

SOBIE 2023 Proceedings



**Society of
Business, Industry, and Economics**

23rd Annual Academic Conference

**Sandestin Golf and Beach Resort
April 12-14, 2023
Destin, Florida**

SOBIE 2023



Registration – Bayview Foyer

April 12	April 13	April 14
7:00 – 11:00 AM	7:00 – 11:00 AM	7:00 – 11:00 AM

Wednesday, April 12

	Terrace 1	Terrace 2	Terrace 3
7:30 – 8:45	1- Pedagogy	2- Pedagogy	3-General Bus
9:00 – 10:15	4- Economics	5-Round Table	6-Student Research
10:30 – 11:45	7- Leadership	8- Round Table	9- Pedagogy
12:00 -1:15	10- Open	11- Open	12- Open

Thursday, April 13

	Terrace 1	Terrace 2	Terrace 3
7:30 – 8:45	Breakfast (Bayview Room and Terrace)		
9:00 – 10:15	13- Round Table	14- Student Research	15- Pedagogy
10:30 – 11:45	16- Pedagogy	17- Student Research	18- Economics
12:00 – 1:15	19- Finance	20-Student Research	21- Political Econ
1:30 – 2:45	22- Sports	23- Student Research	24- Marketing
3:00 – 4:15	25- Economics	26- Student Research	27- Pedagogy
4:30 – 5:45	28- Open	29- General Bus	30- Student Research

Friday, April 14

	Terrace 1	Terrace 2	Terrace 3
7:30 – 8:45	31-Pedagogy	32- Marketing	33- General Bus
9:00 – 10:15	34- Economics	35- Finance	36- General Bus
10:30 – 11:45	37- Economics	38- Finance	39- Student Research
12:00 – 1:15	40- Labor Issues	41- Accounting	42- Student Research

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Examining Economic Impact and Effects of Guntersville Lake in North Alabama

Benjamin B. Boozer, Jr.
Jennifer Green
Camaron Harry

ABSTRACT

The purpose of this research is to examine the economic impact and effects associated with Guntersville Lake in Alabama. The analysis considers reported spending patterns from survey data of lake users and employs IMPLAN (Impact Analysis for Planning) to develop output measurements of input variables. Economic impact and effects are derived for Marshall and Jackson counties in Alabama, with a regional analysis area encompassing Blount, Cullman, DeKalb, Madison, and Morgan counties in that state.

Economic activity is the basis for spending that derives economic impact and its corresponding types of impacts – direct, indirect, and induced – in generating net output from selected inputs. Direct effects are derived from spending associated initially and directly with the event, and indirect effects are secondary effects emanating from economic activity that results from direct effects. Induced effects represent increasing payrolls from corresponding employment and represent the potential for increased spending according to consumption propensities. Total economic effect is tallied and expressed as gross output. From economic impact and economic effect, economic contributions are produced as a wider effect with benefits across a larger scope of society.

Aggregate demand and economic activity are generated through an immediate impact and one or more subsequent impacts. Bass tournaments and related activities are analyzed and summed with residents' contributions in measuring output. An economic impact model utilizes at what point these effects occur in quantifying economic activity. Using multiplier analysis, the results of this study are conveyed through three effects: direct; indirect; and induced. Findings conclude that economic impact for the region analyzed is \$23.87 million and may be delineated as \$17.46 million from tournament activities and \$6.41 million from residents' contributions.

In addition to economic impact from fishing and visitors and residents' contributions, the report considers the following areas in compiling total economic activity through economic impact and economic effects and lists the associated economic activity of each: fiscal impact base case; economic effects of lakefront property valuation; county level recreational household spending; boat sales; economic effects from sector payrolls; and dam operations. The total economic effect produced as a summation of each variable is \$1.20 billion for Jackson and Marshall counties and \$1.44 billion for the region area.

The study may be used in developing economic proposals for identifying demand for this type of recreation and exploring service gaps where those demands are not met. The possibility of meeting the recreational needs of citizenry in the area through synergies provided with similar outdoor recreation that could be developed or enhanced by the existence of Guntersville Lake offers additional practical and research potential.

Examining the effects of schedule flexibility, remote work, support, pay, and stress on job acceptance and perceived fulfillment: A policy capturing approach

D. Scott Kiker
Judith Scully Callahan
Valeria Alterman
Mary Brtek Kiker

Abstract

Recent events including the Coronavirus pandemic have led organizations to adopt strategies allowing for increased employee flexibility in scheduling as well as adopting technologies that allow employees to complete their job duties from a remote location outside of the office. In this research, we examine the effects of these two factors, schedule flexibility and remote work, as well as more traditional variables such as pay, support, and stress on both likelihood of job acceptance and perceived job fulfillment. Employing a policy capturing approach, we asked research participants to read a series of organizational profiles that varied in reported level of schedule flexibility, stress, pay, support, and degree of remote work. Our results reveal participants used information on multiple variables when determining both their choice of jobs and their subsequent perceived fulfillment from the job. Further, we also explored the moderating effects of various demographic characteristics on the strength of these relationships.

Engaging Capstone Seniors Starting Day One – An Experiential Exercise

Dan Mertens

Robert Lloyd

Abstract

This paper introduces the creation of an experiential exercise that exposes students in a capstone business strategy course to the concept of competitive analysis. The exercise combines the powerful benefits of intrigue and humor in a puzzle-based exercise designed to enhance the learning opportunities for students to grasp the fundamentals of this core concept within strategic management education. By connecting experiential learning with the competitive analysis fundamentals on the first day of class, students will be better engaged in the classroom. The goal of this effort is to validate the exercise with a focus of increasing first-day engagement of undergraduate business seniors from a variety of majors.

Feedback from this conference will be incorporated into future research to utilize a pre-post design for empirically testing for differences in student engagement following the deployment of this exercise, resulting in quantitatively supporting that this experiential exercise significantly heightens student engagement in the subject matter.

Keywords: experiential learning, student engagement, humor, first day of class, pedagogy

Sustainability in the Electric Vehicle Supply Chain

**Angela Tidwell
Cartreal Davidson**

The first batches of EV batteries are hitting their retirement age and around 3 million utilized battery packs will be emerging from EV yearly which address around 108 GWh. This issue will influence the subsequent life investigations, since the favored second life techniques rely upon the particular qualities of the EV battery. This is additionally muddled by varieties of the corruption levels from the first life use, resulting in batteries arriving at end of life (EOL) with various maturing conditions. Also, the battery state at EOL should be matched to the most reasonable as well as productive second life end use application considering obligation cycle, size prerequisites, market size and income potential. A sea change is underway, with more nations and localities announcing their intentions to phase out their use of fossil fuel engines for a more eco-friendly solution of battery operating automobiles. The change drives a range of obstacles to those nations. Among the many unanswered questions is what will happen to all of the old batteries that are now available on the market? This paper explores the potential second life applications for electric vehicle batteries that will maximize its value while also preventing the further depletion of minerals such as cobalt, lithium, and nickel, including Energy Storage Systems (ESSs) solutions as an application to utilize EV used batteries.

Inventory as a Lever for Working Capital in the Steel Supply Chain

Angela Tidwell

Deja Lindsey

The steel industry has seen supply chain and inventory challenges during and after the pandemic. This case study explores the relationship between inventory service levels and working capital for a global steel producer. ACME Steel currently has over 8,000 finished stock materials, a \$156 million dollar working capital investment. The company is consistently over inventory working capital budget level. The business does not have an operating process that manages service level such that the budget is not exceeded. The working capital level flexes with the market dynamics and the supply demand variability. Given a hard ceiling on the working capital, this research will analyze the impact that inventory service levels have on working capital, and provide a process for managing such levels to maintain working capital budgets.

Sexual & Reproductive Health PHCI: Consumer Behavior in the Digital Space

Terry Stringer Damron
Joe Cangelosi
Kristen Brewer
Lauren Pate
Rebekah White

Abstract

A centerpiece of teen angst films and a hot topic in political debate, sexual and reproductive health education is inconsistent, imbalanced, unreliable, or altogether unavailable as part of the educational curriculum in the United States (Hall, Sales, Komro, & Santelli, 2016). For consumers of all ages, access to sexual and reproductive health (S&RH) preventive health care information (PHCI) plays a crucial role in family planning and prevention of undesired outcomes (unwanted pregnancies, sexually transmitted infections (STIs), etc.). In addition to potential societal benefits, S&RH PHCI stands to create economic value in the U.S., where STIs cost the healthcare system billions of dollars each year (Centers for Disease Control, 2021).

The purpose of this project is to gain insights concerning those who report they are likely to share S&RH PHCI on social media and networks. Specifically, the authors sought to determine the demographic characteristics, perceived level of subject expertise, source selection criteria, and social media and network platform preferences of those consumers who said they are likely to share S&RH PHCI. This research will allow health organizations and experts to understand online consumer behavior pertaining to S&RH PHCI and, accordingly, develop more efficient and effective marketing communication strategies.

Theoretical Perspectives for Entrepreneurial Education

Eren Ozgen

Abstract

Entrepreneurial education research is growing in importance as it creates social, cultural, and economic value and facilitates the transformation of society. Based on recent literature review the paper provides an overview of key factors that play a role in entrepreneurship education and highlights the research gap in the field. The paper summarizes current research findings, such as the changing nature of entrepreneurship education, the importance of technological revolution, refinement of methodologies, variety of players and contexts addressing the lack of theorization in the field and develops further questions based on a multi theoretical perspective. The paper suggests future research agenda grounded on a multi-disciplinary and multi theoretical framework such as Evolutionary Economics, Social Network Theory, Social Cognitive Theory, Online Collaborative Learning Theory, Cognitive Theory of Multimedia Learning, Institutional Theory and Multiple Agency Theory.

Can Religiosity, Coupled with Other Demographic Variables, Help Predict Participation Levels in a Civic Organization

Mark Grimes
Judy Orton Grissett

Civic organizations provide many valuable services to the communities in which they are located, but they are only as effective as the quantity and quality of the time that their members are willing to invest. Because of this, finding the right members who will be actively engaged is critical. This study hypothesizes that there is a connection between how religious one is, and how that religiosity is expressed through life activities, and the degree of participation that a member will engage, with the supposition that more religious people will have higher participation rates. Other variables, including religious denomination, gender, and race, were also explored in a survey of Georgia Kiwanis clubs to if there were predictors related to any of those items. Religiosity was found to be a positive predictor of higher involvement in meeting attendance and project participation, and there was a slight statistically significant relationship between religious denomination and meeting attendance. Other demographic variables did not show significant results with this sample.

Testing Integrity versus Student Privacy: Academia's Ongoing Battle for Quality Online Assessments

DeShannon McDonald
O. Guy Posey

ABSTRACT

Universities are faced with an ever-growing challenge of ensuring academic honesty in both face-to-face and online learning while providing students with flexible course options and assessment methods. According to [bestcolleges.com](https://www.bestcolleges.com), 75% of undergraduate students have taken at least one online course. While, according to the International Center for Academic Integrity (ICAI), “more than 60 percent of university students freely admit to cheating in some form” (academicintegrity.org, 2023). To help ensure academic honesty in online courses, universities have increasingly turned to proctoring tools to authenticate student identity and help monitor the online remote testing environment. These proctoring tools may use biometric and webcam technology allowing universities to record, capture and store images of students' likeness, biometric data, personal information and private surroundings. In 2020, due to COVID-19, many universities changed to fully online course instruction regardless of student preferences. These changes left students little or no options other than to accept the changes or drop the classes and possible delay graduation.

This paper offers practical considerations for colleges and universities created by legal challenges to intrusive proctoring tools when used to scan and store images of students' biometric data and private locations during remote testing. The authors specifically look at the 2022 *Ogletree v. Cleveland State University* (CSU) case where the court determined that CSU conducted an unreasonable search when it required students to scan their private locations in order to complete an online exam using AI proctoring tools. The court weighed student Fourth Amendment rights verses the university's need to protect academic integrity.

Faculty-Industry Collaborations Focused on the Engagement and Impact Practices of Interest to Accrediting Agencies

Jamye Long
Cooper Johnson

Abstract

Faculty engage in service activities that can be parlayed into further bragging rights and benefits for universities with regards to accreditation. This presentation focuses on a collaboration between two professors at The University of Tennessee at Martin and Go Cloud Careers. Together, they work to bridge the educational gap for degree seeking students in their business programs and the practitioners in the technology fields specialized by Go Cloud Careers. This two-way street of educating students and professionals is an example of a successful endeavor that showcases faculty engagement and impact practices, which is a growing interest in accrediting agencies, such as AACSB.

The Impact of the Russia-Ukraine War on Eastern European Stock Markets

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Abstract

We investigate the causal relationships and extreme return co-movements between the Russian stock market and adjacent Eastern European (EE) stock markets before and after the recent Russia-Ukraine war. Since the EE stock markets are regarded as a group of emerging markets in the same region for the purpose of investment, we are motivated to identify any change in their relationships after the war. This would be critical in terms of stock portfolio diversification. We find that the war has an asymmetric impact on the Bulgarian stock market and the other EE stock markets. Our study is expected to provide a new insight to stock market participants.

Fiscal Policy, Business Cycles, and Economic Development

Yuexing Lan

I. Introduction

The literature of China's reform is large, but few papers examine the impact of fiscal policy on economic growth in China. Zhang and Zou [1998] examine how the allocation of fiscal resources between the central and local government has affected economic growth since reforms began in the late 1970s. Surprisingly they find that growth fell following the decentralization of government spending. However, some studies (Ma [1997], Lin and Liu [2000]) reach opposite conclusions. They find that fiscal decentralization has made a positive contribution to growth.

The literature of fiscal policy indicates that the fiscal divergence could affect the business cycles.

Levinson [1998] studies U.S. states and finds that constraints on fiscal policy lead to more volatile business cycles. Darvas et al. [2005] examine 21 OECD countries and find that fiscal convergence between two countries leads to more synchronized business cycles. Furceri[2009] investigate 11 EMU and 21 OECD countries and find that countries with similar fiscal positions tend to have lower business cycles volatility.

The literature of irreversible investment shows that business cycles volatility reduced the economic growth. The results from Bernanke [1983], Kneller and Young [2001], and Blackburn and Varvarigos [2005] show the volatility and uncertainty reduce capital accumulation and the relationship between business cycles volatility and growth is negative.

What might be the effect of fiscal divergence on economic growth in China? This paper wants to investigate this issue.

We follow the Darvas et al. [2007] methodology but apply them to China.

2. Methodology and Data

2.1 Econometric Specification

In this paper, we are focus on investigating the empirical linkages between differences in fiscal

policy and economic growth in China.

First step is to show effect of fiscal policy on the business cycle volatility and Lan [2010] shows a positive and statistically significant relationship between the fiscal divergence and business cycle volatility across China (see Lan[2010] for details) . Then we examine the linkages between differences in fiscal policy and economic growth in China through the business cycle volatility.

The empirical analysis relies on two key variables: fiscal divergence and business cycle volatility. We discuss each in turn. Following Darvas et al. [2007], we measure fiscal divergence between province i and province j during sample period τ as differences in budgetary positions of the two provinces:

$$FiscalDiverge_{ij\tau} \equiv 1/\tau * \sum (|Budg_{it} - Budg_{jt}|) \quad (1)$$

where $Budg_{it}$ is the provincial nominal government budget surplus of province i at time t , measured as a percentage of nominal GSP. Next, we calculate the fiscal divergence for each province. Following Furceri [2009], we take the average of $FiscalDiverge_{ij\tau}$ over a set of j provinces (with $j = 1 \dots = n-i$):

$$FiscalDiverge_{i\tau} \equiv \sum_j FiscalDiverge_{ij\tau} \quad (2)$$

$FiscalDiverge_{ij\tau}$ denotes the average (over sample period τ) absolute difference in the government budget position between province i and province j . A larger value means a higher average divergence between the fiscal positions of the two provinces. Similarly, a larger value of $FiscalDiverge_{i\tau}$ means that province i has a more dissimilar fiscal position than the rest of the country.

The second key variable is the volatility of business cycle. We use (the natural logarithm of) real GSP to measure the real economic activity. We then de-trend the variables so as to unveil business cycle fluctuations. Given the potential sensitivity of results to the particular type of de-trending procedure and the lack of consensus about optimal de-trending techniques, we employ three de-trending techniques: first difference, the Hodrick-Prescott (“HP”) filter (with smoothness parameter equal to 100), and the Hodrick-Prescott (“HP”) filter (with smoothness parameter equal to 6.25) (see Frankel and Rose [1997a, 1997b, and 1998], Darvas et al. [2007]). After de-trending, the volatilities of business cycles are obtained for every

province as the standard deviation of the province's cyclical component over the sample period ($\sigma_{i\tau}$).

Our simplest empirical specification follows that of Frankel and Rose [1998] which focus on the endogenous business cycle synchronization with respect to trade. This econometric model is also used by Darvas et al. [2007]. The benchmark regression takes this simple form:

$$\sigma_{i\tau} = \alpha_{\tau} + \beta \text{FiscalDiverge}_{i\tau} + \varepsilon_{i\tau} \quad (3)$$

Where $\sigma_{i\tau}$ and $\text{FiscalDiverge}_{i\tau}$ denote the business cycle volatility and fiscal divergence province i over sample period τ .

The literature of irreversible investment shows that macroeconomic volatility is negatively associated with growth. To examine the effect of fiscal divergence on economic growth in China, we follow Furceri [2009] and consider the following equation:

$$g_{i\tau} = \theta + \delta \sigma_{i\tau} + \gamma X_g + \zeta_{i\tau} \quad (5)$$

Where $g_{i\tau}$ and $\sigma_{i\tau}$ denote our measures of real GDP growth rate and the business cycle volatility for province i over sample period τ . X_g is a set of control variables. These variables are: the initial log of real GDP per capita (y_0) and the average growth rate of the population (n). We measure y_0 as the log of real GDP per capita at the beginning of sample period and n as the average growth rate of the population over sample period τ .

