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# KRANNERT SCHOOL OF MANAGEMENT

Highlighting Management Department  
Faculty Research

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## **Management Department Head Ananth Iyer**

The 7th edition of the Faculty Research newsletter from the management department showcases our faculty's research, and provides a glimpse of the diversity of ideas being explored. We hope you learn, ponder and question these ideas, and seek out the faculty to learn more. Our goal is to establish an intellectual dialog that can benefit us all, with you, the reader, playing a key goal in helping us realize this goal.

The paper by Jim Dworkin explores the impact of conflict resolution training on team performance by carefully studying the impact on different modalities of classroom delivery i.e., face to face, hybrid and fully online. Given their documented impact of team learning, their insights shed light on ways to improve team performance.

Tom Godwin's research focuses on how analysts balance effort to monitor firms. The research focuses on analysts relative forecast error (compared to other analysts), and they establish that greater attention on large firms is at the expense of lower attention paid to small firms. They also show that "CEO succession generates less uncertainty than the appointment of an outsider".

The paper by Manu Kalwani focuses on the impact of social media influencers in gaining customers. Their research focuses on "whether low-cost, online marketing tools could help create a greener and healthier world by persuading farmers in rural China to adopt a new nanotechnology-based pesticide". They find that the presence of an influencer on a platform improves the quality of discussions regarding the product and enables potential customers to learn about the product.

Federico Rossi's paper focuses on the impact of "quantifies the effect of competition on content creation and user activity in social networks". They focus on players in the National Women's Soccer League and their competition on the soccer field and their role on Twitter and social media. Both player tweets and their soccer goals generate attention, which they quantify. As Federico says "Our model accounts for all that and tells us that involving all players is more efficient in terms of the outcome you get, compared to the input you give. If you involve all players, you get 20 percent more efficiency."

Amir Sariri's paper focuses on the impact of mentorship on the performance of startup firms. Their paper shows that "the probability of external funding for entrepreneurs with an average level of mentorship (23 hours) is 74 percent higher than for entrepreneurs who receive no mentorship. An extra hour of mentorship is associated with an 8 percent increase in the amount of capital raised."

Dejanir Silva's paper develops a model to explore the link between a consumer's wealth (home or stock portfolio) and their consumption. The researchers claim that "the Fed affects the economy mainly through wealth effects." This is a timely piece of research as we observe how the Fed is trying to tame inflation.

Jen Tang's paper focuses on clustering categorical, rather than continuous, data. The paper shows that use of their "model and their proposed data encoding methods (the Equilateral and Semicircle encodings)" demonstrate that "it is sufficient to observe only a fraction of noisy data entries to recover the true clustering structure with high probability in high dimensions."

Yuan Yuan's paper explores the impact of prosocial incentives, such as walking miles raising money for charity from corporate sponsors. They show that for employees "receiving a message encouraging them to donate their steps and viewing a donation page increases their likelihood of following through the next day by at least 20 percent". Their research "combined an online field experiment consisting of about 40 million users on the fitness tracking program with a follow-up observational analysis".

We hope you enjoy this research newsletter, and understand the depth of scholarship that goes into each one of these research efforts. More importantly, we hope you appreciate the quality of the faculty that comprise the management department, and seek them out to assist you if appropriate. We seek your feedback in our efforts to engage with you and showcase our faculty.

Have a wonderful day.

Ananth V Iyer

Department Head, Management

Susan Bulkeley Butler Chair in Operations Management

Krannert School of Management





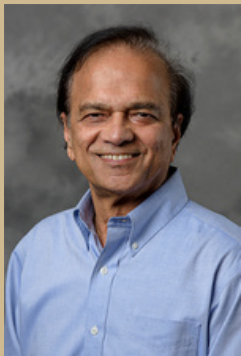
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**Yuan Yuan**

# Conflict Resolution Training Helps Students Collaborate on Teams

by Melvin Durai

A professor assigns a project to a group of students, telling them to work as a team to complete it. But one student, confused about his role, appears to shirk his responsibilities, prompting another student to fire off a nasty text, which only produces more tension and resentment.

A face-to-face conversation or phone call may be more effective in such situations, allowing students to engage in a dialogue and consider each other's perspective.

"One of the things you need to do in terms of resolving conflicts on teams is think about what medium you're using," said James Dworkin, chancellor emeritus and professor of management in Krannert School of Management.

Dworkin, a longtime arbitrator and mediator, offered conflict resolution training to students as part of a Purdue University research study that evaluated the effect of three teaching strategies to promote teamwork in a systems analysis and design course during the Covid pandemic. Among its findings, the study shows that conflict resolution training can be a valuable tool for improving teamwork skills and communication.

Dworkin collaborated on the research with Alejandra J. Magana, the W.C. Furnas Professor in Enterprise Excellence in the Department of Computer and Information Technology, as well as postdoctoral associates Tugba Karabiyik and Viranga Perera, and doctoral students Paul Thomas and Aparajita Jaiswal.



