersecting the average US income in Figure 4. This could cause some of the associated costs that Cao had in his model, like a cost for unfamiliarity for using LEDs, to also decrease, making them even cheaper in the real world.

Figure 3:

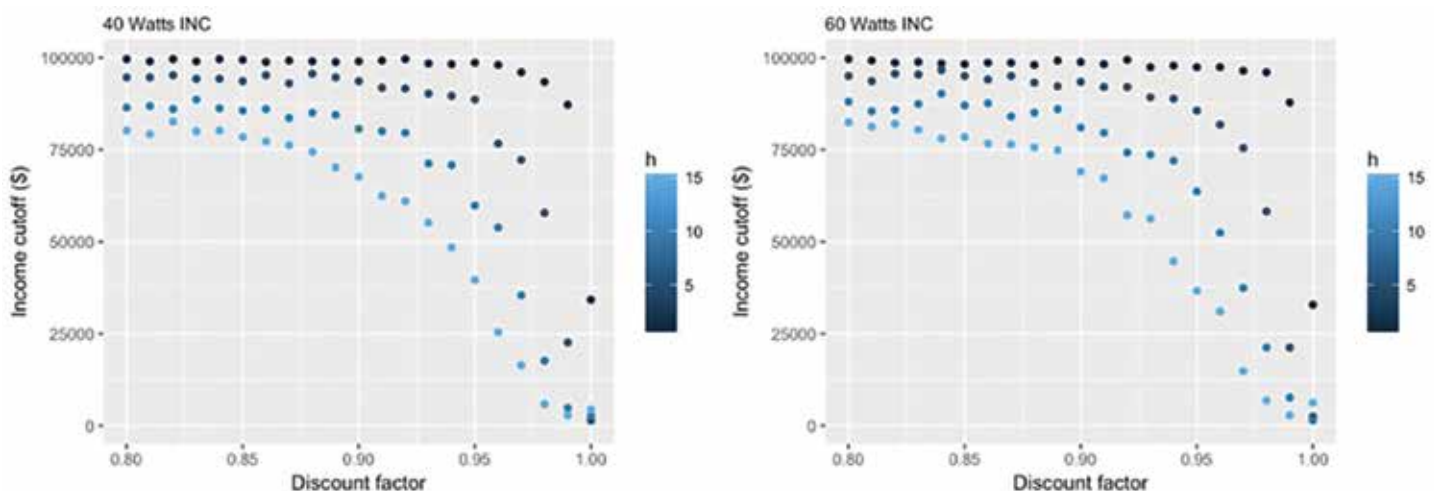
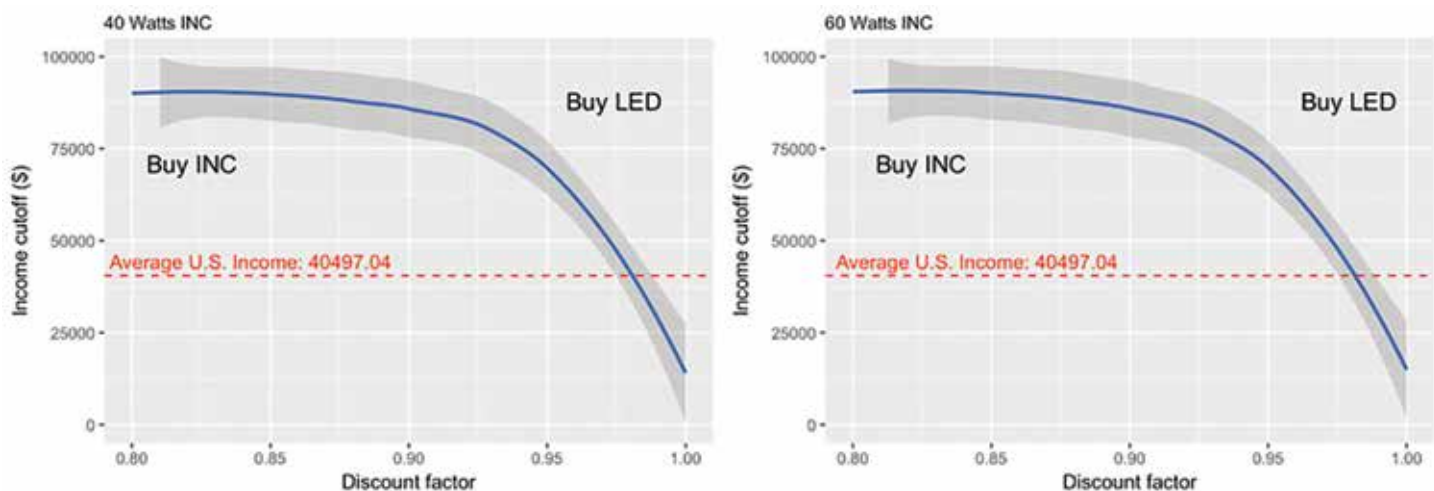