2.2 Data

We consider 27 of 31 Chinese provinces. We exclude Xizhang (Tibet), Chongqing, Sichuan, and Hainan provinces due to lack of data¹. Annual data from 1980 to 2010 comes from The Bureau of National Statistics of China and can be obtained at www.chinadataonline.org.

3. Empirical Results

¹ In 1988, Hainan was removed from Guangdong and became a separate province. Chongqing City was formerly part of Sichuan until 1997.

We first examine the effect of fiscal policy on the business cycles volatility across china. Table 1 reports coefficient estimates of β . The first rows present the benchmark estimates and the second rows consider a slightly different measure of fiscal divergence. Three ways of measuring business cycle volatility are arranged in columns in all tables.

First, let's look at table 1. The first row in this table presents the benchmark results. All coefficients of β are positive and significantly different from zero at the one percent level. These results show that the relation between business cycles volatility and fiscal divergence is positive and significant.

Row 2 considers a slightly different measure of fiscal divergence. Instead of using the average of the absolute value, it uses the absolute value of the average.² The estimated coefficients are positive and statistically significant at one percent level again.

Table 1

Estimates of β

Row		GDP, Differenced	GDP, HP- Filtered	GDP, HP- Filtered (6.25)
		0.0039***	0.0041***	0.0022***
1	Benchmark	(.0004)	(.0004)	(.0002)
		0.0038***	0.0039***	0.0021***
2	FiscalDV- Variant	(.0005)	(.0004)	(.0002)

Standard errors are given in parentheses. Coefficients significantly different from zero at 0.10, 0.05, and 0.01 level marked with one, two, and three asterisk(s). Intercepts suppressed to ease presentation. FiscalDV-Variant, which stands for fiscal divergence variant, is absolute value of average of differential (not average of absolute value of differential).

In Table 2, we provide the results of coefficient estimates of δ . All coefficients of are positive but not significantly different from zero. All coefficients of δ are also negative and significantly different from zero. These results imply that the business cycle volatility induced by the differences in fiscal policies has

² The two measures would differ in cases where one province does not always have a higher budget surplus than another. If provinces i and j traded places within the decade as to which one had the greater budget surplus to GDP ratio, then taking the average of the absolute values would result in a greater measure than would taking the absolute value of the average.

no effect on the economic growth.

Table 2

Estimates of δ

Row		GDP, Differenced	GDP, HP- Filtered	GDP, HP- Filtered(6.25)
		0.47	0.37	0.45
1	OLS	(.18)	(.19)	(.30)

Standard errors are given in parentheses. Coefficients significantly different from zero at 0.10, 0.05, and 0.01 level marked with one, two, and three asterisk(s). Intercepts suppressed to ease presentation.

4. Conclusion

The goal of this study is to investigate the empirical linkages between differences in fiscal policy and economic growth in China. The results suggest that the business cycle volatility induced by the differences in fiscal policies has no negative effect on the economic growth. Our results do not support the findings in the literature.

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Short and long run impacts of fiscal Spending on economic growth: an ARDL approach

James Francisco
Yuexing Lan

1. Introduction:

In this paper we want to examine the empirical linkages between government expenditures and Economic growth. More precisely, we evaluate the effect of the government spending on the Gross Domestic Product (GDP).

The study of government spending has been heavily researched, and some studies focus on the short run effect on economic growth. The findings are mixed.

For example, the results from Hsieh and Lai [1994] show no conclusive evidence that government spending can increase output per capita. But others find significantly positive effects of government spending on output (Blanchard and Perotti [2002], Auerbach and Gorodnichenko [2012], and Atems [2019]).

A few papers investigate this issue in the long run and the results are also mixed. Barro [1990] shows a negative relationship between government spending and economic growth in the long-run. But Aschauer [1989] finds that government spending has a positive effect on economic growth in the long-run and the results from Blanchard and Perotti [2002] indicates there is no correlation between government spending and economic growth in the long-run.

In this paper, we follow Michieka, N., and Gearhart, R. (2019) by using ARDL to investigate the short- and long-run relationships There are advantages of ARDL.

2. Methodology

A. Economic Theory

What might be the effect of government expenditure on economic growth? There are two

major macro effects of government spending: the multiplier effect and the crowding out effect.

The government spending will increase the aggregate demand (AD). The Multiplier effect implies that the increase in the AD is greater than the government spending. On the other hand, the crowding out effect suggests that the economy grows by less than government spending.

So, from a theoretical viewpoint then, the matter is ambiguous. If the multiplier effect dominates the crowding-out effect, then government spending will contribute higher economic growth. If the crowding out effect dominates the multiplier effect, then government spending and economic growth may be negatively correlated. Therefore, the question is ultimately empirical.

B. Data

This study uses annual data from 1980 to 2021 for US on GDP and its components: consumption, investment, and government spending are collected from U.S. Bureau of Economic Analysis (www.bea.gov). All data are presented in real terms.

C. Model

Our ARDL model (p, q, r) is specified as:

$$GDP_t = \alpha + \sum_{j=1}^p \beta_j GDP_{t-j} + \sum_{i=0}^q \vartheta_i GOV_{t-i} + \sum_{n=0}^r \delta_n INV_{t-n} + \epsilon_t$$

ϵ_t is the error term. GDP is Gross Domestic Product in the U.S., GOV is US government spending, and INV is the private investment.

3. Empirical results and main findings

Before estimating the model, we conduct routine diagnostic unit root tests. We test stationarity of our variables by using Augmented Dickey-Fuller (ADF) AND Dickey-Fuller GLS (DF) methods. Table 1 reports all unit root test results.

Table 1
Unit root test

Variables	ADF	DF
lnGDP	-1.948	0.7715
FDlnGDP	-5.1845***	-5.2306***
LnGOV	-2.5343	-0.5492
FDLnGOV	-3.1184**	-3.125***
LnINV	-0.9849	0.489
FDLnINV	-5.576***	-5.2358***
LnCONSU	-1.9955	-0.0096
FDLnCONSU	-4.8029***	-4.7712***

Note: The critical values for the ADF statistics are: -2.61 (10%), -2.93 (5%) and -3.6 (1%).

The critical values for the DF statistics are: -1.61 (10%), -1.95 (5%) and -2.62 (1%).

*** Denotes significance at 1%, ** Denotes significance at 5%, and * Denotes significance at 10%

We cannot reject the null of a unit root for the log in all variables at conventional test size.

However, we reject the null hypothesis for the first difference of the log in all variables at conventional test sizes. Given these results, we find the first differences for all to be stationary.

Table 2:
F-Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.681719	10%	2.17	3.19
k	2	5%	2.72	3.83
		2.5%	3.22	4.5
		1%	3.88	5.3

Table 2 shows that the F-statistic is 4.6817, and it less than 1% critical value but greater than 2.5% critical value from the upper bond. Accordingly, we can reject the null hypothesis of “no long-run relationship between dependent variable and independent variables.

Table 3 reports the long-run coefficient.

Table 3:
Long-run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGOV	0.914309	0.062041	14.73722	0.0000
LNINV	0.302896	0.061265	4.944017	0.0000

As the bonds test results indicate that is a long run relationship between economic growth and government spending. the long run coefficient of government spending suggests that a 10% change in government spending will result in a long-run change of 9.14% in GDP

Table 4:
Short-run Coefficients

Variable	Coeff.	Std. Error	t-Statistic	Prob.
LNGDP (-1)	0.295751	0.117021	2.527339	0.0281
LNGDP (-2)	0.233698	0.059212	3.946811	0.0023
LNGOV	0.332885	0.073607	4.522465	0.0009
LNGOV (-1)	-0.334689	0.107201	-3.122077	0.0097
LNGOV (-2)	0.303299	0.073049	4.152022	0.0016
LNINV	0.264466	0.011453	23.09133	0.0000
C	0.518349	0.133808	3.873840	0.0026

Now we turn to our findings on the short-run coefficient. From Table 4, one can see that the coefficient of log government spending is 0.33 and is statistically significant at 1%. The short-run coefficient of government spending suggests that a 10% change in government spending will result in a long-run change of 3.3% in GDP

Conclusions

We investigate the correlation between fiscal spending and economic outputs in US in both short-run and long-run by using ARDL model and our results show that there is a statistically significant positive correlation in both short-run and long-run.

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INTRODUCTION

In recent years, cybercriminals have stolen personally identifiable information (PII) and used those facts to spoof the victim in order to perpetrate a crime for their financial gain (Singleton, 2014). According to one source, one-fourth of all fraud and identity theft reports in 2023 were identify thefts, a total of 1.4 million reports (NCITP, 2023). According to another source, the following was true 2019-2022:

- Identify scams were the most commonly reported scam in the U.S. in 2021
- Government benefits fraud is a leading type of identity theft
- 87% of consumers have left personal information exposed online
- Identity theft now accounts for 30% of all Federal Trade Commission reports

Even the government passed an act to protect PII: US Health Insurance Portability and Accountability Act (HIPAA) (Mohammed, 2014). Having sound privacy controls is a must for many organizations today.

However, privacy means different things to different people. The meaning varies based on several factors, many of which are personal. Then add the fact government agencies are creating laws and regulations on what is considered an appropriate meaning to address them. It can be easy to misapply privacy controls or a privacy program out of an inappropriate understanding and definition of privacy. This article will try to supply information to assist in making an effectual definition of privacy and a resulting privacy framework suitable to defend against the aforementioned cyber threats.

DEFINING PRIVACY

Security, confidentiality, and privacy are closely related but are not the same things. A common misunderstanding is to assume these three are the same thing. Security generally addresses keeping something free from danger or threat (dictionary.com/Merriam-Webster definitions). It means both safety and the measures taken to be safe. Security plays a big role in information systems and technologies and is key to certifications like CISM or CISSP. Confidentiality is keeping sensitive information from unauthorized access or use and applies to a variety of types of information, which may include personal private information (AICPA, 2018 - ¶1.25). Confidentiality is one of the Trust Services Principles for SOC 2. Privacy applies to a specific type of information (i.e., personal) and is the fifth category in AICPA's TSP (AICPA, 2018 - ¶1.25). Privacy is generally related to personal information such as personally identifiable information (PII) that is the target for cybercriminals conducting identity theft, for example. Privacy has obviously grown as an area that most private businesses and public business-like entities must address in its governance, risk, and controls (GRC) responsibilities.

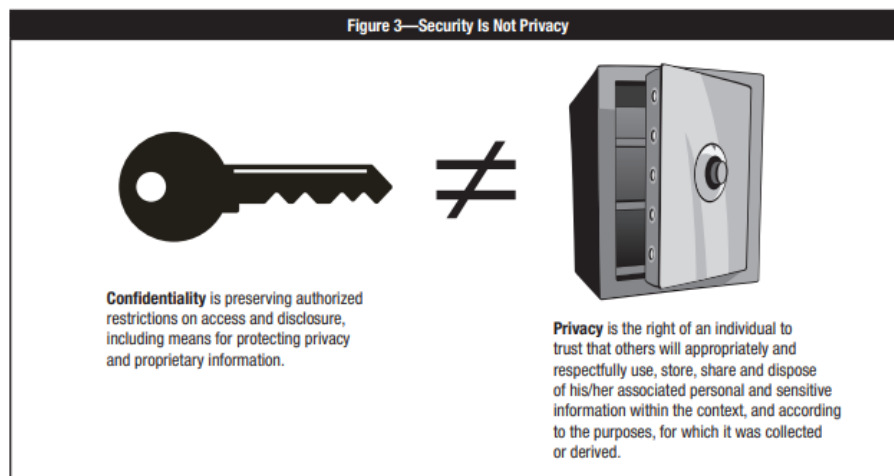


FIGURE 1: *Security Is Not Privacy.* ISACA, “*Privacy Principles and Program Management Guide*”, p. 13.

To develop an effective privacy program, one needs to first scope the topic for an appropriate and specific definition. The precision of the definition is the cornerstone of the program and a critical success factor in developing an effective privacy program. One cannot conduct an effective risk assessment or develop effective controls unless one has adequately scoped the topic or landscape. In Figure 1, a distinction was made between Confidentiality and Privacy. It could be extended to distinguish between Security and Privacy.

SECURITY

The security profession developed the security “triad” years ago and it is still being used today as a framework for defining security. The three components of security are Confidentiality, Integrity and Availability (See CISM Domain 1 below). Security is a higher level of consideration in protecting information systems, information technology, and digital assets. It would also cover infrastructure (hardware), data, and applications (software) and well as the other components that make up the information system (e.g., firewalls, routers, gateways, network wiring, etc.). But it also can be viewed as these three aspects of protecting information systems and data: confidentiality, integrity, and availability.

Integrity is protecting data to ensure it is correct, unaltered, and therefore reliable. The unaltered aspect relates to unauthorized access via applications or “back-door, systems access. It also relates to errors that are created through software bugs, operator error, etc. Thus, integrity would include monitoring authorized access but also monitoring software development and some kind of safety net of checking for accuracy and integrity after the events that created them. Availability is about timely access to the data. That is, authorized individuals can access the data when they have a need and can access all the data they have been authorized to use. Cybercrimes like ransomware can easily crush access to the entity’s data as we experienced recently on the East coast with Colonial Pipeline. In fact, cybercrimes are a consideration in confidentiality (e.g.,

corporate espionage), security (theft of digital assets), and privacy (identify theft).



FIGURE 2: ISACA YouTube presentation of Domain 1 for CISM exam.

CONFIDENTIALITY

Confidentiality was defined above (see Figure 1) and summarized in Figure 2 above. Confidentiality is one of the three elements in the security triad and thus more narrowly defined than security (see Figure 2 above). The AICPA SOC 2 Guide (2018) includes Confidentiality as one of the five key Trust Services Principles (TSP) categories and defines it with similar wording as protecting sensitive information, in a variety of types of information, from unauthorized access or use. That may include data that would be personal (e.g., names, addresses, social security numbers).

PRIVACY

As mentioned, privacy is about personal data and information, such as PII. In its “Privacy Principles and Program Management Guide”, ISACA (2016, p.7) offers this definition:

“Privacy, at the most basic level, is the right of individuals to determine if, when, how and to what extent data about themselves may be collected, stored, transmitted, used and shared with others.”

Note that the cornerstone of privacy is individual information such as personal identifiable information. Because of the growth in cybercrimes and the ease of remote access to many systems and databases around the world, there has been a growing concern about protecting personal information, especially PII, from unauthorized access and use. Therefore, a sound privacy program would chiefly be concerned with personal data that the entity has in its custody, and the thefts to that object. For example, if a mailing service organization only uses data from other sources to be melded into the mailing objects of its service, it may not actually have custody of the names and addresses. On the other hand, if the entity does its own payroll and has names, addresses, and social security numbers in the payroll or HR database, then that is a key concern that should be addressed in a privacy program.

One way to define a privacy framework for the definition provided herein is to use the National Institute of Standards and Technology's (NIST) "Privacy Framework" (2020, p.i):

- Building customers' trust by supporting ethical decision-making in product and service design or deployment that optimizes beneficial uses of data while minimizing adverse consequences for individuals' privacy and society as a whole
- Fulfilling current compliance obligations, as well as future-proofing products and services to meet these obligations in a changing technological and policy environment
- Facilitating communication about privacy

WHAT'S NEXT

Once executives responsible for GRC have a grasp, and a good definition, of privacy, then they are ready to develop an effective program. There are some standard accepted practices, frameworks, schemas that lay out a sound process for developing an effective program.

CONCLUSION

The first step in developing a program in the GRC arena is to define with some specificity what the area of interest involves. In the case of privacy, an effectual definition for privacy is necessary to avoid confusion of the target to be protected. For example, it is easy to confuse privacy with confidentiality and/or security. Privacy will have some aspects of these two components, but it is distinct enough to be defined more clearly. Then those responsible for privacy can be more effective in developing a program to address the properly constrained area. In this article, information was provided to assist those responsible in developing a suitable definition of privacy in order to develop and maintain an effectual privacy program.

For business-like entities to effectively and efficiently remediate the risks associated with identity theft, a critical success factor is to begin remediation with a reliable applicable framework, which requires defining privacy of identity information versus other similar seemingly applicable terms.

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Centripetal and Centrifugal Forces in Voting Models

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Robi Ragan

Background

Elections are a highly watched and anticipated event. Candidates and parties compete to get votes, shaping their policies around what they believe will win. However, this raises the question of what kind of political stances will win and what incentivizes candidates to adopt these positions.

Some attempt to answer this question by studying incentives created by different sets of election rules. Matakos (2018) looks at how electoral rules affect parties. He found that these rules effect how cohesively the party members work together, which in turn leads to party moderation or extremism. Groffman (2004) found that oftentimes a candidate's position will be closer to the median voter of their respective party than the overall median voter. Cox (1987) was one of the first to look at candidate behavior under specific electoral system. He made several key discoveries about candidate positioning such as that multi candidate equilibria under plurality rule must be non-centrist, different scoring rules will have a substantial effect on candidate strategy, and that under Condorcet Procedure candidates have a dominant strategy to adopt the position of the median voter.

One of the first systematic treatments examining the incentives parties and candidates face under different electoral systems is that of Cox (1990). He found that with certain systems of voting, centripetal forces dominated and candidates were almost always positioned near the position of the median voter, while with others centrifugal forces dominated and candidates were dispersed throughout the political spectrum. He looks at both plurality and proportional representation (PR) models and finds cases of centripetal and centrifugal forces dominating in each. In his study, Cox found that there were different thresholds for centripetal and centrifugal

forces depending on whether or not partial abstention, cumulation, or both were allowed. In this paper we attempt to replicate the results of Cox (1990) using an agent-based computational model.