The researchers share their results in a paper entitled "Teamwork Facilitation and Conflict Resolution Training in a HyFlex Course During the Covid-19 Pandemic," published online on Jan. 21, 2022, and forthcoming in the *Journal of Engineering Education*.

The study evaluated the effect of these strategies: offering a HyFlex version of the course, facilitating scheduled online teamwork sessions for all students, and providing conflict resolution training to help teams overcome collaboration challenges.

HyFlex, which combines face-to-face and remote instruction, had primarily been implemented in graduate studies to accommodate working adults but became a safe way to offer lessons during the pandemic.

Using a simultaneous triangulation mixed-methods design, the researchers compared data from two offerings of the course: Fall 2019, when instruction was fully in-person, and Fall 2020, when the pandemic necessitated a HyFlex delivery mode. The Fall 2020 course was offered in three sessions: a HyFlex Tuesday in-person session, a HyFlex Thursday in-person session, and a HyFlex fully-online session.

Students in the Fall 2019 course received no conflict resolution training, nor did they write a reflection.

Students in all three sessions of the Fall 2020 course were asked to read a case study titled “Coping with Hitchhikers and Couch Potatoes on Teams,” which illustrated the typical challenges of teamwork in educational settings and suggested coping strategies.

Students in two sessions, the HyFlex Tuesday in-person session and the HyFlex fully-online session, received conflict resolution training. Dworkin, who has more than 40 years of experience as an arbitrator, mediator, and fact-finder in various labor-management disputes, attended the sessions to share techniques to address conflict and prevent conflict escalation.

Students in the HyFlex Thursday in-person session did not receive the live training, which allowed researchers to evaluate the potential effect of conflict resolution training.

A week after the conflict resolution training, students from all three sessions were asked to write a reflection on a personal experience with team conflict, including a description of how they addressed it and what they would change if they encountered the same conflict again.

The researchers collected data from team and individual academic performance, team self-and-peer assessments, retrospectives on team collaboration strategies, and reflections on team conflict resolution strategies.

Their analysis indicated that the HyFlex sessions, enhanced with the cooperative learning strategies, gave students a comparable learning experience to the traditional in-person mode.

The researchers found a positive effect, at least in the short term, of the conflict resolution training. All students who received the training showed an overall positive gain in their descriptions of how they would handle conflict they had experienced in the past.

“The students who had the training tended to have more cooperative approaches to resolving conflict,” Dworkin said.

Students in the HyFlex fully-online session appeared to benefit the most from the training. None of them initially described applying a collaborative mode for conflict resolution, but following the training and case study, nine students said they would adopt a collaborative strategy.

The fully-online students may have benefited the most because of the medium they were using, Dworkin suggested. The in-person students were meeting and conversing with each directly, which made it easier to work as a team, while the online students were seeing each other on Zoom.

“Maybe the training made a bigger impression on them—the importance of having sincere conversations,” he said.

The students learned the importance of resolving conflict in an assertive and cooperative manner.

“When people have a conflict, they want to sweep everything under the rug,” Dworkin said. “That’s not a good idea. You need to go right at it. You need to be prepared and you need to be ready to discuss.”

While the study shows that conflict resolution training can benefit students collaborating in a class, it can also benefit them in workplaces and other settings.

“Wherever you go, you work on a team,” Dworkin said. “You very seldom work on your own. Even if you’re the boss, you have a team.”



# How Financial Analysts Reallocate Attention in Response to Leadership Changes

*By Melvin Durai*

The president and CEO of a successful department store chain unexpectedly announces her early retirement, citing health concerns. She is replaced by a relatively unknown vice-president from a rival chain. This rare occurrence has implications for the financial reporting and disclosure of the firm going forward.

During the transition, financial analysts who cover the company must determine what to recommend to clients regarding the firm's stock. As they expend more attention to learn about the new CEO and develop new relationships, will they continue to devote the same amount of attention to other firms in their portfolios? Or will they reallocate attention at the expense of the forecast quality of those other firms?

While prior research has suggested that analysts may be unwilling to shift attention in response to an extraneous event, a study by Thomas Godwin, assistant professor of accounting in Krannert School of Management, and Theodore Goodman, associate professor of accounting in Krannert, finds that analysts do indeed reallocate attention across the firms in their portfolios—and they do so in a strategic manner that affects the quality of their forecasts. Their findings are consistent with the idea of rational inattention and extend this concept into the area of financial analysts.



Exploring the dynamics of attention allocation in a study entitled "Analyst Rational Inattention: Evidence from CEO Turnover Events," the researchers examine how analysts react to unanticipated events within their portfolios.

“What we’re showing is that analysts strategically and voluntarily change their attention allocation based on the composition and the events happening within their portfolios,” Godwin said. “That can happen in a way that hurts the other firms in an analyst’s portfolio, but in supplemental analyses, we find that also can happen in a way that helps the other firms in an analyst’s portfolio.”

Among their findings is that analysts reallocate attention toward larger, more important firms in their portfolios and away from smaller firms. Their results also indicate that the extent of attention reallocation depends on how well analysts could anticipate the executive turnover event.