Figure 4:



HOWEVER, EVEN IN THE BEST-CASE scenario, where the price of LEDs are the same as incandescent bulbs, some assumptions are problematic. The model assumes rational human beings, so a possible place for error is the assumption that when LEDs get cheaper, more people would be willing to risk switching over to LEDs. To put it another way, Cao assumed that people had no innate preference between LEDs and incandescent lightbulbs. Yet, as seen in the legislative history, people love what's familiar.

CAO'S WORK FITS SQUARELY IN THE research for exploring energy paradox. Researchers attempt to model the problem that is ruled by a multitude of both irrational and rational factors. This model does show that the most patient consumers do indeed prefer the LEDs, something that can be logically reasoned. If you value your future more, why shouldn't you save a few dollars over the long run? Intuitively, it also makes sense that as the price for LEDs get closer to the incandescent bulbs, that the more lower income consumers would want to buy LEDs. This model suggests that it is mostly upfront costs that keeps LEDs from becoming much more prevalent. Whether through a subsidy for LEDs, or a tax on incandescent bulbs, governments could encourage LED sales, without an outright ban.

THE MODEL EXPANDS ON THE PREVIOUS knowledge of the energy paradox, by correctly identifying some of the underlying factors for the energy paradox. The main factor is that people don't take their future into account when buying lightbulbs, and only see the price in front of them. We then could transfer the idea of this model to other inexpensive energy saving appliances. However, more empirical data should be collected to further to refine the model itself, and to also understand its limitations. In addition, more models should be explored on larger, big-ticket items like cars. Given the larger purchase, the more opportunity for savings and with the larger upfront costs, the consumer would be more likely to weigh the future as much as the past. Unlocking the energy paradox could make energy and environmental

policies more targeted, and lead to a sustainable and energy efficient future.



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The Economist: Professor Stella Chan

**Interviewed and Written by
Nicoletta Sumarta**

A little more than a semester since joining the Wisconsin Economics department, Professor Stella Chan already has a reputation that precedes her. Her students have consistently praised her and have found her to be an extremely engaging and educational instructor.

Besides being a robust lecturer, Professor Chan is also a highly experienced macroeconomist. With a graduate degree from UCLA and research experience at the International Monetary Fund (IMF), Professor Chan's interest in international finance has grown and developed in the best of settings. Here, she talks about her path to becoming an economist, her time at the IMF, her experience with economic research, and lastly, her take on current events.

At what point in your undergraduate career did you realize you wanted a career in economics?

When I was in high school, I always thought that I would become a journalist sometime in the future, so I thought somewhere down the road I would study international affairs or international studies. Since I was on the science track in high school, I had no prior exposure in economics. So when I came to the US--I went to UC Berkeley for my undergrad--I explored different subjects in social sciences. I thought I would stay in history or political science. Then, I took Intro to Micro and Macro, and I just fell in love with economics. I really liked the structured, disciplined, and logical way of thinking about how economic agents behave and interact with each other.

So your field is macroeconomics, and international finance specifically. When did you realize your interest in these areas?

I was interested in development issues, and realize that one contributing factor to economic growth is the development of financial markets and integration into global capital markets. That's a broad interest I always had. I remember the Asian financial crisis also occurred when I had to declare my major as an undergrad, and so that was one of the main reasons I became interested in currency crises and central bank policy.

After earning an undergraduate degree in economics, how did you come to the decision to pursue a career at the IMF instead of graduate school?

I actually did not think about studying economics at a graduate level. I thought I would work first, anyway, to find out what I'm interested in doing and learning in the future. I was fortunate enough that the IMF just started a new research assistant program targeting undergraduate students with an economics degree. They came to Berkeley to recruit, and I was fortunate enough to get the job. I've

interviewed with many companies, most of them are in the private sector ... but the job at the IMF was one of the few jobs that really allowed me to directly apply my knowledge of economics to my job. Even though my work didn't directly decide the policy of different countries, it still indirectly shaped macroeconomic policies at a national level, so it is really meaningful work.

How and when did you eventually decide to go to graduate school? Was this decision influenced by the time you worked at the IMF?