Model

We will be using a one-dimensional spatial model and as much as possible, we will follow Cox's notation. N is the number of voters, v is the number of votes a voter may cast in a round, p is a dummy variable with 1 meaning partial abstention is permitted and 0 if not, c is a dummy variable with 1 meaning cumulation is allowed and 0 if not, k is the number of legislators to be elected per district, f is the electoral system that is used (plurality or proportional representation), and m is the number of candidates.

We will generate our voters on a $[0,1]$ policy space using a uniform random distribution $\sim u(0,1)$. There will be 1001 voters and two to five candidates, whose initial location is also randomly drawn from $\sim u(0,1)$.

Candidates will follow a modified version of Laver's Hunter Strategy (2005). When a candidate follows the hunter strategy, "if the last policy move increased support, the same move will be made again". Else, "[they] reverse heading and make a unit move on a heading [in the opposite direction] from the direction now being faced" (Fowler and Laver 2008). To put it simply, when a Hunter loses, they will shift their policy either left or right. If this move increases their vote share, they will continue in the same direction. If their vote share decreases, then they will start moving in the opposite direction. Initially, a random direction will be chosen and the shifting in positions can be made without cost. The size of the step that the candidate makes will be based upon the candidate's relative vote share and will be discussed in detail later, but in short candidates who have lower vote shares can take larger steps than candidates with higher vote shares.

Candidates do not know other candidate positions, but will know the other candidate's vote share.

They do not know the location or preference of the voters, only the voter shares for all candidates.

Our Hunter deviates from Laver's Hunters because any candidate who has won a seat will no longer adapt until they lose the seat.

Our model will start with one treatment, but there can be up to six. The six total treatments are as follows:

- 1) Plurality rule with no cumulation of votes with $m \leq 2v$
- 2) Plurality rule with no cumulation of votes with $m > 2v$
- 3) Plurality rule with cumulation of votes with $m \leq v + 1$
- 4) Plurality rule with cumulation of votes with $m > v + 1$
- 5) Proportional representation with $m \geq 2$ and partial abstention or cumulation of votes
- 6) Proportional representation with $m = \max(v, 2)$ if neither partial abstention nor cumulation is allowed

There will be five-hundred rounds of voting and we will start with one-hundred runs of a given v, p, c, k, f and we will average across these one-hundred runs for the results.

As seen above, partial abstention or cumulation will be allowed in some iterations. When one of these is allowed, there will be a threshold in place that determines when a voter will abstain or cumulate. The threshold will be distance-based, with candidates more than twice as far as the closest candidate not receiving a vote from the voter. For cumulation, each candidate receiving the following percentages of votes: $\frac{D_i}{D_1 + D_2 + \dots + D_n}$ with D representing the distance of the candidate from the voter.

When proportional representation is used, we will follow the d'Hondt Method. Under the d'Hondt Method, seat allocation is determined by quotients. When all votes have been recorded,

quotients will be calculated for each party. The party with the largest quotient will receive a seat, with its quotient being recalculated and the others remaining the same. The quotient for each party will be calculated with the following equation: $quotient = \frac{v}{s+1}$, with v being the total number of votes that a party has received and s being the number of seats that the party has won so far (s starts at 0 and increases with every seat allocation).

Model

The model will follow the following procedure:

1. One-thousand-one voters are generated with single-dimensional ideal points, which are drawn using a uniform random distribution on a $[0,1]$ policy space.
2. M candidates are generated with starting points generated using a uniform random distribution on a $[0,1]$ policy space.
3. Voters will cast v votes.
 - a. Voters vote for a candidate that is closest to their ideal point.
 - b. If abstention is allowed in a treatment, then voters do not vote for candidates that are more than double the distance of the closest candidate.
 - c. If cumulation is allowed, the candidates receive the following percentages of votes:

$$\frac{D_i}{D_1+D_2+\dots+D_n}$$
 with D representing the distance of the candidate from the voter.
4. The k seats are distributed to the candidates
 - a. If the electoral system f =plurality, then the competitors in the model are candidates. The k candidates with the most votes are given a seat until k seats are filled.
 - b. If the electoral system f =proportional representation, parties are candidates. Seats are distributed by quotients. The party with the largest quotient will receive a seat, with its

quotient being recalculated and the others remaining the same. The quotient for each party will be calculated with the following equation: $quotient = \frac{v}{s+1}$.

5. The competitors adapt according to our modified Hunter rule, based on the results from the previous election
 - a. If a candidate fails to win a seat, then the candidate will take a step on their current heading. If this move increases their vote share in the next round, they continue taking steps in that direction. However, if their vote share goes down then they reverse their heading and take a step in the opposite direction.
6. The step size that losing competitors take will be calculated in the following way.
 - a. The vote share for all competitors is calculated as: $share_m = \frac{votes_m}{\sum_m votes_m}$
 - b. The difference between the vote share for each competitor (m) and the competitor with the highest vote share (m*) is calculated: $d_m = share_{m^*} - share_m$.
 - c. If $d_m < 0.01$ then d_m is rounded up to 0.01 to prevent candidates from becoming “stuck” in small gaps between voter ideal points.³
 - d. Each competitor without a seat draws their step size from: $\sim uniform(0, d_m)$.
 - e. Competitors with seats do not take a step. Therefore, their step size is 0.
7. There are five-hundred rounds of voting for each run of the model.
8. The results consist of the averages found from one-hundred repeated runs of the same treatment of the model.

Examples of Centripetal and Centrifugal Forces

³Developing step size in this way allows for several benefits. This method allows candidates far away to quickly make up ground with larger step sizes. However, it prevents them from becoming too large and getting the candidate caught in a loop. The converse is also true, with the method preventing candidates from having a step size that is too small, which can lead to the competitor becoming stuck between two voters and unable to pick up any additional votes.

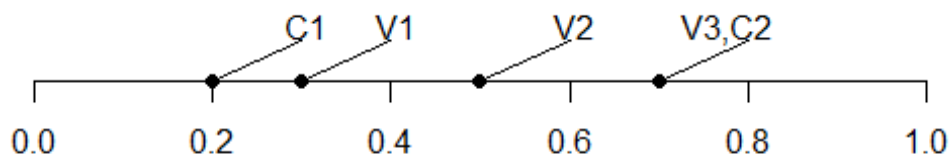
The following simplified examples will demonstrate the centripetal and centrifugal forces that this project aims to study.

In each example, candidates are indicated by C# and voters are indicated by V#.

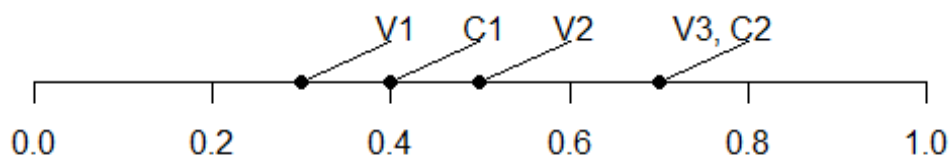
Centripetal Forces

Majority rule is being used with 3 voters and 2 candidates.

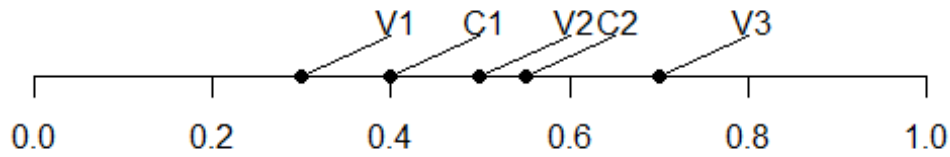
In the initial round, Candidate 2 wins by receiving votes from Voter 2 and Voter 3. Candidate 1 received 1 vote from Voter 1.



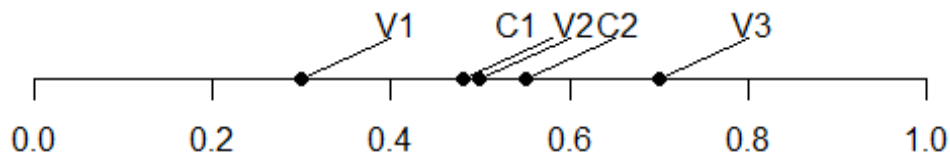
In round 2, Candidate 1 shifted his position to the right. Candidate 1 is now the winner, receiving votes from Voter 1 and Voter 2.



In round 3, Candidate 2 shifted his position to the left. Candidate 2 is now the winner, receiving votes from Voter 2 and Voter 3.



In round 4, Candidate 1 shifts to the right. Candidate 1 is now the winner, receiving votes from Voter 1 and Voter 2.

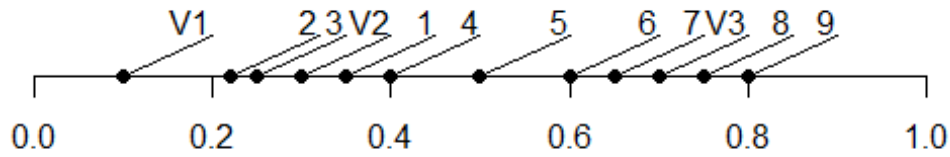


This cycle continues every round, with each candidate getting closer and closer to the position of the median voter (in this case Voter 2).

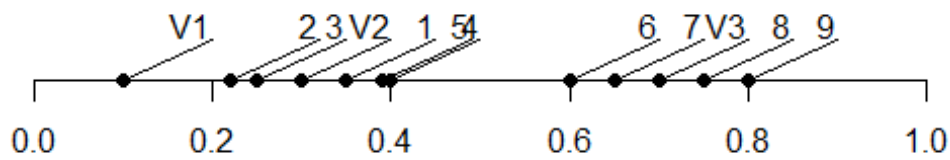
Centrifugal Forces

The Japanese voting system is used. With this model, each voter uses four total votes to select candidates for four seats, and plurality rule is used. In the models, there are four voters (indicated by V#) and 9 candidates (indicated by just a number).

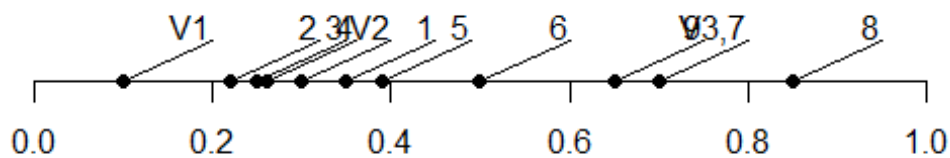
In round 1, Candidates 2,3,1, and 4 each receive 2 votes and win. Candidates 6,7,8, and 9 receive 1 vote and candidate 5 receives no votes so they will shift their positions for the next round.



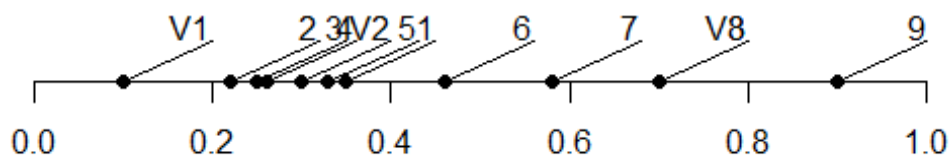
In round 2, Candidates 2,3,1, and 5 each receive 2 votes and win. Candidates 6,7,8,9 each receive 1 vote while Candidate 4 receives no votes so they will shift their positions for the next round.



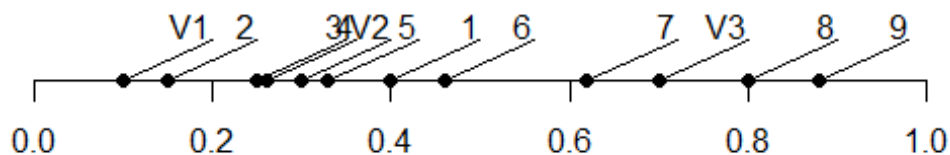
In round 3, Candidates 2,3,1, and 4 each receive 2 votes and win. Candidates 6,7,8, and 9 each receive 1 vote and Candidate 5 receives no votes so they will shift their positions for the next round.



In round 4, Candidates 3,4, and 5 receive 2 votes and win. Candidates 2,1,6,7,8, and 9 each tie at one vote for the final seat and must go through an arbitrary tiebreaker. Assume that the tiebreaker is a series of coin flips where the winner survives, the loser is eliminated, and Candidate 6 comes out victorious. Therefore, Candidates 2,1,7,8, and 9 will shift their position for the next round.



In round 5, Candidates 2,3,4, and 5 each receive 2 votes and win. Candidates 6,7,8, and 9 each receive 1 vote and candidate 1 receives no votes so they will shift their positions for the next round.

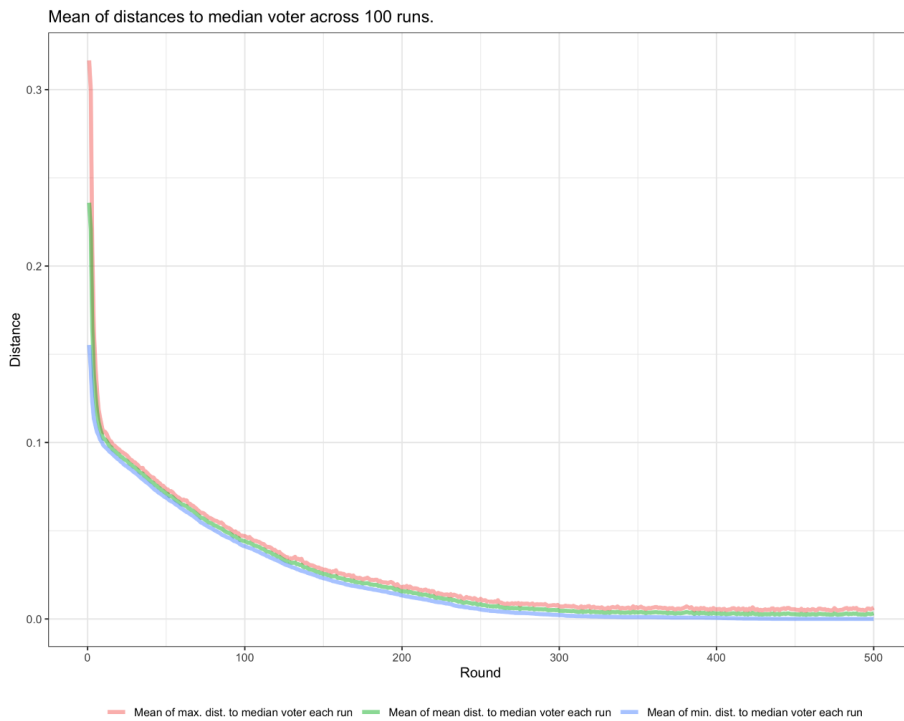


Here you can begin to see how the candidates are becoming more and more separated across the policy space.

Results

Treatment 1: Plurality rule with no cumulation of votes with $m \leq 2v$

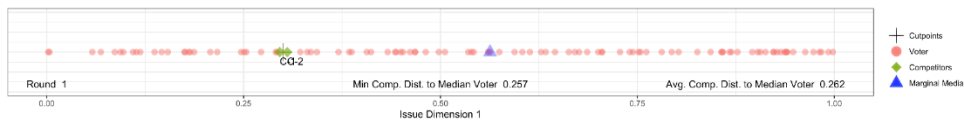
To begin, let $v=1$, $p=0$, $c=0$, $k=1$, $f=$ plurality, and $m=2$. There were 100 runs of 500 rounds of voting that took place and produced the following results:



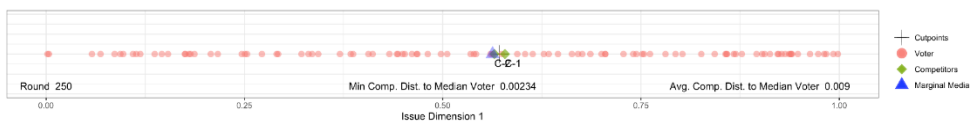
To show the evolution over time of one run:

It is clear that clustering around the

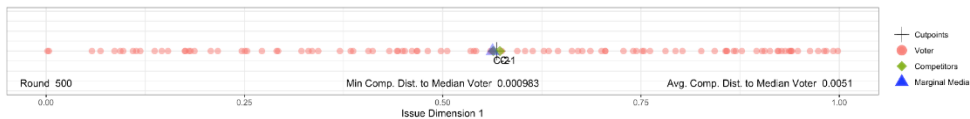
median voter does occur over time. These results replicate the corollary to the median voter theorem, which states that in a single-dimensional model, when voters have single peaked preferences, they will elect the candidate that is closest to the median voter. This serves as a robustness check for the



model. To further expand on these results,



the conditions were re-run with 3, 4, and 5 candidates to see which forces dominate in each instance.