“Whenever analysts need additional attention for one firm, they take that attention from less important firms to their careers, which diminishes the quality of forecasts for those smaller portfolio firms,” Godwin said.

Prior literature has not examined how the idea of rational inattention applies to the quality of analyst forecasts. When a firm replaces its CEO, financial analysts must expend additional attention to build inroads with the new executive and understand how the change will impact the firm’s accounting policies and disclosures. The authors document that rational inattention extends beyond static traits of firms, and attention allocations is affected by transitory events like CEO turnover.

The researchers estimate attention based on an analyst’s relative forecast error. “The measure that we use to proxy for attention is the proportional mean analyst forecast error, so essentially it’s the analyst forecast error relative to all the other analysts forecasting the same period for the same firm,” Godwin said.

Using a sample of 876,385 analyst forecasts from 1992 to 2018, they find that when analysts allocate more attention to one firm, they allocate less attention to the other firms in their portfolios. In additional tests, they also find evidence for the reverse: allocating less attention to one firm allows analysts to allocate more attention to other firms in their portfolio.

Through a cross-sectional analysis, the researchers show that analysts give priority to larger firms when they need to reallocate attention.

“The firms that often suffer from this are the smaller firms in an analyst’s portfolio,” Godwin said. “Even in the case of excess attention, smaller firms don’t tend to benefit.”

Another cross-sectional analysis shows that analysts with more homogeneous portfolios benefit from information spillovers. When they expend more attention for one firm, they gain useful information that applies to other similar firms within their portfolios, thus lowering the costs of attention reallocation.

The authors also document that the amount of attention reallocation depends on the resources available to the analyst. “We find our results are more concentrated in analysts at smaller brokerage houses, where resource constraints are more binding,” Godwin said.

Among other findings, the researchers show that an insider CEO succession produces less uncertainty and requires less attention from an analyst than the appointment of an outsider.

“We know from prior literature that insider CEO succession is often more anticipated,” Godwin said. “There’d be less of a shock to the analyst versus an outsider CEO succeeding, in terms of trying to understand how that might change the accounting policies.”

The study not only contributes to the understanding of how analysts allocate attention, it also has implications for firm behavior, indicating when firms are being closely monitored. Firms can take advantage of analysts being distracted or be more disciplined when analysts have more time to devote to them.

“Firms are not naïve to the fact that their analysts sometimes have to work on something else or have some available attention,” Godwin said. “Our findings indicate that firms take advantage of that attention reallocation, albeit rational from the analyst’s perspective.”

# The Positive Power of Social Media Influencers

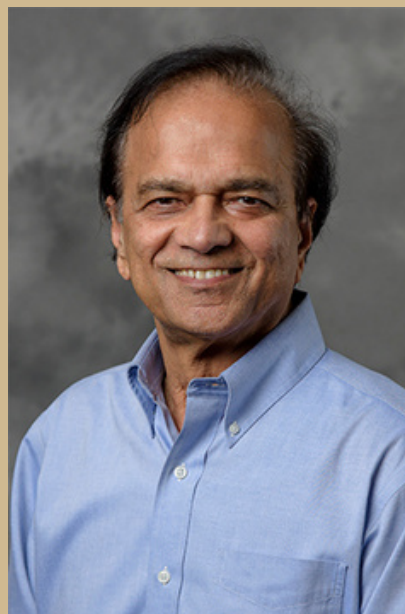
*By Melvin Durai*

The most well-known social media influencers, such as soccer star Cristiano Ronaldo and singer Selena Gomez, boast millions of followers and endorse everything from haircare products to exercise machines. But to be a social media influencer and inspire people to try a product, you don't have to be a celebrity or expert. You can be a village officer in China who encourages fellow farmers to try a new eco-friendly pesticide with a social media message like this: "Hello, my farmer friends! Recently the weather is good for pest control. Please use the new pesticide from ... Don't forget to post your application photos."

A study co-authored by Manohar Kalwani, the OneAmerica Professor of Management in Krannert School, shows just how effective social media influencers can be in getting customers—even in a rural setting—to overcome their doubts and try a new product.

"Engaging customers through a social media platform can help overcome barriers and facilitate new product adoption," Kalwani said.

He and his co-authors, Wanqing Zhang (PhD, '17) of Bayes Business School (formerly Cass), University of London, and Pradeep Chintagunta of Chicago Booth School, share their findings in a paper entitled "Social Media, Influencers, and Adoption of an Eco-Friendly Product: Field Experiment Evidence from Rural China."



Source:  
Manohar Kalwani



Published last April in a special issue of the *Journal of Marketing* on “Better Marketing for a Better World,” the paper was a finalist for the 2021 AMA/Marketing Science Institute/H. Paul Root Award.

The researchers explore whether low-cost, online marketing tools could help create a greener and healthier world by persuading farmers in rural China to adopt a new nanotechnology-based pesticide that is nontoxic and environmentally friendly. In particular, they wanted to see whether social media tools could alleviate customer uncertainty, a major obstacle in the adoption of new technology.