Originally, I wanted to come back to the IMF and work as an economist, and that's why I started thinking about applying for a PhD program in economics. What's also helpful about working at the IMF is that it gave me the hands-on experience of working with data, analyzing data... there were also a lot of issues I was exposed to that actually gave me an idea of what I may want to do research-wise.

There were also a lot of professional development opportunities at the IMF. I took Portuguese classes when I was working there because I had to sometimes go to databases and read documents that were published by the Brazilian government. Another thing is that there were a lot of in-house seminars and training sessions I could attend if I had the time. So I highly recommend students who are interested in going to graduate school in the future but want to take a break to go work for the Fed or the IMF. These are great opportunities.

For those students still unsure about a major in econ, what do you have to say to them?

I think economics is definitely a great major. The methods that you learn are very useful. The analytical and theoretical framework can be applied to a broad set of issues ranging from consumer and firm behavior, to environmental issues, to development issues. The second thing is that I think economics gives students a really strong quantitative foundation, espe-

cially through the learning of econometrics. It is particularly useful these days when everything is becoming more data-driven... with the availability of Big Data, having these quantitative skills and having the experience of working with data and doing statistical analysis are all extremely important.

Going a step further, for those students starting considering to pursue economics and economic research as a life-long career, what does formal research in economics actually look like?

In econ we use the scientific method: we come up with a hypothesis and theory which, a lot of time, is grounded in mathematical models, which makes it more objective. Ultimately, we use economics to analyze real world issues and make predictions about them. So the discipline of using data to verify your claims is very important. That's kind of a pro of economic research. But I think the issue students need to be aware of when doing economic research, is that it is not the same thing as doing scientific research in the natural sciences. You cannot repeat experiments in a controlled environment. The assumptions that you make when analyzing economic issues are very important because, as they change, so will the conclusions of your research.

When you're thinking about the recent financial crisis, for example, if you assume investors have rational expectations, the implications of the model will be different than if you used behavioral economics and assumed that there are different psychological kind of... aspects that dictate how people behave. Especially in macroeconomics, there is a lot of disagreement in terms of how the market functions, or how the economy functions, and that's why some people are saying that economists were not able to predict the most recent financial crisis. So it is important to realize that different assumptions lead to different conclusions.

The second thing is, because we cannot re-

peat experiments, the testing of hypothesis is based on historical data. If there are any structural changes in the economy..., the outcome of the economy may be different from what happened in the past.

Do you think there are any specific problems that you face when conducting research in your field (international finance and macro), that might not necessarily be faced by other economists doing research in other fields within economics?

Definitely. Macroeconomic data is usually time series data, so we have to take into account the properties of time series data. Another thing is that there are usually so many variables in macroeconomic data that are changing at the same time... and there is no way to control these other variables to ensure they stay constant. And if you're looking at a developed economy versus a developing economy, there may be different economic structures, and even different political and social structures that would affect your outcomes in research.

Also for emerging markets... there are so many structural changes going on in the economy, these countries are going through trade liberalization, and their financial markets are being developed. You definitely have to take these things into account. They are usually also going through political transitions... one thing I was looking at in my research is whether central banks are independent from their governments, and it turns out those things really do affect economic outcomes.

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Another thing your research touches upon is the allegations of china being a "currency manipulator." To what extent are these allegations true?

The first thing people need to be aware of is the definition of currency manipulation. Because China has a fixed exchange rate, by definition its central bank has to intervene in the foreign exchange market to maintain this fixed exchange rate. Some people call this manipulation... but what's more important is whether the Chinese government is intervening in a way that artificially lowers the value of the Chinese Yuan in order to favor its exporting sectors.

The second thing is, a lot of politicians are focusing on the bilateral exchange rate between the US and China, but the more important thing we should be focusing on is the real effective exchange rate... basically the exchange rate between China and its major trading partners, not just the US. The real exchange rate takes into account the cost of producing exports, because it's not just the currency value that affects the trade balance

between China and its trading partners it's also the price level and the cost of production. So that's very important to realize.

Some people have been claiming that China is manipulating its currency because it has been running a persistent current account surplus, experiencing private capital inflows, and also accumulating lots of foreign exchange reserve. Although these are evidence pointing to China manipulating its currency, my research shows that, especially in the first decades of the century when China received a huge influx of foreign exchange, we did not see a huge real exchange rate appreciation, which is predicted by standard theory. So what I argued is that the lack of real exchange rate appreciation is mainly due to structural changes China experienced at the turn of the century. The first thing is... I call it sterilization by the people, which is when its population decides to save more and hold more monetary balances due to the deterioration of a social safety net in China and a lack of development in its insurance and financial markets. The second thing is, because China entered the WTO in 2001, it experienced trade liberalization and relaxed lots of its import restrictions. These two factors actually contributed to the "moderate" response of the real exchange rate.