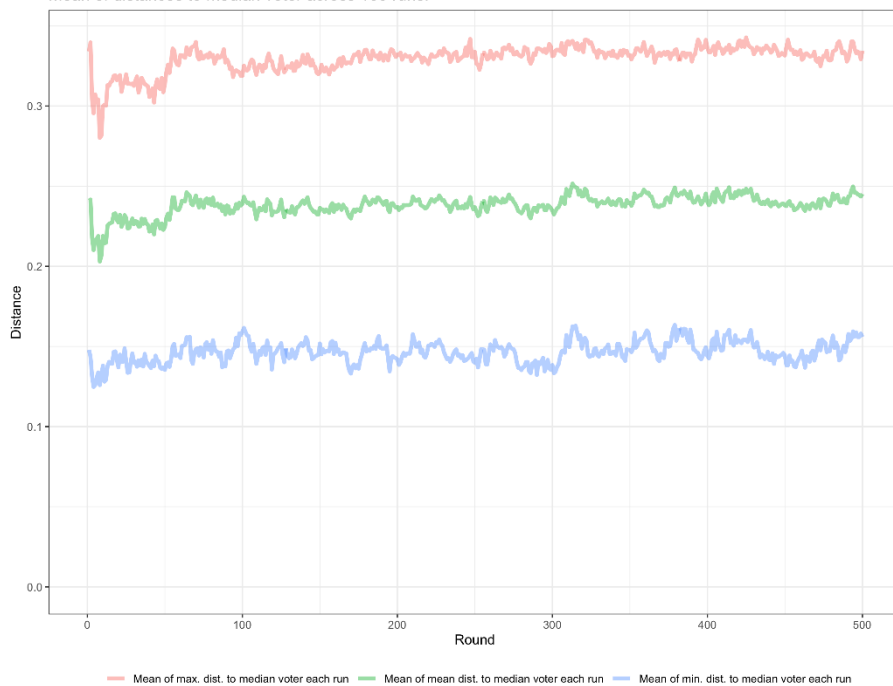


Treatment 2: Plurality rule

with no cumulation of votes with $m > 2v$

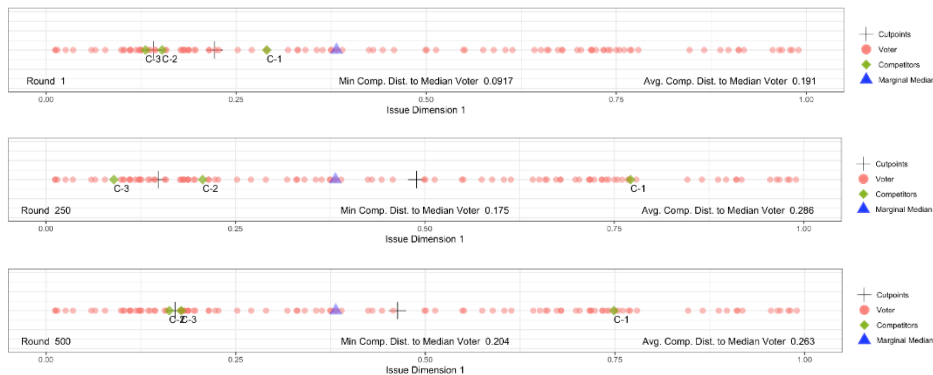
This treatment produced similar results in the 3, 4, and 5 candidate cases. While there was some fluctuation, in each instance the average dispersion remained relatively stable, with only a slight rise in the dispersion over time. While candidates were occasionally able to get close to the median voter, they were quickly forced back out as candidates further away were able to capture

Mean of distances to median voter across 100 runs.



additional votes. The figure below shows the average distances across three runs when $m=3$ and $v=1$:

To show the evolution of one run over time:



As one can see in this example, while the candidates are continually shifting across the space, their

average distance to the median voter remains relatively unchanged over time.

Treatment 3: Plurality rule with cumulation of votes with $m \leq v + 1$

[Results forthcoming]

Treatment 4: Plurality rule with cumulation of votes with $m > v + 1$

[Results forthcoming]

Treatment 5: Proportional representation with $m \geq 2$ and partial abstention or cumulation of votes

[Results forthcoming]

Treatment 6: Proportional representation with $m = \max(v, 2)$ if neither partial abstention nor cumulation is allowed

[Results forthcoming]

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"I've Gotcha." Cognitive Decision-Making Biases in Enterprise Resource Planning (ERP) System Implementation

Michael W. Davidson

ABSTRACT

Large Government Defense and Aerospace Contractors (“unlimited” resources) have initiated the process of mandating Small Manufacturing Businesses (SMBs) to implement Enterprise Resource Planning (ERP) systems. Large customers require small manufacturing companies to implement an ERP system to create synergy and streamline the supply chain management process. ERP systems integrate various functions and departments within a business into a comprehensive approach. When SMBs’ implement an ERP system, they can effectively manage their inventory, finances, and customer relationships. This process enhancement allows the SMB to become more efficient and effective in operations. This process increases profitability and a more competitive position in its market niche. When large Defense and Aerospace contractors “mandate” SMBs to implement a “complimentary” ERP system, they intend to create a more efficient and effective supply chain. However, implementing ERP systems in SMBs’ is complex, expensive, and laborious. Over half of the U.S.-based small and medium businesses often need help to complete this process effectively. The reasoning behind this failure rate is wrong decisions in the early phase of decision-making by the management/owner of SMBs. This overview investigates the Behavioral Economic (B.E.) concepts of Temporal Discounting (T.D.) and Optimism Bias (O.B.) and their “influence” role in preventing these managers from accepting, deciding, and following through on the implementation of the respective ERP system. T.D. can lead managers to make impulsive decisions prioritizing short-term pleasure over long-term well-being. O.B. can lead managers to take excessive risks, overlook potential problems, and make overly optimistic decisions. Both biases can have negative consequences on decision-making. Be aware of these biases and mitigate their effects by taking a more rational and objective approach to decision- making. Someone can achieve a potential solution to this Delayed Decision-making/Resistance to Implementation of Manufacturing ERP system by developing an “Enhanced” Training Module that incorporates Temporal Discounting and Optimism Bias concept factors into improved Decision-making.

INTRODUCTION

Small and medium-sized businesses represent many businesses in the United States (Blackford, 2003, U.S. Census Bureau, 2008). Of this proportion, SMBs represent many businesses that support immense Defense and Aerospace (D/A)/NASA contractors. This overview centers on small businesses with less than 100 employees and annual sales revenues under \$10 Million. Typically, SMBs do not have unlimited resources and fail to see the future value of investing in

systems like an ERP system due to its cost and complexity. Also, these SMBs lack advanced technological tools that are "standard" and "common" in their counterpart Large Government Contractor customers (Xu, Rondeau, & Mahenthiran, 2011). ERP systems are an excellent example of this lack of technology and represent a potential for small organizations to align and manage operations efficiently and effectively (Jacobs & Weston, Jr., 2006; Hirschheim & Klein, 2012). These "complimentary" systems are complex, time-consuming, and costly to implement in these SMBs (Kaith, 2010; Dixit & Prakash, 2011).

The initial decision to follow the mandate and pursue purchasing and installing an ERP system is usually highly delayed due to several factors centered around decision-making by management and the owner of the organization. This lack of or wrong decision leads to "crisis management" due to indecision and unacceptable delays in formalizing a plan. ERP consultants and large D/A contractors usually present all future value potential to decision-makers, but the timing of this decision is complex and usually disjointed. Many factors are stressed to SMB enterprises based on the "future value of synergy and efficiency" and "hopefully" future profitability by streamlining all operational processes. In doing this, they aim to achieve the goal of all their suppliers using the same or similar functionality systems, and they can streamline their procurement process. Implementation leads to cost savings and a more robust, efficient, and effective supply chain. Another advantage of using a standardized ERP system is that the large government contractor can ensure their customer (U.S. Government) that all or most of their suppliers use "best practices" in inventory management, financial reporting, and customer relationship management. This synergy improves product quality and services being supplied to the federal and state governments, which "hopefully" will improve the quality of services they provide to the public. This mandating to small and medium businesses will create a more

streamlined and effective supply chain, leading to cost savings, increased profitability, and improved product and service quality.

This overview presents two potential causes of this delayed process and eventual wrong/improper decision. This overview proposes a potential solution for adapting organization training modules to utilize Artificial Intelligence (A.I.) technology to generate “enhanced” training modules and develop a pre-cursor module that interacts with managers developing behavior profiles on specific individuals. After analyzing the results of this behavioral analysis, A.I. would then develop and tailor a specific module for that individual who would incorporate behavior concept factors that affect economic decision-making.

LITERATURE REVIEW

Enterprise Resource Planning systems in large corporations have been extensively researched (Tezel & McManus, 2003; Jacobs & Weston, Jr., 2006; Vemuri & Palvia, 2006; Wu, Li, Chu, Sculli, & Gao, 2008; Morris, 2011); Nazemi, Tarokh & Djavanshir, 2012). More recently ERP product industry has initiated a focus on "smaller and medium size businesses" (Wu, Xu, He, 2009). This focus has exposed a "crisis" within the SMB community due to a massive variance in implementation success (Kaith, 2010; Negahban, Baccher, & Skibniewski, 2012; Quiescenti, Bruccoleri, La Commare, Noto L Diega, & Perrone, 2006; Momoh, Roy, & Shehab, 2010, Xu, Rondeau, and Mahenthiran, 2011).

In the research phase of the SMB decision-making process on what type and complexity of ERP system to purchase and implement, most encounter typical "off the shelf" tools from large corporations (i.e., Microsoft, Oracle, Sage, SAP, Netsuite®, Epicor) that sell their product to other large organizations (Boeing, Northrop Grumman, Ball Aerospace). Around sixty percent of small to medium size businesses that have started implementing an ERP system have either failed

outright or failed to realize any Return on Investment (ROI) (Panorama Consulting Solutions, 2014). Many factors are involved, but most center around cost, time requirements, and indecision by management to accept the potential future value of the product and resist the "mandate" they feel is being forced onto their business. What these SMBs fail to recognize in this decision-making process is that "if ERP systems achieve higher efficiency and effectiveness (higher productivity)," then the cost of poor or improper decision-making leads to less efficiency and less productivity which creates "crisis" among customers relationships and passing on of this inefficiency and lack of productivity to their customer (inflated price scheme) (Wu, Li, Chu, Sculli & Gao, 2008). These decision-makers in these SMBs fail to recognize that if they see the future value of the ERP system and make "minor to middle-level attempts" investments up front in the process, then they could potentially dramatically reduce their operational overhead and general and administrative expenses (Negahvan, Baecher & Skibnieski, 2012). This would make them dramatically more competitive in their bid process and satisfy customer requirements.

Opportunity in Existing Literature

These types of ERP platforms have been widely studied and evaluated and attracted many literature reviews throughout the history of information systems academia (Jacobs & Weston, Jr., 2006). Researchers and analysts have searched for creative ways to reduce the impact of ERP systems on organizations on a large scale, specific to attempting to prevent implementation failures. However, this focus shift to small and medium-sized businesses (here - manufacturing oriented) have not benefited from this "prevention failure" process development. There is inadequate literature on ERP implementation failure reasoning in SMBs due to Behavior Economic (B.E.) factors like Temporal Discounting and Optimism Bias by significant decision-makers within the organization. Those who have investigated this region of research have not attributed failures to managers'

psychological reasoning for making the decision. Many non-consensual and wide-ranging reasons for failure lead to confusion. This confusion prevents these SMBs from developing guidelines that fit their specific organization, leading to "hopefully" effective implementation and a successful operational system.

RESEARCH OVERVIEW QUESTIONS

The following are addressed in this overview study.

1. What Behavioral Economic (B.E.) parameters/factors lead to/exacerbate “lack of decision” or “improper decision/extended delay” to implementing an ERP system?
2. How do Temporal Discounting (T.D.) and Optimism Bias (O.B.) affect decision-makers specific to ERP implementation?
3. How could decision-makers mitigate the effects of T.D. and O.B. in ERP decision-making?
4. What factors lead to managers' resistance to accepting ERP requirements “mandates” from customers in manufacturing?
5. What “enhanced” training module content would incorporate T.D. and O.B. into the "Decision-Making Process" specific to the context of ERP"?

OVERVIEW RESEARCH FRAMEWORK

Temporal Discounting (T.D.) and Optimism Bias (O.B.) can impact managers'/owners' decision-making process in the “context of” and “acceptance of” Enterprise Resource Planning requirements. Enterprise Resource Planning (ERP) (business management software) includes integrated applications that small businesses use to collect, store, manage, and analyze data. Government prime defense and aerospace contractors are mandating small manufacturing businesses install and operate these platforms to be more efficient in their manufacturing processes and match (complement/synergy) their ERP systems to ease data transfer integration. Managers and owners of small businesses battle between doing what is required/mandated by their customers and keeping their 'tested" manufacturing process that has kept them in business (fear of change/maladaptive behavior).

To counteract this discrepancy between “forced” adaptation to inevitable change, an enhanced training module platform is needed for small manufacturing business owners incorporating temporal discounting and optimism bias (behavior economics) into decision-making processes.

Temporal discounting is a manager’s tendency to value immediate rewards more highly than future rewards. Small business managers/owners give greater weight to the present moment than to future outcomes. Managers in these types of suppliers "tend to accept a less attractive outcome in the present time, even if appropriately discounted, rather than waiting for a more attractive outcome, especially if the risk is associated with the delay" (Whelan & McHugh, 2009; Dittmar & Bond, 2010; Parnell & Crandall, 2017). This leads to suboptimal decisions, especially regarding long-term investments like ERP implementation. A manager or owner who is the primary decision maker may opt for a cheaper but less effective ERP solution in the short term rather than investing in a more expensive but comprehensive solution that yields more significant benefits in the long run.

Optimism bias is a manager’s tendency to overestimate the likelihood of positive outcomes and underestimate the likelihood of adverse outcomes (Weinstein, 1980). "Optimism pushed to the extreme is dysfunctional to organizations (Parnell & Dent, 2009)". This bias also impacts decision-making in the context of ERP, especially with implementation cost and time estimates. Managers (decision makers) could be more optimistic about the speed and ease of implementing an ERP solution, leading to the underestimation of resources and time required to integrate the system into their business structure fully. Lack of proper decision-making in these SMBs leads to daily organizational "crises." These daily "high impact" events create chaos in managing daily operations. They significantly burden the small manufacturing organizational

structure and prevent proper workflow efficiency. They require a prompt and decisive response (Crandall, Parnell, & Spillan, 2014, Haibing, Jinhjong, Qi, & Wilbur, 2015). Behavioral Economic Factors provide insight into decision-making in all stages of crisis management (Parnell, John A., William 'Rick' Crandall, 2017).

SMBs do not have the operational structure of their defense and aerospace counterparts. Therefore, a lack of decisions or wrong decisions regarding adaptation to change voluntarily or through "mandates" creates daily crisis management situations. These types of crisis events are dramatic to operational efficiency and profitability. Most SMBs are privately owned and fight cultural changes based on their longevity in business and resent being told how to operate their business. Even though these potential efficiency aspects are not appreciated by these business owners, forcing the implementation onto their business structure creates a crisis in cash management, workflow, productivity, and customer relationships.

To mitigate the effects of T.D. and O.B. in ERP decision-making, organizations (SMBs) must adopt a systematic and evidence-based approach that involves:

1. Analysis of the organization's current systems/processes to identify areas for improvement.
2. A clear and comprehensive implementation plan includes detailed cost and time estimates and identifies potential risks and contingencies.
3. Consistent monitoring and evaluation of progress and be prepared to make course corrections.
4. Continuous improvement encourages regular reflection and learning from past experiences to inform future decision-making.
5. Use "independent experts" in the decision-making process to bring a fresh perspective and reduce the effects of bias.

By taking these steps, small manufacturing businesses can ensure that their ERP decisions are informed by a realistic assessment of the costs and benefits and are made with the organization's long-term success in mind.

To train managers to overcome these biases, it is necessary to emphasize the long-term benefits of the ERP system and provide clear and detailed information about the resources and effort required to implement it successfully. Managers should be trained to consider the ERP system's potential risks and drawbacks and think critically about the decision-making process. Involving managers in the ERP implementation process and providing regular updates on progress and results builds their understanding and support for the system.

Manager resistance to accepting ERP requirements in manufacturing arises from various factors:

1. Lack of understanding: Managers do not understand the benefits and purpose of implementing ERP systems and their impact on business processes.
2. Concerns over cost: Implementing an ERP system is a significant investment, and managers are concerned about cost and Return on Investment (ROI).
3. Change management: Managers resist change, especially if they are comfortable with current systems and processes (fear ERP implementation will disrupt their workflows and cause confusion and productivity loss).
4. Technical challenges: Managers have concerns over the technical aspects of implementing an ERP system, such as data integration, system compatibility, and software customization.
5. Resistance to cultural change: Managers resist cultural changes that come with an ERP implementation, such as new ways of working and new employee responsibilities. To overcome these challenges, the organization must communicate ERP benefits, provide training and support for employees, and involve managers in the implementation process to address their concerns.

Off-the-shelf training modules currently used for manufacturing operations are not specifically tailored for companies with less than 100 employees and revenue streams lower than \$10 Million.

"Enhanced Training Module incorporating Temporal Discounting (T.D.) and Optimism Bias (O.B.) in Decision-making Process" specific to the context of ERP."

- I. Introduction
 - A. Temporal Discounting (T.D.) Definition
 - B. How T.D. influences decision-making.
 - C. Overview of ERP systems and their role in decision-making
- II. Understanding Temporal Discounting
 - A. Concept of T.D.
 - B. Impact of time on decision-making
 - C. How to measure T.D.
- III. TD in ERP Decision-making
 - A. Role of ERP in decision-making
 - B. Influence of T.D. on ERP decision-making
 - C. Examples of T.D. in ERP systems
- IV. Overcoming TD in ERP Decision-making
 - A. Strategies for overcoming T.D. biases in ERP decision-making.
 - B. Importance of considering long-term outcomes
 - C. Balancing short-term considerations in ERP decision-making.
- V. Case Studies
 - A. Real-world examples of T.D. in ERP decision-making.
 - B. Successful strategies for overcoming T.D. biases in ERP decision-making

C. Lessons learned from case studies.

VI. Conclusion

A. Recap of critical points of the training module

B. Importance of considering T.D. in ERP decision-making

C. Potential benefits of overcoming T.D. biases in ERP decision-making.

Training modules would be designed for managers and owners and be interactive, have a mix of lectures, group discussions, and hands-on activities to aid in knowledge transfer to participants. The goal is to help participants understand and apply the concepts presented.