Coordinating with the pesticide maker and local officials, they conducted two pilot studies and a field experiment in two provinces in China for 16 months, beginning in April 2017. The randomized control field experiment, from June to August 2018, involved 34 villages and 643 farmers in Zaoyang, Hubei province. The pesticide firm provided free samples to the farmers, hoping they would try the new technology and then adopt it by ordering it at market price.

For their experiment, the researchers created four treatment groups. Farmers in the control group learned about the product from self-experimentation and offline social interaction. Farmers in the second group received information from another source as well: the pesticide firm’s one-on-one telephone instruction. Farmers in the third and fourth groups had access to yet another source: social media. These farmers were invited to join online discussion groups on WeChat with other farmers from their own village. They could discuss any topic, including the new pesticide or agriculture in general. Their questions would be answered by other farmers or the firm (represented by the researchers).

The fourth group not only interacted with other farmers on social media, but also heard from social media influencers, who had been nominated by farmers themselves. These unpaid influencers, described as “eminent village personalities,” included village officers or party secretaries, village women’s directors, and directors of plant protection stations. They did not possess any expertise in the new product, but their positions and professional credentials commanded respect among farmers.

The researchers found that the social media platforms produced significantly higher adoption rates than the self-experimentation and offline interaction of the control group. This was true whether or not an influencer was used.

Seeing farmers in similar field conditions can improve new product 'match value' and encourage a trial," Kalwani said. "Farmers unsure how to get maximum benefit or efficacy out of the product can reach out to others and learn how to use the new technology for best outcomes."

The influencer's impact was also significant: a greater number of farmers were willing to try the product, resulting in even higher adoption rates.

"When a product is brand new to the world, encouraging trial behavior among prospective users is key," Kalwani noted. "During this stage, overcoming uncertainty about the new product's authenticity is paramount."

Traditional marketing with personalized one-on-one telephone support produced similar trial and adoption rates, but at a much higher cost. The return on investment (ROI) was 1.91.

Social media with influencers was the most cost-efficient method, with the highest ROI value (3.45), followed by social media alone (2.45). The researchers note, however, that having unpaid influencers may not be practical in other contexts.

On average, the marketing interventions produced a 30 percent increase in adoption rate, compared with the control group. This may increase productivity by 6 percent and reduce production costs of pesticides by 20 percent (both twice as large as for the control group).

Analyzing the types of messages shared in the discussion groups, the researchers found that the influencers were not only encouraging farmers, but also giving reports about their own trials, which helped build trust in the new technology, the supplier, and the trial program.

They also found that farmers in discussion groups with influencers were more willing to share their experiences with the new pesticide and discuss topics related to the trial program than their counterparts in discussion groups without influencers.

"We find that the presence of an influencer on the platform, relative to not having one, creates an online environment that fosters more product-relevant discussions among participants," the researchers write. "Those discussions on products then motivate learning about the new product."

# How Competition Affects Posting Activity, Engagement on Social Media

*by Melvin Durai*

Alex Morgan, Sydney Leroux and Ali Krieger are three of the most popular players in the National Women's Soccer League (NWSL). They not only compete on the soccer field, but also vie for attention on Twitter and other social media.

Each tweet from these players brings them significant attention from users, which in turn can be monetized with lucrative sponsorships and product endorsement contracts. But the tweets also steal attention from other players' accounts—and this effect depends both on a player's posting activity and on her soccer performance, according to a study co-authored by Federico Rossi, assistant professor of marketing in Krannert School of Management.

The study, believed to be the first to empirically investigate the role of competition on social media platforms, attributes a significant part of the daily social media activity to competitive pressure.

"In a world with no competition for attention, you would actually see significantly less content creation, about one-third less posts. And this would generate a negative impact on user engagement in social media platforms," said Rossi, who collaborated with Gaia Rubera of Bocconi University in Italy.

The study quantifies the effect of competition on content creation and user activity in social networks. It also shows how a revenue-sharing model involving all content creators is most effective at maximizing user engagement.

The researchers share their results in a paper titled "Measuring Competition for Attention in Social Media: NWSL Players on Twitter," forthcoming in *Marketing Science*.



Source:  
Federico Rossi

Rossi began following the NWSL during its inaugural season of 2013 and noticed how players were using Twitter to promote themselves and the league, just as actors, musicians and other entertainers do. With so many players tweeting, he wondered about the impact of competition on the number of tweets and attention they received.

For their study, he and Rubera used Twitter mentions to measure the attention given to the soccer players. They designed a demand-supply model in which the demand comes from Twitter users who decide whether to mention a player in their tweets and the supply comes from players who decide how many tweets to post in any given period. The players seek to maximize the attention they receive, with the assumption that more attention leads to more monetary opportunities.

The researchers assembled two datasets, one providing soccer statistics from the 2013 season and the other providing information on players' posting activity on Twitter and mentions they received.

They found that players receive attention from both their posting activity and their soccer performance. On average, an additional tweet increases a player's attention share by 19 percent; in comparison, a goal scored on the soccer field increases a player's attention by 20 percent.