Another piece of news that has been making headlines are the tariffs recently imposed by the U.S. government. From a macroeconomic perspective, what are some implications of these tariffs?

We need to think about these effects in both a short-term and long-term perspective. With the steel tariffs... it's trying to help domestic steel producers, and we have seen steel prices going up... so they actually have been benefiting from these tariffs. But we haven't actually seen a drop in imports of steel. This may be because the US has such a high demand for steel. So it is benefitting certain producers... but turns out that these trade barriers are also hurting a lot of manufacturers. So when

thinking about effects, we need to be aware of the nature of the global supply chain. A lot of manufacturers in the US actually rely on imported materials, and with the tariffs, the costs of production will eventually go up. We haven't actually seen consumer prices pick up yet, but eventually these costs will have to be passed onto the consumer. So in the long term, the consumers will end up suffering too.

Another thing President Trump has been saying is that these tariffs will bring jobs back to the US, but manufacturers may switch from China to other countries when importing materials. They could go to Vietnam, Korea, and Philippines to look for cheaper supplies. So it may not be bringing jobs back to the US. Some economists even predict that, somewhere down the road, we may actually lose jobs because of these tariffs.

We also need to realize that foreign countries can also retaliate, which is exactly what we have been seeing. These also have its effects: Harley Davidson has decided to shift some of its production to Europe to avoid these retaliatory tariffs. Somewhere down the road, uncertainties about our trade policy, the trade policy of other countries, and fear of an escalating trade war may cause investors and producers to delay their investment projects which will affect the financial market and banking sectors. So if the situation is not controlled, it may actually affect more than the manufacturing sectors... I'm not necessarily saying that there will be a recession, but there are a lot of things we need to look out for, and be careful of.

What's coming up next in your research?

Recently my research has switched over to looking at central bank policy specifically, my main focus is central bank credibility and independence, and how this is related to the durability of an exchange rate regime. The method I'm using is survival analysis, which takes into account the amount of time a coun-

try has already stayed in an exchange rate regime, and how it affects the durability of the regime.

Are there any conclusions from your future research that you are already pretty sure about?

There are really two schools of thought in this matter. The first thinks that a higher degree of central bank independence will lead to a more durable exchange rate regime. The second assumes... the more independent a central bank is, the less they need to rely on a fixed exchange rate regime to anchor their inflation rate... so they can adopt a floating exchange rate regime. So the results can go either way... but in the short to medium run, having central bank independence will help a country maintain its fixed exchange rate regime. But, if a country is able to maintain a re-

gime and has demonstrated a commitment and resolve to maintain low inflation, then they can possibly switch to a floating exchange rate regime. So that's the conjecture I have with regard to this research.

Meet the Researchers |



Rebekah Dix

As an undergraduate, Rebekah Dix has collaborated with graduate students and faculty to study spatial efficiency in ride-sharing platforms, design a novel algorithm for optimizing spatial allocations in continuous space with continuous demand, and develop a theoretical framework for studying games in which players' strategies are contingent contracts. She will graduate from UW in May and begin an economics Ph.D. program in fall 2019. Her research interests lie in the intersection of economic theory and computation.

Travis Cao

Since the lightbulb energy-paradox project, Travis Cao has further explored topics in the field of environmental economics. His senior honors thesis on fuel economy in Californian vehicle market deployed demand estimation technique developed by Berry, Levinsohn, and Pakes in 1995 on empirical data to further explore the role of energy efficiency in consumer choice. He is graduating from UW in May, and will go on to start his doctoral program in economics in fall 2019. He hopes to continue studying environmental economics as long as his interest persists.

Morgan Klaeser

In February, Morgan started as a Research Assistant at the Federal Reserve Bank of Boston. She is currently supporting a working paper examining how the structure of state aid formulas influences their efficacy in closing racial achievement gaps. Morgan notes that being involved in Equilibrium--as well as engaging economics projects where she could receive feedback on her thoughts--have determined her success after graduation.

Jose Larrain

Jose Larrain is graduating this May and will be attending a PhD program in Economics beginning in the fall of 2019. Following his paper on Ban the Box, he hopes to continue to study public economics and the effects policy can have on different races. His long-term career goal is to become an economist and serve in academia.



Equilibrium is made possible by the students who have researched, written, designed, edited, and created each word and every page.

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