They are utilizing new Artificial Intelligence Technology to generate training modules and develop a pre-cursor module that interacts with managers developing behavior profiles on specific individuals. After analyzing the results of this behavioral analysis, A.I. would develop and tailor a particular enhanced training module for that individual, which would incorporate behavioral economic factors into a successful transfer of knowledge to the individual and improve the decision-making process.

SMBs operate daily in a very volatile market. Everyday minor fluctuations in operations produce a significant cascade effect and perpetuate immediate crisis management. Change is constant, and how a small business reacts/responds quickly to these situations will determine if the SMB managers/leaders/decision makers properly adopt new directions for their specific business.

Since most of these organizations do not have a large employee base (typically, many personnel wear many hats within the organization), they constantly battle internally to meet basic weekly and monthly requirements for operations (payroll, customer requirements, deliverables).

Long-term planning is usually the last topic of discussion as every day is occupied by what crisis is developing regarding which division within the organization (personnel, payroll,

operations). Managers at all levels struggle to complete daily requirements and deal with change while hoping to think about how to optimize processes (future planning and future value).

Owners who typically make long-term strategic decisions usually fail to understand the criticality or requirements of ERP implementation. Usually, they identify the minimum amount of change they can tolerate to meet customer requirements. They fight any large-scale project due to the time, cost, and reorganization required. Most business analysts believe this inefficiency would drive this supplier from the marketplace (if their competitors successfully implement the ERP system and become more efficient/effective, and profitable).

ERP system implementation does require a significant process change and mandates employees at all levels to adapt to support/accept the new system. Not only must the decision makers decide to adjust and accept the ERP implementation they must also choose a proper design, application, and plan that fits their organization up front in the early phase of decision-making.

Most of the prominent providers of these ERP systems develop various models that can be adaptable to most organizations. The literature review indicates that further development down to the SMBs' is still required. Research focusing on how to further adapt/modify these systems to these organizations is vital to assisting with implementation success.

This overview only slightly addresses multiple factors which lead to indecision or wrong decision associated with ERP implementation. These factors are leading contributors to the failure to decide, failure to make a correct decision, and failure to prevent delay of any decision specific to the implementation. Management commitment and organizational culture are primary contributing factors (Brenton Pabst, Augusta Casas, Ravi Chinta). This seems logical and apparent, but what behavioral economic factor supports/drives/explains these factors?

As detailed earlier, a manager's tendency to emphasize immediate rewards more than future rewards (T.D.) typically dictates most management strategic business decisions. With customer mandates driving the decision-making process to either adapt your current manufacturing operational process platform or integrate the implementation of a new ERP system, the manager has an internal crisis to manage. In giving more weight to the present moment (daily operational status) than to future outcomes (increased efficiency, productivity, profitability, customer satisfaction), the manager leads themselves to suboptimal decisions. The primary decision maker in opting for a cheaper (status quo) but less effective ERP solution in the short term rather than adopting a more elaborate, expensive, and comprehensive solution in a long time stifles the growth and future value of the organization.

Also, a manager's tendency to overestimate the likelihood of positive outcomes (large contractor will not force system implementation onto the small company, lack of ERP implementation will not affect efficiency, productivity, profitability) and underestimate the likelihood of adverse outcomes (loss of business, loss of competitive advantage(s), decreased productivity, decreased profitability, going out of business) pushes the organization into yet another crisis mode.

This bias, as stated earlier, really impacts decision-making in the context of ERP (implementation cost and time estimates). The decision maker(s) are overly optimistic about the speed and ease of implementing an ERP solution, leading to an underestimation of resources and time required to integrate the system into their business structure fully.

Contributions to failure reinforce the rationale that managers and employees must assist in the implementation process as a critical component to success. Any organizational change affects everyone, and adaptation to the new approach is crucial not to impede current workflow and

deliverables. Supporting this corporate and strategic change management is challenging if the culture does not comply with a smooth transition to the new system (Xu, Rondeau & Mahenthira, 2011).

A "shared" organizational vision is crucial to the success of the ERP implementation process, especially in these SMB organizations. Many conference presentations center around frustration from an almost manic-depressive nature of decision makers support for ERP implementation.

Research indicates that most common implementation issues center around cost, time, training, and acceptance (Hidalgo, Albors & Brenton Pabst, Augusto Casas, Ravi Chinta 39 Gomez, 2011).

This overview has found that the apparent flow down of these issues does not fully consider behavioral economics factors/parameters like T.D. and O.B. in supporting why decision-makers are reluctant to adapt to ongoing market drivers (customer flow down mandates and requirements).

Dimensions identified through research as areas for need during an ERP implementation in SMBs include:

1. Management commitment
2. Organizational culture
3. Cross-functional communication skills
4. Executive support, participation, and understanding
5. Need for integrated systems
6. Willingness to adopt change management
7. Lack of staffing resources, and
8. Understanding of implications and constraints of integrated enterprise systems.

Issues identified support existing literature and critical matters that Panorama Consulting (2014) identified in their causes for failed ERP implementations in SMBs. As most literature review indicates, executives (decision makers) are the primary element of ERP implementation success (Avram, 2010; Zabjek, Kovacic & Stemberger, 2009). It follows that fully understanding how those managers decide is crucial. To address this matter, this overview digs into behavioral economic factors T.D. and O.B. to flow into the development of interactive enhanced training modules for both decision-makers (executive/owner) and employees (crucial to also support the ERP implementation process).

The outcomes from the overview revealed that the primary factor leading to a failed implementation stemmed from a lack of organizational and executive commitment to the project. The corporate culture must be ready to sustain significant change management initiatives and cultural shifts to reduce the expectations on critical employees.

"Optimism bias, temporal discounting, and inertia contribute to our knowledge of why decision-makers are reluctant to change" (Parnell & Crandall, 2017). Parnell and Crandall, 2017 delve into the realm of organizational culture and "IF" it does not support a crisis-ready mentality, then crisis planning is challenging until there is a cultural shift. This is quite apparent in this scenario where managers delegated to make this type of decision do not foresee the crisis event they are causing. No foresight into the potential crisis leads current management into chaos mode when customer demands lead to production and contract interruption. "Moreover, SMBs must require support from vendors and consultants beginning with the sales process to ensure that the organization's correct system has been selected before implementation. Vendors must continue to pay special attention to the individualistic needs of SMBs. Vendors and consultants can contribute

more support to these small and medium size manufacturing businesses in better understanding the impacts ERP systems can have on the company and what they are or are not capable of doing.

CONCLUSIONS

SMBs decision-making process needs formal training to incorporate Behavioral Economic Concepts of Temporal Discounting and Optimism Bias. Behavioral economics does explain when SMBs are faced with a “crisis failure” - to decide or proper action to implement an ERP system – most decision-makers revert or gravitate towards a pre-established decision rule instead of a logical problem-solving thought process (Parnell & Crandall, 2017).

This overview takes this into account and assists in identifying/determining a potential “root cause” of this type of indecision or wrong timing decisions by managers at these small and medium size manufacturing organizations.

This leads to determining "how to use Behavioral Concepts of Temporal Discounting and Optimism Bias in Economic Decision-Making Policies” of small manufacturing businesses dealing with this costly and highly technically demanding ERP implementation. Parnell and Crandall, 2020 emphasized the need for SMEs to implement more effective crisis planning. Their research also found that these SME managers are more likely to expect a crisis in their small company but are less prepared to deal with it. Remember, the problem in a small to medium size organization does not always involve external control of situations. Most crisis management situations are internal and deal with daily requirements to meet customer deliveries, cash flow status, and overall operational maintenance. TD and O.B. are crucial behavioral concepts that can seriously influence small manufacturing businesses’ economic decision-making. Here are some ways these concepts incorporate into monetary policy.

1. As stated, it is a tendency to place more value on immediate than future rewards. This leads to impulsive decision-making, which has negative consequences in the long run. Economic policy should incentivize employees to make decisions that have long-term benefits.
2. As stated, O.B. is a tendency to overestimate the likelihood of positive outcomes and underestimate the possibility of adverse effects. This also leads to risky decision-making, especially in situations where there is uncertainty. To address this, economic policy can be designed to provide more accurate information to employees about the risks and rewards of different options.
3. Combining both behavioral concepts include policymakers who design policies that address both T.D. and O.B. (i.e., Economic policy that provides long-term tax incentives and more accurate information about risks associated with different options.

Incorporating Behavioral Concepts such as T.D. and O.B. into economic policy can help to promote better decision-making and more positive outcomes for employees and the organization. This leads to effectively training the managers/owners who make the decisions. If the focus is only on employees and not the primary decision-makers, then overall policy rarely changes, and effective implementation of new processes is lost in the "chaff."

Using A.I. technology to enhance current training modules (models) to include Behavioral Economics (B.E.) parameters/factors in a development model will assist in identifying a better overall personality trait of the person taking the training. After A.I. analysis of the psychological and behavioral training module results, the A.I. will generate a "formalized" enhanced training module specific to that individual and hopefully "train" properly by including personality traits that remove the barriers of the T.D. and O.B. biases.

Future research includes expanding this overview and testing to see a correlation effect. Parnell and Crandall, 2017 stated that Behavioral Economics offers "keen insight" into decision-making in all stages of the Crisis Management (CM) process. Suppose managers at these small organizations see the real long-term positive potential of implementing this ERP to prevent future operations and customer relations crises. In that case, they will benefit from a more efficient and effective organization. This will also reduce stress levels in the decision-making process and improve overall productivity and profitability.

The term "I've Gotcha" in the title refers to a real-life experience where a large vendor who supplies these ERP systems stated this to a small business owner regarding the decision to buy an ERP system. The individual vendor knows about the flow-down "mandates" and sells the product to many SMBs' because they must satisfy their main customers. These small and medium size manufacturing businesses in this market sector only survive by these types of contracts and are not usually diversified. The SMB buys the product and then must deal with all the implementation ramifications. Here is where the "I've Gotcha" really hurts. The salesperson knows small manufacturing businesses are between doing business as usual and adapting to a rapidly changing market driven by the Government and defense and aerospace customers. What does a small business do – adapt and survive, implement properly, train properly, and thrive?

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Human Resources: Major Disaster Preparedness and Recovery Planning

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Abstract

Unique managerial problems surface during the first few hours following any large-scale disaster. The complex organizational demands require planning and implementation that is flexible and able to change depending on the emergency agent. All government organizations are required to have an Integrated Emergency Management System in place and ready for operation. This paper presents the proposed role and responsibility for Human Resource departments prior, during, and immediately following major disasters. The relationships important for Human Resource departments to consider are planning, training and written plans, with emphasis on the role of the planning process.

Disaster Planning

September 11, 2001 will be remembered forever as a major changing point in the sense of security of the United States. Fundamental changes have been initiated within the context of emergency management preparedness and response, especially within government organizations. Many organizations are finding challenges in getting effective cooperation in planning, training and capability assessment across all disciplines. The wake-up shock for most companies was in the devastation felt or seen as a result of Hurricane Katrina on the United States Gulf Coast. It had been more than 15 years since Katrina obliterated and drowned portions of Louisiana and Mississippi, when another major disaster struck the entire planet in the form of a global pandemic. Many companies have struggled back to life, but many are still in a quagmire of no funds, no employees, and for many – no markets.

Planning an effective organizational response to catastrophic challenges requires consideration of operational, business issues, and legal concerns. The goal is to prepare for major disasters, respond to disruptions, reduce effects, and recover from any consequences. Preparations allow companies to satisfy their moral obligations to employees and communities, and meet any federal, state, or local compliance requirements.

An organization's employees are the company's most valuable asset. If a major disaster occurs, every company should have as its first priority the welfare of employees followed by a continuity plan to ensure the business survives. Many employees are going to need time to ensure the well-being of their family members, but getting back to work is an important aspect of person's emotional recovery. Campbell and Pritchard (1976) suggested that motivation deals with a set of independent/dependent variable relationships that explain the direction, amplitude, and persistence of an individual's behavior, while holding constant the effects of aptitude, skill and understanding of the task, and the constraints operating in the environment. Well managed disaster planning and recovery may energize, channel and sustain human behavior favorable towards the organization.

This paper will present issues, concerns and proposals for human resource planning prior to and during major disasters. A major disaster is one in which an entire community may be in a life hazardous situation. Through pre-planning and having all employees knowledgeable about disaster planning, companies will help ensure the safety and welfare of employees as well as potentially supporting the community. The good will and positive approach a company takes will have long term effects on the motivation of employees and stake holders within the community which it operates.

Classification of Disaster

The United States Homeland Security Council in partnership with the Department of Homeland Security, have created a series of planning scenarios for National, Federal, State, and Local Homeland Security preparedness activity usage (Howe, 2005). The scenarios are designed for foundational structure in setting standards for which capabilities may be measured. The fifteen scenarios considered are:

1. Nuclear Detonation – 10-Kiloton Improvised Nuclear Device
2. Biological Attack – Aerosol Anthrax
3. Biological Disease Outbreak – Pandemic Occurrence
4. Biological Attack – Plague
5. Chemical Attack – Blister Agent
6. Chemical Attack – Toxic Industrial Chemical
7. Chemical Attack – Nerve Agent
8. Chemical Attack – Chlorine Tank Explosion
9. Natural Disaster – Major Earthquake
10. Natural Disaster – Major Hurricane

11. Radiological Attack – Radiological Dispersal Devices
12. Explosives Attack – Bombing using Improvised Explosive Device
13. Biological Attack – Food Contamination
14. Biological Attack – Foreign Animal Disease (Foot and Mouth Disease)
15. Cyber Attack

These Scenarios have been developed for adaptation to local conditions throughout the United States. There are some areas for special concerns – continuity of government in Washington DC.; financial markets in New York; and major trade and commerce channels in major cities – every location in the country is susceptible to one or more major disasters. The scenarios are written with a focus on response capabilities and needs, not preventative measures. The scenarios present a top-down approach to planning. The United States is placing importance on citizen wellbeing and expects all organizations to follow in this ethical direction.

Preparedness Planning Process

Disasters are acute events that disrupt employee's well-being and may have long term effects on business operations. In the aftermath of Hurricane Andrew in 1991, many firms saw the serious effects that a disaster of this magnitude could have on their work forces and to counter they mobilized their resources to help employees rebuild their lives (Doup, 1992). In a study conducted by Sanchez, Korbin, and Viscarra (1995), to determine the effects of support by a company following a disaster, they found that tangible support reduced initial anxiety health strains. They also found that tangible support targeting urgent post-disaster needs added to long-term changes in employee depression levels, job satisfaction, and organizational commitment. In a disaster situation many people will find support from many directions such as family and friends, and thus preferred their employers to provide basic help (Sanchez, Korbin, Viscarra, 1995).

There are many myths about human behavior during disasters. Literature on disaster response has recently shown that people and groups become more cohesive and unified during situations of collective stress. Yet disasters and their subsequent responses are by their very nature unique social problems (Kreps, Drabek, 1996). Not only is there potential for destruction and disruption due to the

disaster agent, many individuals and organizations will stop routine activities and take on new disaster-related tasks and responsibilities (Drabek, McEntire, 2003).

The literature has found that challenges during disasters have been increased due to an absence of standardization, scarcity of information and lack of communication (Auf der Heide, 1989). These issues are why many new behaviors and organizations appear following disasters. The literature indicates that emergent behavioral phenomena are likely to occur when demands are not met by existing organizations (Auf der heide, 1989). Quarantelli (1996) also found that experience in previous disasters and the degree of pre-planning will mitigate the effects of post-disaster behavior. When organizations merely respond to crisis, without a proactive posture, more damage seems to prevail (Nudell, Antokol, 1988). Smits and Ally (2003) also contend that when behavioral readiness is absent, crisis management effectiveness becomes a matter of chance.

Many emergent activities occur during a disaster and there can be no accurate pre-plan for every potential situation. Group emergence appears when an organization is formed with new structures and functions but is fleeting in nature (Quarantelli, 1996). Noting that pre-planning affects emergence Drabek (1987) discussed the suggestion that the degree of formalization due to pre-planning will have an affect on the re-establishment of normal relationships and the achievement of goals, each having an effect on stability and termination of the emergent group.

The emergent behavior approach to disaster management shows that there is more than one way to organize and that there may be order even in situations seemingly chaotic (Koehler, 1996; Mileti, 1989). This suggests that chaos theory may be appropriate to consider in studying emergent behavior during disaster situations (Koehler, 1996). This indicates that preparation and planning activities should be based on actual disaster behavior with response operations being decentralized, flexible and based on cooperation. Fortunately there are many more experienced managers who may be recognized as important resources for disaster planning.

The findings by Drabek and McEntire (2003) conclude that emergency managers should not try to impose the command and control model on disaster response. Disasters by their nature lead to

emergence and require participation of many people.

What is evident is that some form of preparation, training and planning activities are required to formalize the behavioral activities of individuals responding to a disaster within a company. A survey by the international Foundation of Employee Benefit Plans found that 52 percent of all organizations have a disaster plan. A full 67 percent of those with a plan have either completed it or revised it due to the effects seen as a result of Hurricane Katrina, September 11th, and the SARS scare (Babcock, 2006).

The tendency for organizations is to relate emergency planning to a written plan and submit this plan as evidence of the company preparedness. Planning is a never-ending process, while the plan is only a spot on look for a specific time period. Preparedness is dynamic and will be contingent upon the disaster situation. Thus, preparedness is a state of readiness to respond to an individual threat.

The state of readiness means an organization examines its susceptibility to the full range of potential disasters (vulnerability analysis), the identification of human and material resources available to cope with the threats (capability assessment), and design organizational structure for a coordinated response (plan development). Because potential threats will vary in scope, organizational structures will change, and skills diminish when not exercised, planning and training must be a continual process in order to create a disaster readiness (Buckle et al, 2000). It is important to examine the disaster planning process, making specific relationship to preparedness communications.