Just as consumers make substitutions in a supermarket based on ingredients, the researchers found that Twitter users were more likely to substitute their attention among players with similar characteristics, such as team affiliation and physical attractiveness. To estimate the attractiveness of each player in their study, the researchers asked a random sample of online respondents to rate randomly selected photos of players.

"My interest here was to show that, similar to products on a supermarket shelf, players are chosen for their ingredients, and some of these ingredients are the reason why the user goes on Twitter and gives attention to these players," Rossi said.

While they did find significant substitution patterns based on attractiveness, the researchers found team affiliation to have a stronger effect. A tweet from goalkeeper Hope Solo had three times the effect on her Seattle Reign teammate Megan Rapinoe's share of attention compared to the average effect on other players.



To measure the impact of competition, the researchers simulated two scenarios, one in which players compete individually for user attention and another in which players collude. They found that the competitive scenario generates 50.3 percent more tweets than the non-competitive one. These additional tweets increase user activity on the platform by 7 percent.

“More people are writing and being engaged in the platform,” Rossi said. “The metric that I’m using is mentions, because they capture the time spent by users discussing a given player.”

Knowing that Twitter currently has a revenue-sharing model with traditional media outlets, the researchers wanted to explore how this model could be extended to social media influencers, such as NWSL players, to increase engagement.

Analyzing data from the 2013 season, they conducted three experiments, each with a different amount of money (\$200, \$300, \$500) distributed for each tweet. In the first model, Twitter pays only the most popular player, Alex Morgan, who had 1.2 million followers in 2013. In the second, the platform pays only Hope Solo, a player who tweeted less frequently. In the third, three of the most popular players, Morgan, Solo and Abby Wambach, shared the reward. In the fourth, all players shared the reward for tweets.

The researchers found that while the model where only Morgan is paid creates more growth in mentions, it also costs considerably more. For a growth of one percent in user mentions during the 2013 season, Twitter could have paid \$96,200 to Morgan or spent \$75,400 on all players.

“The platform would basically have to spend more incentives to engage Morgan and have her write more tweets,” Rossi said. “In addition, her tweets at some point would become less interesting, as opposed to, say, having tweets written by other players. Our model accounts for all that and tells us that involving all players is more efficient in terms of the outcome you get, compared to the input you give. If you involve all players, you get 20 percent more efficiency.”

This efficiency comes partly from the competitive pressure to tweet. “If one player starts talking, the others come back and do the same,” Rossi said. “You have a more efficient distribution of incentives by having everybody talk.”

The study suggests that social platforms can benefit from increasing competition among content creators such as athletes and entertainers.

Just as a grocery store displays several types of ketchup that a consumer can purchase, social platforms can suggest substitutes to a soccer fan. “When you see a user engaged with a player, make sure that the user knows about other players sharing similar characteristics,” Rossi said.

# Mentorship Gives a Boost to Startup Founders, but Only if They're Fast Learners

*By Melvin Durai*

Incubators, accelerators and other startup programs are designed to help entrepreneurs turn their ideas into successful ventures. What these programs offer varies considerably and may include financing, subsidized office space, discounted accounting and legal services, and access to specialized software. But what they almost always offer is mentorship of some sort.

Mentorship is an essential component of both public and private startup programs, as well as a major contribution of early-stage investors, yet little is known about the impact of mentorship on startup performance.

"Because it's very difficult to observe and measure, we still have a lot to learn about it," said Amir Sariri, assistant professor of strategic management in Krannert School of Management. "But we know, at least from decades of research, that providing business mentorship and advice is a critical extra-financial contribution of not only accelerators, but also early-stage investors."

Collaborating with Ajay Agrawal of University of Toronto's Rotman School of Management, Sariri conducted research to show that mentorship drives startup performance. It has a significant impact on the amount of capital raised and valuation of fledgling companies.



Source:  
Amir Sariri

Exploring an important aspect of mentorship—teaching entrepreneurs how to set priorities—the researchers find that mentorship provides a significant boost to the success of technology startups, but this effect is almost entirely concentrated among entrepreneurs that the authors term “high learners.”

Among the first to provide empirical evidence on the relationship between mentorship and startup performance, the researchers reveal their results in a paper entitled “Does Mentorship Drive Startup Performance? Yes, But Only for High Learners.”

They conducted their study using a novel panel of technology-based startups that participated in a nine-month program called Creative Destruction Lab (CDL). This program offers mentorship to pre-seed and seed-stage companies. They analyzed data from startups participating in six business schools across Canada and the United States.

Studying the relationship between the level of mentorship and observed performance three years later, they find that the probability of external funding for entrepreneurs with an average level of mentorship (23 hours) is 74 percent higher than for entrepreneurs who receive no mentorship. An extra hour of mentorship is associated with an 8 percent increase in the amount of capital raised. “The magnitude of these effects is economically quite meaningful,” Sariri said.

After determining a causal relationship between mentorship and startup performance, they explore an important way in which mentorship may impact performance: by teaching entrepreneurs the critical skill of prioritizing tasks. During the nine-month program at CDL, entrepreneurs set priorities for their companies before and after receiving feedback from mentors, a process that occurs multiple times over a series of eight-week sprints.