Pearson and Clair (1998) present a crisis management model that provides for comprehensive description of pre-event environment, perceptual and organizational characteristics, and post-event reactions, responses, and outcomes. Three primary pre-event constructs include an environmental context of organization practices, executive perceptions of risk, and adoption of organizational crisis management preparations.

The effects of planning are obvious when reviewing case examples. After the 1993 World Trade Center bombing, Morgan Stanley Dean Witter introduced new hard a fast requirement for employees in case of disaster. Morgan was the World Trade Center's largest client with 3700 employees. During the September 11th situation, the employees of Morgan were directed outside of their building by in-house

security officers, even though the South Tower's public address system was informing workers it was safe to return to their offices. Everyone at Morgan knew of their contingency plans and all but six employees escaped (Fowler et al, 2006).

Even trained and experienced leaders, who are committed to an organization's clear and common understanding of their mission and responsibilities during a disaster, cannot effectively implement a strategy without access to human, financial and technological resources needed to take action (Jenkins, 2006). Human Relations has a support and assist role within all organizations. However, during a disaster they may be overwhelmed by the immensity of need by every employee and concern for their own family and well being. Leadership should anticipate this burden and plan to have multiple centers of support and information to provide for its employees.

This strategy should include a disaster workforce plan for standing capability of permanent, temporary, and contracted groups that is scaleable based on the level of disaster. Adequate training should be provided for all staff and contracted personnel to enhance group behaviors and knowledge of available and potentially needed resources. This training should be conducted, led and have full participation of all senior level employees. Determining physical structure and equipment needs to provide for disaster response with all communications equipment capable of performing in all potential disaster types. Develop and have ready for implementation a resource-tracking system that is capable of documenting location and condition of each employee during a disaster.

It is important to realize that disaster situations are dynamic and it will be impossible to cover every contingency. The planning process should emphasize flexibility so that those involved will know that they may be flexible in actions, adjusting to the changing disaster demands. The New York City Office of Emergency Management was a state of the art facility designed to support the city in case of disaster. The New York OEM was located across the street from the World Trade Center and was one of the first buildings to be destroyed when the buildings collapsed. The planning process should focus on principles of response rather than trying to elaborate the process to include many specific details (Perry, Lindell, 2003). There are multiple reasons for not incorporating too much detail in a written plan. First,

it is impossible to anticipate all details of variation in disaster circumstances. Second, details can quickly go out of date and require constant updates (Hoetmer, 2003). This updating is time consuming and takes resources away from other activities. Third, with so many potential details, if included each emergency situation would confuse priority activities. Responders would be confused on which direction to take and not have anyone to clarify actions. Finally, more details mean a more complex document. This makes a very difficult tool for training and confusion of what role each person is to undertake.

Very important for Human Relations coordination is the organizational preparedness plan to have a connection to the local, state and federal plans for the geography in question. These plans will include coordination with community assets such as emergency management, law enforcement, hospitals, public health agencies, the military, and other community support organizations (Perry, Lindell, 2003) The psychological contract between an employee and employer is based on the organizational citizenship behavior of the company and the perception of obligation and responsibility they have towards each other (Robinson et al. 1994). With the media attention on disasters over the past decade, employee expectations of employer obligations are adjusting to include security issues (Martin et al. 1998).

Human Resources Department Involvement

A dilemma in planning for disasters is the human issues to be dealt with, human resource policies and procedures that impact employees when responding to a disaster. Human resource function is critical in disaster planning but often overlooked (Kendell, 1999). There are four main areas for human resource development of a disaster planning process.

1. Pre-disaster (planning)
2. Disaster Response (what is done when crisis occurs)
3. Recover (what is done during the recovery process part of the plan)
4. Post Recovery (long term issues that arose during and post disaster)

Communication is vital for human resources department as organizational expectations are presented on an ongoing basis. Through human resources all employee communication takes place. Employees expect clear goals, guidelines and company expectations for their behavior regarding their roles within the company, to be issued through the human resources staff.

The first contact with a new employee should include issues regarding disaster management. This sets the perception early in the mind of the employee that their new company cares for their welfare. When details of any disaster plan are executed, human resources is responsible for maintaining a level of continuity in who, what, when, where and how. If proper planning is in place the names can be filled in to functions allowing ease in following up with compensation and documentation.

In many organizations the first emergency response is not managed directly by human resources but through another department such as building management or risk-management, or it may be completely turned over to an outside organization. It is important that leadership from the human resources department participate in any central disaster management team or center. Knowing where employees are and their situation will be vital for organizational recovery.

Many disaster functions an organization needs to manage are not going to be pleasant. In many situations there will be injury or death and the employees family members will need to be notified. Many employees during a disaster will want to participate and help and it will be the function of human resources to keep everyone following established preparedness plans, even though these plans will be flexible to adjust to contingent situations.

During recovery operations, human resources will be called upon to assist with various need programs of employees. As a minimum effort human resources will need to direct employees to the proper civil or not-for-profit organizations for support. During post recovery, human resources will deal with lingering effects including the potential for downsizing the organization or shifting of personnel between departments. Flexibility will be essential to post recovery as each individual will have varying circumstances related to their personal experience with the disaster. The separation between work and family becomes more dependent upon organizational support as many people may have priority personal situations that may take precedence over work time.

Analyze Threats and Response Potential

The first guideline for preparedness planning is determining an accurate knowledge of potential

threats and the likely human responses. A complete hazard assessment should be initiated and all vulnerability areas reported to the central command. At no time should the central command consider 100 percent accuracy in reports, evidenced as to the number of inaccuracies in media reporting during Hurricane Katrina (Fonash, 2005).

“it is far more important in a disaster to obtain valid information as to what is happening than it is to take immediate action.... Planning in fact should help to delay impulsive reactions in preference to appropriate actions necessary in the situation” (Quarantelli, 1996: 106)

Threat assessment must be continuous, prior to, during and post disaster. Emergency planning must include the logistics of first response and following actions for recovery. The discipline created by planning and training will allow for a more accurate assessment that will save lives and help in business continuity (Perry, Lindell, 2003). In the planning process, analyzing capabilities means communication with multiple organizations rather than keeping the analysis in-house. A good example of working together is in the Browns Ferry Nuclear Power Plant fire, where local fire department hoses were unable to connect to the facilities water fittings.

Emergency planning should recognize that planning and management are different functions. The true test of any plan is in implementation during a disaster (Quarantelli, 1985). Planning defines the risks and potential demands (personnel, facilities, equipment, and materials) on an organization. Management involves performance, meeting the needs of the employees and survivability of the organization.

Establishing a Virtual Emergency Response Center (VERC) as part of the emergency planning will support the flexibility of response. A VERC will allow participants to work from their normal work location, home or anywhere they need to be located. Virtual means something that is created, simulated or carried on by means of a computer or computer network. A VERC allows access to vital records and organization data during emergency situations. Bank of America has developed a regional approach by

creating ten regional support teams, all trained on notifications, evacuations, activations and event management using a combination of communication mediums (Davis, 2002).

Core functions of a VEOC should include:

- Communication and intelligence to effectively receive and transmit information
- Command and control functionality to put multiple responses in place at one time
- Coordination and documentation to organize disaster management plans and to record actions taken
- Automation of checklists to ensure response and recovery functions are monitored and may be followed for effective future planning.
- Alert notifications for management tracking throughout the organizations.
- Media management to inform the public about issues concerning the organization.

Communications

The first thought for most individuals when a crisis occurs is about their family members. Family members may not be together when disaster strikes. Organizations providing for employee basics during a disaster should have a communications strategy in place to first and foremost allow employees to contact family and close friends.

Depending on type and level of disaster, establishing effective interoperable communications is defining any problems and establishing solution requirements. Both voice and data communication systems should have multiple back up scenarios. Interoperable communications means being able to talk with whom you want, when you want. This does not mean the ability to talk to everyone all the time (Jenkins, 2006)

Organizational communication concerning disaster preparedness starts with top management. Leadership promoting disaster planning creates a powerful, meaningful perception that the organization is committed to the welfare of its employees. Leadership presents themselves as being in control and

willing to use every means necessary to meet the immediate needs of employees if a disaster occurs. In addition, the perception of being in control allows positive behavioral tendencies by employees during a disaster and participation during any recovery activities.

Physically the need for communications is a high priority for business disaster planning. In a study completed by Tierney and Nigg (1995), they found that business owners responded that the loss of telephone usage was the highest form of disruption during the Des Moines floods in 1993. The severe damage to infrastructure during Hurricane Katrina reinforces the need for a communications plan with multiple back up scenario. The following is an indicator of the severity and potential loss of communications during a disaster:

- More than three million customer telephone lines were knocked down in Louisiana, Mississippi, and Alabama.
- As of September 28, 2005, more than 30 days following the hurricane, over 260,000 customer lines remained out of service, including 238,000 in Louisiana and 22,000 in Mississippi.
- The entire communications infrastructure on the Mississippi Gulf coast was destroyed.
- Significant damage was inflicted both on the wire line switching centers that route calls and on the lines used to connect buildings and customers to the network.
- Thirty-eight 911 call centers went down. Thirty days after landfall, two call centers in Louisiana remained out of service.
- Two telephone company switches in New Orleans responsible for routing 911 calls for the surrounding parishes were knocked out by flooding, resulting in one of the most significant losses of capacity in and around New Orleans.
- Local wireless networks also sustained considerable damage, with up to 2,000 cell sites out of service
- A month after landfall, approximately 820 cell sites remained out of service, the majority within New Orleans and other areas of Louisiana.
- Over 20 million telephone calls did not go through the day after the hurricane.
- 37 of 41 broadcast radio stations in New Orleans and surrounding areas were knocked off the air (2 AM and 2 FM stations continued to broadcast).

The majority of systems in place, still operable, soon lost power as diesel generators ran out of

fuel and no sources were available for replenishment. Any communications systems in place were used by rescue personnel and the individual person in New Orleans had no form of communications, for some it was weeks before they were able to access a communications medium.

It is recommended that a well-planned and robust communications system be established, one that includes backup generators with reasonable fuel sources. There should be redundant systems, self-healing networks, access to multiple mediums of technology communications, and sufficient equipment available. With a backup consisting of handheld radios and replacement batteries. The most important consideration is who will use the equipment, and will they know how to use it? Once again, best laid plans are only as good as the training individuals will receive on where the equipment is located and how it may be used.

A unified response promotes consistency and an audience-centric approach should be utilized to prevent erratic response by different individuals (Barton, 2001). In Massey (2001) the effect of consistent communications resulted in influencing employee perceptions of organizational legitimacy. The need for leadership to present control over the situation means that it is critical for legitimate consistent communications to be managed effectively.

Legal Requirements and Considerations

Potential legal and other complications may arise due to organizations not being prepared for disaster and crisis management situations. Management may be held liable for failing to prepare a crisis management program and informing their employees of procedures to follow in the event of a crisis. Bordwin (1999) researched legal aspects of crisis and stated that managers may be sued for potential criminal liability. Human Relations departments already have the responsibility for these areas, and they will need to review accordingly for disaster preparedness planning

Legal Issues relating to Disaster Preparedness and Emergency Response

- OSHA

- Family Medical leave Act
 - Statutory Requirements
 - Limitations on FMLA Leave
 - Expansion of Leave Policies
- Americans with Disabilities Act
 - Statutory Requirements
 - Impact of a disaster on Accommodations Obligations
 - Rescue and Assistance for Disabled Employees
 - Confidentiality Constraints
 - Executive order 13347 (Signed July 22, 2004)
- National Labor Relations Act & Union Contract Implications
- The Worker Adjustment and Retraining Notification Act
 - Statutory Obligations
 - Relieve from Notice Requirements
- Uniformed Services Employment and Reemployment Rights Act
 - Statutory Requirements
 - Leave Eligibility
 - Reinstatement Obligations
- Workers Compensation
- Unemployment Benefits
 - Normal Statutory Protections
 - Federal Disaster Unemployment Assistance
- Insurance Coverage Issues
 - Practical Considerations
 - Business Interruption coverage
- Legal Issues relating to Telecommuting
 - Fair Labor Standards Act
 - Workers Compensation
 - OSHA Application to Home Offices
- Record Keeping Requirements

Training Programs

Regular training and period exercises provide a valuable way to test disaster management plans. Training should be as realistic as possible and stress using the disaster management plan for any major event. Training should also be used as a documenting system for identifying, developing, and sustaining

baseline capabilities for prevention, preparedness, response and recovery. This means involvement at all levels of an organization to identify capabilities and needs.

While everyone has heard about major disasters, relatively few people in the United States have actually participated in a disaster. While there are many organizations knowledgeable about hurricanes in Florida and earthquakes in California, no one has experienced a dirty nuclear bomb, or an epidemic such as pandemic influenza or SARS. No organization can assume taking the risk of relying on government organizations to provide for needs following a disaster, therefore, every organization, no matter the size, industry or location should have some form of periodic training to ensure employees know what to do in a disaster situation.

With almost any skill and capability, practice and experience increase proficiency. For employees, exercises, particularly for the type and magnitude of disasters for which there is little experience, are required to develop skills and identify what may work and what needs further development.

Response skills to practice:

- Obtaining and communicating accurate situational data for evaluation and coordinating the appropriate response during and after the disaster.
- Leadership skills: the effective blending of top leadership in a unified command and control with decentralizing decision authority in the hands of those employees on the front line of the disaster allowing the employee to use innovative activities for effective response to a myriad of potential situations.
- A complete understanding of all roles and responsibilities for critical employees prior to, and in response to, a disaster.
- Effective communications and coordination of groups.
- The ability to identify, and properly deploy resources from all sections of the company, community and government sources when available.

Of course, training should be viewed from the perspective of where problems are expected and conflicts could potentially be resolved. Like a class where students all get perfect grades, the test is suspicious of being too easy, if the training does not generate problems then maybe not enough

importance has been placed on the necessity or the scenario is inadequate. It is also clear that repeated experience of disaster training events will help the organization devise coordination skills. An effective planning process, characterized by careful plan reviews, and critiqued emergency exercises, provides an alternative to learning from actual disaster experience (Kartez and Lindell, 1989).

The disaster planning process has many audiences, primarily because many different individuals are involved in implementing emergency plans. Effective planning requires explaining the plan to all management and personnel in various departments that will potentially be involved with disaster recovery. All employees should know that a plan will be in effect and they should understand their roll in implementation. Employees will need to know who can do what for them during and after a disaster.

Most importantly, training will bring individuals together allowing personal relationships to develop beyond normal operations of the organization. Emergency planning brings together the entire scope of Human Relations responsibilities within an organization. Comprehensive testing involves the preparedness plans, staff levels, facilities, equipment and leadership. And drilling involves a public relations communication to the public at large. Many companies may have product and materials that could be dangerous following a disaster. Employees will have a higher commitment to their organization when they are seen as positive community members.

Inter-agency communications are essential for understanding complex, dynamic and evolving crisis situations (Paton, Jackson, 2002). Simulations, a practice which many IT workers are sufficiently skilled, presents an opportunity for emergency managers to develop, review and rehearse technical and management skills while practicing under high pressure situations in a safe supportive environment. Being in a simulated situation is the best way to consider what a person might do in a real situation.

In the United States Navy nuclear power program, all nuclear-powered vessels are in constant training mode, including actual reactor shut downs. During these training sessions, all workers must coordinate their efforts to protect life, and systems. In the event of an actual disaster situation, these workers will have experiences similar situations and be more relaxed and effective in their efforts at recovery. The goal of simulation training is the repeated recall of factual and procedural knowledge for

situation application (Blanchard and Thacker, 1999)

Strong efficacy beliefs contribute to stress resilience (Jex, Bliese, 1999). This is important for those in disaster situations where co-worker lives may be at stake. Self-efficacy may be used as a predictor of learning in the training environment and its transfer to actual performance in a real situation (Blanchard, Thacker, 1999).

Conclusions

It is evidenced through historical activities that disaster preparedness is a necessary function for all organizations. Many years go into building up an organization and within moments the entire business can fall apart due to something beyond the control of management. The nature of a disaster prompts immediate behavior to protect employees and see to their welfare. Having a plan that has been tested through exercise training allows employees to feel more secure in their organization. Having a plan will allow a business to speed up recovery thus ensuring employment and motivation continuity.

Billions of federal dollars are being spent on disaster mitigation and preparedness, it would see appropriate for all organizations to create and update their plans in accordance with new technologies and coordination with local governments. It is true that a written plan does not guarantee security, but the absence of a plan bounds on negligence to employees. Through an ongoing planning process, with sound principles and applicable training programs, a company may find employee satisfaction and motivation increased. The role of group think during crisis management should be questioned. "In a crisis, too many decision makers may frustrate carefully laid plans" (Podolak, 2002, p. 54). The role of diverse top management teams as presented may be found in Greening and Johnson (1997).

This paper attempted to present the importance of a disaster management plan and the value of the process perceptions and training of personnel in effectively preparing for the worst. While many top managers may be unwilling to expend the resources necessary for disaster management planning and training, the potential losses as seen through recent disasters should convince organization stakeholders the value of this investment.

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Introducing Auction Theory Using Numerical Methods

Mariano Runco

Abstract

This paper introduces the fundamentals of auction theory to advance undergraduate or beginning graduate students using Monte-Carlo simulations. Several basic theorems of auction theory are introduced via simulations to help students understand the workings of the models. Moreover, many possible exercises are proposed so that students reinforce their understanding of the material.

JEL codes: A22, D44, C15

Keywords: Auction theory, Simulations, Monte Carlo methods, economics education.