“That gives me the opportunity to look at whether entrepreneurs learn to prioritize business objectives over time, and from a group of highly accomplished, highly experienced ex-entrepreneurs and active investors,” Sariri said. “This nice empirical feature allows me to measure how fast novice entrepreneurs are picking up a critical business skill from people who have done it before.”

The researchers find that the propensity to learn is not uniform among founders. They divide their sample into high learners and low learners, based on whether entrepreneurs’ rate of learning over time is above or below the median.



“The large variation in entrepreneurs’ rate of learning is intriguing,” Sariri said. “Even more intriguing is that the high-learners do not appear to be necessarily endowed with superior judgment from the beginning—they are just as bad as low-learners at the start—but they improve much faster than others.”

The researchers find that almost all of the observed impact of mentorship on future performance comes from this group of high learners. Despite receiving the same amount of mentorship, low learners show almost no benefit from mentorship.

Performing additional analyses, the researchers find that the rate of learning itself is not correlated with mentorship.

“We look at whether the intensity of mentorship can bend the learning curve steeper but we just don’t find any evidence for that,” Sariri said. “Put differently, the ability to learn does not appear to change much over time.”

These results favor “nature” over “nurture” when it comes to the propensity to learn. Sariri notes, however, “more research needs to be done to understand the determinants of entrepreneurial learning. For example, it might be the case that early exposure to entrepreneurial activity—perhaps due to having entrepreneur parents—would lead to higher appreciation for and learning from feedback.”

An important implication of the study is that the benefits of mentorship depend largely on an entrepreneur’s willingness and capability to learn. Sariri, over the years, has come across stubborn entrepreneurs who are inclined to disregard feedback. Sometimes that stubbornness serves the entrepreneurs well, allowing them to be trailblazers. Other times, it leads to flat-out failure.

“The popular celebration of the stubborn entrepreneur who did not listen to naysayers and became radically successful misses, and even undermines, the importance of effectively learning from the business environment, especially from expert critique and feedback,” Sariri said.

Another implication is for policy makers. Specifically, policies that aim to increase successful entrepreneurship by attracting investors to regions may overlook the role of non-financial contributions of investors, such as the capacity to mentor inexperienced entrepreneurs.

# Wealth Effects - The Oft-Ignored but Critical Way that Monetary Policy Affects the Economy

*by Melvin Durai*

When inflation soars in America, as it has in recent months, the Federal Reserve typically responds by raising interest rates. This increases the cost of loans, encourages consumers to save more money, and slows the economy. Another way that monetary policy impacts the economy is through wealth effects, the revaluation of real and financial assets. When a consumer's home or stock portfolio appreciates, the consumer feels wealthier and is more likely to spend money. When asset values decline, the consumer cuts back on spending.



A new analytical model shows that wealth effects play a substantial role in the economy's response to monetary policy. The model, created by Dejanir H. Silva, assistant professor of finance in Krannert School of Management, and Nicolas Caramp, assistant professor of economics at UC Davis, attributes more than 80 percent of the initial response of aggregate consumption to wealth effects induced by time-varying risk and household debt.

"Our model shows how economic forces that have been to a great extent ignored up until now, in part due to technical limitations, are actually a central part of how monetary policy affects the economy," Silva said. "If this view is correct, this shows how it may be quite challenging for the Fed to slow down the economy and fight inflation without affecting financial markets or reducing valuations. Movements in asset prices are not an undesirable side effect, but a crucial component of how the Fed ultimately affects households and firms in the economy."

In a paper entitled "Monetary Policy and Wealth Effects: The Role of Risk and Heterogeneity," the researchers propose a framework that generates rich asset-pricing dynamics and heterogeneous portfolios while maintaining the simplicity of the textbook New Keynesian model.

Their model has two main ingredients: rare disasters and household debt. Rare disasters allow the researchers to capture both a precautionary savings motive and realistic risk premia.

Recent empirical research has shown that fluctuations in the compensation for holding risky assets, known as the asset's risk premium, are a more significant factor in asset revaluations than changes in the risk-free rate.

"This represents a challenge to the standard way we think about monetary policy, as the models normally used by central banks completely abstract from changes in risk premia and focus only on changes in future short rates—the opposite of what we see in the data," Silva said.

The researchers assume that the probability of a disaster, such as a financial crisis, pandemic or war, depends on the level of the nominal interest rate, which enables them to capture the time-varying component of risk premia in their baseline model.

"This assumption is part of our attempt to answer the question: why does the Fed affect financial markets so much?" Silva said. "We see that every day in the financial news. The Fed affects asset prices mainly through changes in risk premia, but the question is through which mechanism. We provide a mechanism in the context of a disaster model."

The researchers show that an increase in short-term interest rates disproportionately affect financial intermediaries, which makes the economy more vulnerable to crisis.

“As their balance sheet gets impaired, the remaining investors have to absorb more of the risk in the economy, which pushes the risk premium up,” Silva said. “This affects the price of long-term assets, by either increasing risk or reducing the risk-bearing capacity in the economy.”