1 Introduction

This paper introduces the fundamentals of auction theory to advance undergraduate or beginning graduate students using Monte-Carlo simulations. It has been the author's experience that students struggle to reconcile the basic equations with the conceptual framework of the models. The benefit of using numerical methods is that students can observe the internal process leading to the theoretical results, processes that may be familiar to the experienced theorist yet obscure to the beginner. Moreover, students can easily manipulate the code to analyze diverse scenarios such as increasing the number of bidders or using different distributions of private values. Analysis that is often extremely hard or even impossible to carry out analytically.

This paper includes programs covering the basic topics of Auction Theory such as equilibrium behavior in First and Second Price Auctions, seller's revenue with risk averse buyers, the Revenue Equivalence Theorem and Reserve Prices. These topics can be taught at the end of an upper level Game Theory class or the beginning of an Auction Theory class. As far as I know this is the first article that presents a basic treatment of Monte-Carlo simulations as teaching aid for auction theory. Another article that uses this same methods in a different context is Briand and Hill (2013). Gibbons (1992) provides a wealth of game theoretic applications that can be analyzed using the same methodology, like Cournot and Bertrand competition games with incomplete information, etc.

The programs have been written in MATLAB (they will also work with the open source MATLAB clone Octave) but could easily be modified to work on Python, Fortran, Julia or Scilab, among others. The difficulty of the code is minimal, so that students can learn the basics of the language in one class session or in a handout written by the instructor. For instructors interested in MATLAB a very good reference is Hanselman and Littlefield (2004).

2 Basic Model

All auctions considered in this paper are Independent Private Values (IPV) with two bidders, values

distributed uniformly and independently in the interval $[0,1]$ and unless otherwise noted risk neutral players. Those interested in more details can review Krishna (2002) and Wolfstetter (1996).

Computations are done using Monte-Carlo methods. For illustrations purposes I use the first example shown in the next section (SPA.m). This function takes the value of the object and bid of a player as inputs and returns her expected payoffs in a Second Price Auction. A large number of random values are created (variable x_2) for the other bidder. Then a large number ($M = 100,000$) of auctions are simulated assuming that the other bidder uses her weakly dominant strategy (bidding her own value) and the average payoff is computed (variable EP). This process is repeated 50 times and finally the average is returned as the final result (variable y).

3 Programs

3.1 Second Price Auction

The function SPA.m takes the value of the object (x_1) and bid (b_1) as arguments and returns the expected payoff (the identity of the bidder is irrelevant since this auction is symmetric) assuming that the other player bids her value $\beta(x) = x$.

```
function y = SPA(x1,b1)
rep = 50; M = 100000;
EP = zeros(rep,1);
for i=1:rep x2 = rand(M,1);
[~,I] = max([b1*ones(M,1) x2],[ ],2);
EP(i) = (x1*ones(M,1) - x2)'*(I==1)/M;
end
y = mean(EP);
```

The variable x_2 represents the value of bidder 2. The vector I records who wins each individual auction. It takes the value 1 if bidder 1 wins and 2 if bidder 2 wins. The variable $EP(i)$ computes the expected payoff of bidder 1 in iteration i . Notice that payoffs for bidder 1 in case of winning are given by her value minus the bid of the other player (x_2). The payoff is zero in case of losing.

This program can be used to show students how expected payoff changes with the bid for a given object value. Moreover, they can see that the optimal bid equals the value of the object even if there are more than two bidders. For the first exercise notice that expected payoff for bidder 1 is her value minus the expected value of the other bidder conditional on winning. Define Y as the highest value among the remainder bidders (in this case there are only two bidders making $Y = X_2$, expected payoffs are

$$EP_1(x_1, b_1) = P(b_1 > y)(x_1 - E(Y|b_1 > y)) \\ = b_1 \left(x_1 - \int_0^{b_1} y f(y|b_1 > y) dy \right) = b_1 \left(x_1 - \frac{b_1}{2} \right)$$

where the conditional density is $f(y|b_1 > y) = \frac{1}{b_1}$. The function above has a unique maximizer at $b_1 = x_1$.

For the second exercise, notice that if there are 3 bidders the distribution of Y is $F(y) = y^2$ and the conditional density is $f(y|b_1 > y) = \frac{2y}{b_1^2}$. Thus the expression for expected payoffs with 3 bidders is

$$EP_1(x_1, b_1) = b_1^2 \left(x_1 - \int_0^{b_1} y \frac{2y}{b_1^2} dy \right) = b_1^2 \left(x_1 - \frac{2b_1}{3} \right)$$

The previous function is also maximized at $b_1 = x_1$, thus showing that symmetric equilibrium bids are independent of the number of bidders. The code can easily be modified to include another bidder by making the following changes:

```
x3 = rand(M,1);
[~,I] = max([b1*ones(M,1) x2 x3],[],2);
EP(i) = (x1*ones(M,1) - max([x2 x3],[],2))'*(I==1)/M;
```

The first line creates the values of the third bidder, the second line adds the extra bidder to the auction and the last line shows that, in case bidder 1 wins, the second highest bid is the maximum between the values of the remaining bidders.

As a simple exercise, students could calculate expected payoffs for a given valuation and bid in both two- and three- player Second Price Auctions and confirm their answers with the simulated values (assuming the second player bids her value). Additionally, they can plot the expected payoff as a function of the bid (for a fixed valuation) and compare the graph with the simulated values.

3.2 First Price Auction

Expected payoff in the first price auction, assuming the other bidder uses the equilibrium bid $\beta(x) = \frac{x}{2}$, is given by

$$EP_1(x_1, b_1) = P\left(b_1 > b_2 = \frac{x_2}{2}\right)(x_1 - b_1) = 2b_1(x_1 - b_1) \quad \text{for } b_1 \leq 1/2$$

If the bid is $b_1 > 1/2$ the probability of winning is 1 and expected payoff is simply $x_1 - b_1$. Notice that the above function is maximized at $b_1 = \frac{x_1}{2}$.

The function FPA.m also takes as inputs the value of the object and bid and returns expected payoff, assuming the other bidder uses the equilibrium bid $b_2 = \frac{x_2}{2}$.

```
function y = FPA(x1,b1)
rep = 50; M = 100000;
EP = zeros(100,1);
for i=1:rep x2 = rand(M,1);
[~,I] = max([b1*ones(M,1) x2/2],[],2);
EP(i) = (x1 - b1)*sum(I==1)/M;
end
y = mean(EP);
```

The only difference between this program and the previous is that in the first price auction the equilibrium bid is half the value of object (as can be seen in line 5 of the code) and the payoff is her value minus her own bid (line 6). The program can easily be modified to account for non-uniform distributions, more than two bidders, non-equilibrium strategies by bidder 2, etc. Like in the second price auction, students can calculate expected payoffs for a given valuation and bid and compare the results with the simulated ones.

3.3 Risk Aversion

This subsection analyzes the expected revenue of the seller when bidders are risk averse. In

particular, bidders have utility functions with Constant Relative Risk Aversion $u(x) = x^\alpha$ in which the coefficient of risk aversion is $1 - \alpha$. It is known, see for example [Krishna, 2002], that equilibrium bids in this case are given by

$$\beta(x) = \frac{1}{F_\alpha(x)} \int_0^x y f_\alpha(y) dy$$

where $F_\alpha(x) = x^{1/\alpha}$.

Evaluating the integral and simplifying yields

$$\beta(x) = \frac{x}{1+\alpha}$$

Expected revenue for the seller is 2 times (since there are two players) expected bidder payment

$$E[R(\alpha)] = 2 \int_0^1 P(\text{win})\beta(x)f(x)dx = 2 \int_0^1 x \frac{x}{1+\alpha} dx = \frac{2}{3(1+\alpha)}$$

The following function (FPARA.m) calculates expected revenue for the seller assuming that both bidders use the equilibrium bid $\beta(x) = \frac{x}{1+\alpha}$. This function creates 100000 random values for the players' valuations and compute equilibrium bids (b_1 and b_2) for each auction. Then it computes the maximum of those two and the vector ERS keeps track of the winning bid in each auction. Finally, a simple average is taken over all auctions.

```
function y = FPARA(alpha)
rep = 50;
M = 100000;
ERS = zeros(rep,1);
for i=1:rep x = rand(M,2);
b1 = x(:,1)/(1+alpha);
b2 = x(:,2)/(1+alpha);
[~,I] = max([b1 b2],[ ],2);
ERS(i) = ((I==1)'*b1 + (I==2)'*b2)/M;
end
y = mean(ERS);
```

Students can change the value of alpha and analyze how expected revenue is affected, noting also that $\alpha = 1$ reduces to the risk neutral case. Several interesting extensions can be analyzed here such as increasing the number of bidders, changing the original distribution, etc. It is illuminating to try to carry out these extensions both analytically and numerically and cross check the results.

3.4 Reserve Prices

We can also study the effect of reserve prices on the seller's expected revenue.

This function calculates the seller's expected revenue in a first price auction as a function of the reserve price. Both bidders use equilibrium bids $\beta(x) = \frac{x}{2} + \frac{r^2}{2x}$ for $x > r$ and zero otherwise. Expected revenue is

$$E[R(r)] = 2 \int_r^1 P(\text{win})\beta(x)f(x)dx = 2 \int_r^1 \left(\frac{x}{2} + \frac{r^2}{2x}\right) dx = \frac{1}{3} + r^2 - \frac{4}{3}r^3$$

Notice that this function is maximized at $r = \frac{1}{2}$ generating an expected revenue of 5/12, higher than the expected revenue without reserve price.

```

function y = Exp_seller(r)
rep = 50;
M = 100000;
EPS = zeros(rep,1);
for i=1:rep
x = rand(M,2);
A1 = x(:,1) > r;
A2 = x(:,2) > r;
b1 = A1.*(x(:,1)/2 + .5*r^2 ./ x(:,1));
b2 = A2.*(x(:,2)/2 + .5*r^2 ./ x(:,2));
[~,I] = max([b1 b2 r*ones(M,1)],[],2);
EPS(i) = ((I==1)'*b1 + (I==2)'*b2 )/M;
end
y = mean(EPS);

```

An interesting exercise for students involves modifying the FPA.m function such that it becomes clear that non-reserve price equilibrium bids are no longer optimal in the case of positive reserve prices.

3.5 Revenue Equivalence Theorem

This program (RET.m) calculates the expected seller revenue in three different auctions satisfying the assumptions of the Revenue Equivalence Theorem (the person with the highest value gets the object and a bidder with value zero for the good has expected payment of zero). In particular, the program compares expected revenue from First, Second Price Auctions and All-pay-auctions in which all bidders pay independently of who gets the object. The equilibrium bid in this last mechanism is $\beta(x) = \frac{x^2}{2}$.

```

rep = 50;
M = 100000;
EPS1 = zeros(rep,1);
EPS2 = zeros(rep,1);
EPS3 = zeros(rep,1);
for i = 1:rep
X = rand(M,2);
[C1,I1] = max([X(:,1)/2 X(:,2)/2],[],2);
EPS1(i) = ((I1==1)'*X(:,1)/2 + (I1==2)'*X(:,2)/2)/M;
[C2,I2] = max([X(:,1) X(:,2)],[],2);
EPS2(i) = ((I2==1)'*X(:,2) + (I2==2)'*X(:,1))/M;
EPS3(i) = sum(X(:,1).^2/2 + X(:,2).^2/2)/M;
end
EPS = [ mean(EPS1) mean(EPS2) mean(EPS3)];

```

The 100000×2 matrix X represents the valuations of the two bidders in all the auctions. In the first price auction the player with the highest bid wins and the vector $I1$ tracks the identity of the winner. The vector $EPS1$ determines the revenue of the seller in each auction. A similar procedure is used in the second price and all-pay auctions and finally the average is taken to calculate expected seller revenues.

4 Conclusion

This paper introduced several programs that can be used to help the instructor teach auction theory to undergraduate or beginning graduate students who are exposed to the material for the first time. In the author's experience teaching auction theory in a game theory class, most students find it difficult to grasp the concepts behind the equations. By introducing programs that explicitly determine each player's valuations, who wins each auctions, what are the bids, etc, students can more easily visualize the inner workings of the basic models. Before going over this material I provide students with a summary of basic MATLAB commands and syntax. I have used the numerical simulations presented in this paper with great success at the undergraduate level and I hope instructors will find it useful in their own courses. In a future article I will use the same approach to introduce the more difficult topic of Common Value Auctions.

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REVERSE LINE MOVEMENT BASED STRATEGIES IN COLLEGE FOOTBALL SPREADS MARKETS

Evan Moore
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Abstract

This article tests the efficient market hypothesis and the profitability of simple betting strategies in NCAA college football. We examine all games that have an opening and closing line on the spread, from September 2005 through January 2016. We investigate whether betting based on “reverse line movement” (RLM), in an effort to follow the actions of “sharps,” or professional bettors, is profitable over the time period. We find that, in general, following RLM in college football is not a profitable strategy. However, we also find that RLM serves at various subsets of the season as a profitable indicator, and a profitable reverse indicator.

Keywords: college football; gambling; financial markets; recreation

JEL classification: L83

Introduction

Over \$90 billion is bet on college and professional football (both legally and illegally) in the United States annually (American Gaming Association, 2016). In 2014 alone, more than 12 million individual bets were made on college football at the top offshore betting sites (Fuhrman, 2015). That amount is likely to increase following the United States Supreme Court’s ruling in *Murphy v. NCAA*, which opened the door to more states allowing sports betting. The most popular college football bet, and the one that is the subject of this paper, is a “spread” bet. Because the sportsbook can generate earnings via the “vig,” they are generally expected to attempt to balance the amount of wagering on both sides in order to minimize exposure to any particular outcome, and to take profit from the vig. For example, the 2019 Oregon-Nevada game opened with Oregon as a 21.5 point favorite. An overwhelming majority of the money came in on Oregon, and the line gradually increased to 24 points. This game showed the spread acting as a price, with the spread on offer increasing accompanying the increase in “quantity demanded” of over bets.

However, for certain games, the books do not follow this pattern. “Reverse Line Movement” (RLM) in spread betting occurs when a majority of the money wagered is on the favorite, and the spread decreases, or where a majority of the money wagered is on the underdog, and the spread increases. In other words, the casinos are “betting” on the outcome by attempting to induce even more public action on the side the public already favors. For example, for the 2019 contest between Illinois and Eastern Michigan, the Illini opened as 8.5 point favorites. The vast majority of the money wagered on the spread (88%) came in on Illinois. Yet, the closing line on offer had fallen to 7. Thus, the casinos were making the favored Illinois side “cheaper” despite the increase in quantity demanded for bets on them. Thus, the casinos opened themselves to large potential losses by encouraging bettors to continue to wager on the favorite.

The very existence of RLM contradicts the conventional wisdom that casinos seek only to balance the betting, and profit solely from the vig. This exposes the casinos to large potential losses if the house bets “wrong.” However, if they can correctly induce the public into choosing the losing side, the casinos can obviously profit above and beyond what they’d obtain from the vig.

In many instances, the casinos are following the actions of “sharps,” or professional bettors. Casinos often take bets from certain sharps prior to opening the wagering up to the public. If the casinos note a discrepancy between the perceptions of the sharps and those of the “squares” (non-professional bettors), they may seek to exploit that gap. Most “sharps” use the same type of quantitative models employed by the casinos themselves in setting lines and odds, while relatively few “squares” do. This use of quantitative measures, as well as other types of information available to professionals in the field, may create an information asymmetry that favors the sharps and casinos.

In certain circumstances, casinos may have observed particular biases on the part of “squares” that they can exploit for profit. For example, certain fanbases are known for being overly optimistic about their teams. Additionally, casinos may know (or believe they know) material non-public information concerning certain matchups, and attempt to use such information to their advantage via RLM.

RLM is, therefore, often a sign of some sort of information asymmetry, and sometimes a contrarian move against a public the casinos believe is acting irrationally (Oddshark 2018). Other experts also suggest that most RLM occurs as a result of expert action, and thus we might reasonably expect it to be a profitable strategy over an extended sample (Boyd's Bets 2018). Information on the percentage of money wagered on spreads markets in college football is widely available to the public, for free (with some delay) at popular websites such as www.vegasinsider.com, www.covers.com, and others. It is also available via various web based gambling resource services, such as Sports Insights, LLC, for fees of varying amounts. Such information is also available via various “apps” available on smartphones and tablets. Thus, if RLM is indeed a profitable strategy, then there is a vast amount of potentially profitable information very widely available. While there may be information asymmetries related to the ability to do data-driven analysis or have insider information regarding various factors such as injuries, the fact that the wagering percentage data are available would narrow that gap. This paper examines the RLM phenomenon and its impacts on college football spreads markets. We test the efficacy of the following (naïve) strategies:

- 1) A strategy of betting the same way as the “sharps” in the RLM context would be profitable; and
- 2) A strategy that RLM will be a progressively more profitable strategy as the season progresses, as the quantitative models relied upon by “sharps” have more data to incorporate into their projections.

Literature Review

Gandar, et al (1988) examined the efficiency of sports wagering by testing whether the betting line generates a “fair bet.” They used a regression model in regard to the point spread, providing conditions that would indicate no profit as a result of the wagering. Even and Noble (1992) expanded on the measures of fairness and market efficiency in NFL wagering. Using both the OLS methods employed by Gandar et al (1988), as well as a likelihood ratio test, the authors were generally unable to reject the null hypothesis of fairness/efficiency across NFL betting on both spreads and totals (the combined score of both teams; bettors can wager on whether the combined total is “over” or “under” the total). However, the authors also concluded that “fairness,” as such, is neither necessary nor sufficient to sports wagering matchups.

Badarinathi and Kochman (1996) look beyond “fairness” and searching merely for non-random deviations from a probability of 0.5. Instead, they expand the inquiry to “profitability,” testing

whether any of three wagering “strategies” can be said to consistently earn a profit (cover more than 52.38% of the time, assuming equal amounts wagered, and odds of -110). The authors were able to find at least weak evidence of both non-randomness and profitability for some strategies (Badarinathi and Kochman (1996).