Assuming an economy populated by two types of households, borrowers and savers, their model captures key features of heterogeneous-agents New Keynesian (HANK) models, such as precautionary savings and heterogeneous marginal propensities to consume, in a setting with positive private debt. Through a method that consists of perturbing the economy around a stationary equilibrium with positive aggregate risk, rather than the more common approach of approximating around a non-stochastic steady state, the model provides a complete analytical characterization of the channels involved in monetary policy transmission.

“One of the reasons why the risk-premium effect of monetary policy is often ignored is not because it is irrelevant, but because it is very challenging to incorporate such effects in macroeconomic models,” Silva said. “We offer a new method that is as easy to use as the standard model, while capturing the rich effects incorporated in more complicated methods.”

The model finds that time-varying risk accounts for more than 50 percent of the output response to monetary policy, private debt accounts for about 20 percent, and the interaction between the two accounts for 10 percent.

“Our findings suggest that, when we allow the Fed policy to affect long-term rates through changes in the risk premia, our understanding of how the Fed affects the economy changes substantially,” Silva said. “It turns out that the channel typically emphasized by monetary models is quantitatively very small.”

That channel is based on the idea that households respond to an increase in interest rates by consuming less in the present and more in the future. In contrast, the researchers find that the Fed affects the economy mainly through wealth effects.

“This new channel puts households’ balance sheets and the response of asset prices at the forefront of how Fed policy affects the economy,” Silva said.



# A New Algorithm for Clustering Categorical Data in High Dimensions, Even When Values Are Flipped or Missing

*by Melvin Durai*

You just finished watching Spike Lee's Vietnam War-related movie "Da 5 Bloods" on Netflix. The next time you visit Netflix, you see a group of recommended movies under the title "Because you watched Da 5 Bloods." Some of these movies, like "We Were Soldiers" and "The Forgotten Battle," have obvious similarities to "Da 5 Bloods," but others seem unrelated. Netflix uses an algorithm that groups movies based on various pieces of data, including genres, titles, themes, actors, viewing history, and viewer's ratings on movies. A "small" Netflix dataset, derived from a movie ratings database called MovieLens, contains 1,000,209 observed movie ratings (from 1 to 5) from 6,040 viewers on 3,706 movies. The missing rate is 95.53 percent, which may mean that the average viewer has rated fewer than one out of every 20 movies.

Recommendation systems such as Netflix's, operating on various platforms, are often based on clustering, an unsupervised learning technique that is used to group subjects so that the members of one group (or cluster) are more similar to each other than to those in other groups (or clusters). Among its many applications, clustering is used to sort consumers for target marketing, to filter spam out of mailboxes and to detect fake news on social media.

For continuous data, such as the length or weight of an object, many clustering algorithms have been developed, including the well-known K-means algorithm. But if the data are categorical, only a few algorithms have been proposed.

"One difficulty with categorical data is they are not numeric and the levels or values of different attributes in a dataset normally have different meanings," said Jen Tang, professor of quantitative methods in Krannert School of Management.



Categorical data can be either ordinal or nominal. Ordinal data follow a natural order, such as a scale of 1 to 5 for movie ratings or poor to excellent for credit ratings, while nominal data, such as gender and job type, have no order in their values.

Tang and his co-authors, Jiaming Xu, assistant professor in Duke University's Fuqua School of Business, and Zhiyi Tian, a recent PhD graduate from Krannert, propose a spectral method-based algorithm to cluster subjects (rows) with categorical attributes (columns) in a data matrix and provide its theoretical performance guarantees on clustering accuracy in high dimensions (having a large number of subjects and attributes).

The researchers demonstrate their algorithm in a paper entitled "Clustering High-dimensional Noisy Categorical Data." A revision of the paper was resubmitted to the *Journal of American Statistical Association* (JASA).

The researchers show how their algorithm can be applied to cases with missing and flipped categorical data in high dimensions. Flipped data can occur, for example, through recording errors or the reluctance of subjects to provide accurate values for attributes such as education level and job type.

"Only a few algorithms have been developed, but most of them are heuristic and none can handle the case we consider, for both types of categorical data, efficiently," Tang said. "Most importantly, there is no theoretical proof that these algorithms will find the true or underlying clustering structure."

To establish the performance guarantee of their algorithm, Tang and his co-authors extend a model proposed by Xu to one for general categorical data with an underlying row cluster structure. This cluster structure assumes that subjects in the same cluster share the same values on each attribute with cluster centers generated from a random mechanism.

Under this model and their proposed data encoding methods (the Equilateral and Semicircle encodings), the researchers show that it is sufficient to observe only a fraction of noisy data entries to recover the true clustering structure with high probability in high dimensions.

To demonstrate how their algorithm works in high dimensions, the researchers applied it to the MovieLens dataset. On a standard PC, in ten repeated runs of the algorithm, the average running time to generate a heatmap with a fairly clear clustering pattern was only 19 seconds.

The researchers also compared their algorithm, in finite samples, numerically with four other well-known algorithms (with some modifications to allow missing values) on both clustering accuracy and computational efficiency. They used several synthetic (simulated) datasets and six other well-known real datasets in the comparison.

“For clustering accuracy, our algorithm outperforms all other algorithms, or is at least as good, on all datasets,” Tang said. “As to the computational efficiency, our algorithm has the lowest running time in finite samples and, theoretically, is the least computationally complex in high dimensions.”

# Will People Exercise More to Support a Charity? New Research Provides Some Answers

*by Melvin Durai*

For millions of people around the world, mobile health apps have become essential tools for maintaining good health. More than 350,000 mHealth apps have been released, many of them designed to encourage users to improve their health through exercise.

Some of these apps don't just keep track of users' daily exercise, they also offer various incentives. Users may be enticed with monetary incentives such as cash, gift cards, reward points and Health Savings Account (HSA) deposits. Users may also be offered social incentives, allowing them to compete for rankings and bragging rights among their friends.

Another kind of incentive, prosocial, allows users to support charities through their fitness activities. The Charity Miles app, for example, allows users to channel money from a corporate sponsorship pool to a selected charity.

Although several apps incorporate prosocial incentives, little is known about their effectiveness. Is helping a charity enough to inspire people to walk more steps each day?



A new study co-authored by Yuan Yuan, assistant professor of management information systems in Krannert School of Management, indicates that prosocial incentives do indeed make a difference, particularly for users who've had experience supporting charities. For this group, receiving a message encouraging them to donate their steps and viewing a donation page increases their likelihood of following through the next day by at least 20 percent.

The study, conducted through a fitness tracking app within a large social media platform in Asia, allowed the researchers to compare the prosocial and social incentives.

“On the same platform, we know that the social incentive is effective, and we compare it with prosocial incentive and see that the latter incentive is as powerful or even more powerful,” Yuan said.

He and his co-authors, Christos Nicolaides of University of Cyprus, Alex Pentland of MIT’s Media Lab, and Dean Eckles of MIT’s Sloan School of Management, combined an online field experiment consisting of about 40 million users on the fitness tracking program with a follow-up observational analysis, sharing their results in a paper entitled “Promoting Physical Activity through Prosocial Incentives on Mobile Platforms.”

The program records each user’s daily step counts and sends them a message every night displaying their step counts, as well as their rank among their online friends. It also displays a line of text announcing the champion for the day. The user can click on the message and visit the step ranking page, which shows a list of the top achievers and allows users to “like” the step counts of their friends.

The program also has a “step donation” feature that allows users who achieve a daily goal of 10,000 steps to direct the equivalent of about \$1 to a charity. The money comes from a third party, typically a company attempting to show its corporate social responsibility. A daily quota—the maximum amount available for donations—is usually reached every evening.

Employing an encouragement design for their experiment, conducted over 17 days, the researchers created five treatment groups, as well as a control group, each consisting of more than 6 million users. Collaborating with the platform, they altered the text that usually announces the daily champion.

Users in the first group received a text about the step donation feature, such as “You can donate your steps.” This text was designed to examine the effect of the prosocial incentive, without implying any benefits.

The second and third groups received similar but distinct texts: “You can donate your steps to mark your achievement” and “You can donate your steps to help charities.” These texts were designed to distinguish between users who help charities out of pure altruism and those who engage in warm glow giving. Warm glow giving is a phenomenon in which users seek to gain the joy of helping others rather than making an actual impact.



The fourth group received a reminder that emphasized the social incentive: “Check your step count ranking among your friends.” The fifth group received a reminder designed to help the researchers eliminate the “novelty effect” of their encouragement design: “Keep on it tomorrow.” The control group received the normal or default text announcing the champion for the day.

The researchers found that the first group were 2.5 times more likely to engage in step donation than those who received the default text, announcing the champion. However, the texts received by the second and third groups were less effective, perhaps because each text targeted only one type of motivation (pure altruism or warm glow).

Employing an instrumental variable design, the researchers conducted further analyses and found that viewing the step donation page increased the likelihood of a user exceeding 10,000 steps the next day by at least 10 percent. For those who had participated in step donation before, this probability was at least 20 percent.

For their observational analysis, the researchers focused on users who had not participated in step donation for a long time and found that the effect of viewing the step donation page was as strong as the effect of viewing the ranking page in getting them to take more steps the next day. They also found that the warm glow effect drives some users to engage in step donation but does not get them to increase their step counts. Yuan cautioned, however, that without doing surveys or interviews, motives can’t be conclusively determined.

He also noted that, unlike Charity Miles, the Asia-based program does not allow users to select the charity they’re supporting.

“That may explain why there are so many users who are driven by warm glow giving—because the charity is not one that they really care about,” he said.

For anyone designing a fitness app or program, the study shows the importance of incorporating a prosocial component, Yuan said. He also suggests that the apps should take into account different motives of engaging in charitable behavior.

“They can also make the design a little bit better to motivate the users who are driven by warm glow giving to get engaged,” he said. “If their goal is for user retention, warm glow giving is another element that can be incorporated in their design.”



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