Paul and Weinbach (2005) also looked beyond fairness in order to test for profitability in wagering on college and arena football totals. They tested for evidence that certain strategies could be determined to cover 52.38% of the time or more in college and arena football totals markets. Using a sample of games from the 1990s and early 2000s, they found that, for a given set of offered totals, a naïve strategy of betting the “under” was generally profitable. However, they offered a caveat that markets could potentially adjust. Francisco and Moore (2018) found that, based on a more recent sample of games from 2003-2015, college football totals markets had indeed adjusted, and such a naïve strategy was no longer profitable.

College football betting markets continue to be of interest to researchers. Kuester and Sanders (2011) find that climate aridity has a “dramatic” effect on the spread market. Sinkey and Logan’s (2014) results indicate that home teams are statistically underpriced and favorites are statistically overpriced. Salaga and Tainsky (2015) find that interest in live sports programming, i.e., television ratings, are sensitive to scores closer to spreads and to outcomes in relation to totals. Additionally, Coleman (2017) investigates whether the spread and totals markets correctly integrate the effects of visiting teams’ travel, concluding that the market is an “...inaccurate and inefficient processor of travel effects.”

While most of the literature has thus far focused on markets in general, or bettors in particular, an emerging strain of research focuses on the behavior of the casinos themselves in terms of how lines and odds are set. Levitt (2004), relying on a data set from a handicapping contest for handicapping NFL games in 2001-02, establishes that casinos often, in fact, allow, and even induce, lopsided wagering percentages, instead of attempting to equalize action on both sides. While focusing on spread wagers, rather than totals, Levitt (2004) found that casinos act not merely as “matchmakers,” but instead “take large positions on the outcome of games.” Levitt (2004) reports that casinos are able to exploit superior information and skill at forecasting the outcome of games to increase profits, and that small increases in the casino’s winning percentages can have large impacts on its profits.

Paul and Weinbach (2011) expanded on Levitt (2004). They relied on data showing the percentage wagered on each side of certain bets, available to the public on www.sportsbook.com, and information concerning the amount of individual bets placed at various casinos from Sports Insights, LLC. Exploiting the new information revealed by these data, Paul and Weinbach (2011) were able to evaluate both the actions of casinos in setting lines and odds, and evaluate certain strategies. They found that, consistent with Levitt (2004), casinos operated not simply as matchmakers, equalizing the amounts of wagering on either side, but actually themselves made “bets” on the outcomes of games. Further, Paul and Weinbach (2011) found that a naïve strategy of “fading the public” (wagering the opposite side of a spread or total bet as a large majority of the public) was profitable (at the 10% level) for spreads, but could not determine that such a strategy was profitable for totals.

Here, we build on the contributions by Levitt (2004) and Paul and Weinbach (2011) by evaluating potential strategies potentially adopted by bettors in light of the actions of profit maximizing casinos. For the first time in the literature, we specifically address RLM in spreads markets. We ascertain how frequently RLM occurs, and test its profitability in college football spreads markets. Our approach is different from the Paul and Weinbach (2011) approach of

testing “fading the public,” because RLM involves not only lopsided betting outcomes, but also contrarian line movement on the part of the casinos.

Moore and Francisco (2019) have examined RLM in totals markets, but found that it was not, in general, a profitable strategy. Thus far, there has been no examination of RLM in college football spreads markets.

Data

We analyze wagering on spreads in college football games from the 2005-06 to 2015-16 seasons. The data, acquired from the analytics firm Sports Insights, LLC, include the opening and closing spreads, percentage of money wagered on each side⁴, and actual results, of every Division I college football game over that period. We have chosen to focus on games in which more than 60% of the public was on one side, and RLM was apparent. 60% is a cutoff point often used by services that offer resources and advice to prospective bettors in explaining RLM, and we adopt that convention here. Furthermore, we select 60% as the cutoff point because some apparent RLM may simply be a result of casinos attempting to balance the wagers, and not quite succeeding. We find 3,208 games over our sample that fit that description⁵. Table 1 provides summary statistics for the data used in this analysis. The RLM data is further disaggregated into games in which less than 40% of the money is on the home team, and games where more than 60% is on the home team.

Table 1. Summary statistics

Variable	Mean	St.		
		Dev.	Min.	Max
HTS%	0.512	0.215	0.06	0.93
Opening line	-5.063	15.302	-67	38
Change in line	0.052	1.712	-7.5	10
Error in Spread	0.627	15.688	-50.5	56
Mean Abs. Dev.	12.465	9.543	0.5	56
RLM wins	0.493	0.500	0	1
# of observations	3208			

Variable	Mean	St.		
		Dev.	Min.	Max
HTS \leq 40%	0.291	0.073	0.06	0.4
Opening line	7.116	9.818	-67	38

⁴ Some sites report only the percentage of bets placed, or are ambiguous. Sports Insights, LLC, the source of our data, makes it very clear that they provide the percentage of money wagered, which is what we use in this paper. See, e.g. “. . . Our Sportsbook Insider software now offers both betting ticket percentages and the percentage of actual dollars being waged on the spread, moneyline and over/under for each game.”

<https://www.sportsinsights.com/company/frequently-asked-questions-faq/#bettingpercentagesource>

⁵ All opening and closing totals on offer reported in this paper are the values bettors could get at the standard “natural” odds (-110). Other values may be available for better or worse odds, but the norm in college football (as opposed to other sports, including professional football) is to adjust to market activity via changes in the line, as opposed to “juicing” (i.e. changing the payout from -110 to another figure). A total of 3,272 games exhibited RLM, however 64 of those games were “pushes. Thus, there are 3,208 games used in the analysis which follows.

Change in line	-1.268	1.191	-7.5	0
Error in Spread	1.300	15.221	-50.5	49
Mean Abs. Dev.	12.055	9.379	0.5	50.5
RLM wins	0.479	0.500	0	1
# of observations	1474			

Variable	Mean	St. Dev.	Min.	Max
HTS≥60%	0.699	0.068	0.6	0.93
Opening line	-15.416	10.863	-58.5	26.5
Change in line	1.173	1.215	0	10
Error in Spread	0.055	16.055	-48	56
Mean Abs. Dev.	12.814	9.669	0.5	56
RLM wins	0.504	0.500	0	1
# of observations	1734			

It should be noted that we do observe RLM in some cases where the line change is zero. Such a lack of movement fits the overall description of RLM if there is widely imbalanced betting, because we would ordinarily expect the line to shift in response to such an imbalance (e.g. if 70% of the money were on the favorite, and the spread on offer had not changed, this would be considered an example of the RLM phenomenon).

Tests for Efficiency, or a Fair Bet, and Profitability

A simple test of efficiency is provided by Gandar, et al (1988), who examined the efficiency of sports wagering by testing whether the betting line generates a “fair bet.” A “fair bet” in the context of this football wagering is one which generates a 0.5 probability of covering the spread. Equating fairness with efficiency, the authors tested efficiency by jointly testing the intercept and slope coefficients in the following equation:

$$(1) T_1 = \beta_0 + \beta_1 VL_i + u_i,$$

where T = the actual scoring difference, and VL = the Vegas line (or spread). The authors tested the joint hypothesis of “fairness” that $\beta_0 = 0$, and $\beta_1 = 1$ (Gandar et al 1988), asserting that such a condition would indicate no profit as a result of the wagering.

We also utilize the log likelihood efficiency test employed by Even and Noble (1992), known as the fair bet test, as shown below:

$$(2) L^u = n[\ln(\hat{q})] + (N - n)\ln(1 - \hat{q}),$$

where n is number of covers, N is number of matchups, and \hat{q} is ratio of covers to matchups.

Because this method assumes that an efficient market means that $q=0.5$, we substitute 0.5 for \hat{q} , which yields the following likelihood ratio for the null hypothesis:

$$(3) 2(L^u - L^r) = 2\{n[\ln(\hat{q}) - \ln(0.5)] + (N - n)[\ln(1 - \hat{q}) - \ln(0.5)]\}$$

Paul and Weinbach (2005), then adapted that approach to test for the null hypothesis that a bet is not profitable (i.e., that it does not generate a “cover” more than 52.4% of the time), as shown in Equation (2):

(4) $2(L^u - L^r) = 2\{n[\ln(\hat{q}) - \ln(0.524)] + (N - n)[\ln(1 - \hat{q}) - \ln(0.476)]\}$
 The results from regressions using equation (1) and the likelihood ratio tests for fair bets, i.e., equation (3), and profitability, i.e. equation (4), are presented in the following section.

Results

The results of the simple test of efficiency, based on equation (1), are presented in Table 2. Thus, we note that we can reject the null hypothesis of efficiency. In other words, there is evidence that an RLM strategy can generate results different from a coin flip. That leads to further analysis of whether or not such a strategy is profitable.

Table 2. Simple test of efficiency - equation (1)

	Coefficient	F-stats	p-value	F-stat of $\beta_0=0$ and $\beta_1=1$	p-value
β_0	.847 (0.293)	8.36***	0.0039	5.19	.0056***
β_1	1.044 (0.019)	5.24**	0.0221		
<i>N</i>	3208				

Notes: * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

By disaggregating the data, we can determine more what is driving the inefficiencies. In tables 3 and 4, we show the results of the efficiency tests when we split the sample into those in which less than 40% of the money is on the home team, and those in which more than 60% of the money is on the home team in an RLM situation.

Table 3. Simple Efficiency Tests – Less than 40% of money on home team

	Coefficient	F-stats	p-value	F-stat of $\beta_0=0$ and $\beta_1=1$	p-value
β_0	1.045 (0.461)	5.13	0.0237**	5.96	0.0026***
β_1	1.044 (0.040)	1.17	0.2792		
<i>N</i>	1474				

Table 4. Simple Efficiency Tests – More than 60% of money on home team

	Coefficient	F-stats	p-value	F-stat of $\beta_0=0$ and $\beta_1=1$	p-value
β_0	0.276 (0.639)	0.19	0.6656	0.1	0.9008
β_1	1.016 (0.036)	0.19	0.6639		
<i>N</i>	1734				

Tables 3 and 4 clearly show that the primary driver of the inefficiency is the sub-sample where less than 40% of the money is on the home team. Thus, the RLM is intended to drive “square bettors” – the public - off the home side, so that the sharp bettors (and the casinos) can bet on the home team. The intercept term shows that the line is “off” roughly a full point in such cases. By contrast, as Table 4 shows, in the other part of the sample – where more than 60% of the money is wagered on the home team (indicating that the sharps and casinos are trying to get the public “on” the home team, so that the casinos can bet on the visitors) – the results suggest efficiency. We can further break down the wagers by month to evaluate the success of RLM as a strategy across the season, with respect to both fairness and profitability. In Tables 5, 6, and 7, we show the results, in aggregate, and broken out by month and by percentage of money on the home team.

The log likelihood test statistics, i.e. “Fair bet” and “No profits”, have a chi-square distribution with one degree of freedom. Note that the critical value is 2.706 for statistical significance at the 10% level. Test results in parenthesis indicate the value of the test statistic for betting against the strategy as the win percentage is less than 47.62%.

Table 5. RLM results by month

All	Games	Wins	Win %	Fair bet	No profits	MAD	MAD Stdev
August	89	47	52.81	0.281	0.007	14.343	10.732
September	917	452	49.29	0.184	-	12.206	9.607
October	1001	506	50.55	0.121	-	12.557	9.540
November	982	466	47.45	2.547	(0.011)	12.202	8.953
December	178	86	48.31	0.202	-	13.683	11.473
Dec 1-14	99	42	42.42	2.282	(1.077)	13.825	11.597
Dec 15-31	79	44	55.70	1.028	0.349	13.500	11.383
January	41	24	58.54	1.201	0.627	12.963	9.615
After Dec 15	120	68	56.67	2.140	0.888	13.315	10.768
Totals	3208	1581	49.28	0.660	-	12.465	9.543

Table 6. RLM results by month, > 60% on the home team

HTS≥60%	Games	Wins	Win %	Fair bet	No profits	MAD	MAD Stdev
August	67	36	53.73	0.373	0.049	15.142	11.326
September	567	271	47.80	1.103	-	12.465	9.534
October	487	252	51.75	0.594	-	12.666	9.473
November	457	234	51.20	0.265	-	12.621	9.053
December	121	61	50.41	0.008	-	14.219	11.976
Dec 1-14	58	27	46.55	0.276	(0.276)	14.822	12.407
Dec 15-31	63	34	53.97	0.397	0.064	13.645	11.624
January	35	20	57.14	0.717	0.320	13.743	9.649
After Dec 15	98	54	55.10	1.022	0.292	13.680	10.901
Totals	1734	874	50.40	0.113	-	12.814	9.669

Table 7. RLM Results by month, < 40% on the home team

HTS<=40%	Games	Wins	Win %	Fair bet	No profits	MAD	MAD Stdev
August	22	11	50.00	0.000	-	11.909	8.441
September	350	181	51.71	0.412	-	11.787	9.722
October	514	254	49.42	0.070	-	12.454	9.611
November	525	232	44.19	7.104	(2.483)	11.837	8.858
December	57	25	43.86	0.862	(0.324)	12.544	10.331
Dec 1-14	41	15	36.59	2.988	(2.033)	12.390	10.301
Dec 15-31	16	10	62.50	1.011	0.666	12.938	10.734
January	6	4	66.67	0.680	0.503	8.417	8.800
After Dec 15	22	14	63.64	1.657	1.136	11.705	10.247
Totals	1474	707	47.81	2.443	-	12.055	9.379

Here, it becomes evident that there are particular points at which RLM does drastically deviate from an efficient outcome – in both directions. Most notably, when the casinos are on the home teams (and thus, less than 40% of the public is), betting *against* RLM is a profitable play later in the season (significant at the 10% level). However, once we turn to the postseason (after December 15), we see that RLM is in general profitable. It seems noteworthy that the games in the postseason are played almost exclusively on neutral fields. Thus, overstating the homefield advantage may be a driver of the inefficiency. Also worth considering, however, is that the absolute error of the RLM lines when less than 40% of the money is wagered on the home team is 12.06 (see Table 1). This is not only an objectively strong mean absolute error (anything under 12.5 is considered strong), but also means that this is a more accurate forecast than either the full RLM sample, or the subsample where more than 60% of the money is on the home team. Thus, we must also consider the possibility that the failure of the RLM to be profitable in that circumstance (and indeed the fact that betting *against* RLM in certain circumstances when less than 40% of the money is on the home team) is simply an artifact of randomness or else of sample size.

Conclusion

In general, we find that using RLM in college football wagering is not a profitable strategy. However, there are some important exceptions. First, “fading,” or betting against, RLM in the latter weeks of the regular season (November and December 1-14) is actually profitable, when the RLM indicates sharp action on the home team. This is despite the fact that the forecasts generated by RLM are more accurate (MAD 12.06). That betting against the sharps when they are favoring the home team perhaps suggests that the sharp bettors are overestimating the effect of home field advantage. This is further supported by the fact that after the first two weeks of December, during college football’s postseason, RLM appears to be a very profitable strategy. A key difference is that nearly all postseason games take place on neutral fields. Thus, it appears that the sharp bettors and their quantitative models do a good job of evaluating the relative strength of the sides later in the season, but perhaps allow the location of the games to at times interfere with their forecasts.

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Covid, Social Well-Being, and Academic Performance

Donghyun Kim

I. INTRODUCTION

COVID-19

The COVID-19 pandemic has had a significant impact on the way humans use technology.

Social distancing measures have led to an increased need for technology. Students have had to adapt to full-time online classes (Gewalt et al., 2020), as traditional in-person meetings became impossible during the pandemic. Similarly, meetings in the workplace have transitioned to Zoom calls (Gewalt et al., 2020) for discussing important matters. The pandemic has forced people to become less social and rely more on technology. For instance, paying bills online via Wi-Fi has become the encouraged method. The pandemic has affected almost every aspect of life, requiring people to be more isolated and rely on technology for everyday needs.

The COVID-19 pandemic has negatively affected students' academic performance, with many struggling to adapt to online course materials while social distancing. Additionally, the pandemic has had a significant impact on individuals' social well-being. This research aims to examine three hypotheses: (1) social distancing is negatively associated with social well-being; (2) social well-being is positively associated with academic performance; and (3) social networking sites (SNS) moderate the relationship between social distancing and social well-being, such that a high level of SNS use weakens this relationship. This study suggests that social networking sites use may have a protective effect on mental health and positive impact of academic performance during periods of social isolation. In addition, social networking site use can help students maintain academic performance despite social distancing, educators and policymakers may want

to explore ways to encourage responsible use of these platforms.

II. LITERATURE REVIEW

1. SOCIAL WELL-BEING DURING PANDEMIC

1) Social Well-being

Social well-being can be identified as an individual's internal satisfaction with the quality of relationships within their life and how they evaluate their ability to function within their social environments (Li et al., 2022). A well-structured support system of family, friends and other professional associates is a positively improves an individual's emotional state (Li et al., 2022). According to Silva et al, mental well-being can be defined by two fundamental concepts: 1) human function, and 2) optimal development (Silva et al., 2021). Traditionally, academia has associated the term well-being as an emotional state of internal satisfaction with the "quality of one's life" (Lee et al., 2022). It is important to note that Silva et al (2022), highlight the importance of positive psychological features because they can reduce the severity of mental disorders (Silva et al., 2021). A strengthened sense of coherence, self-efficacy, self-esteem, positive affection, resilience, vigor, and extroversion combined can positively impact the emotional health of an individual (Silva et al., 2021).

2) Pandemic and Social Distance

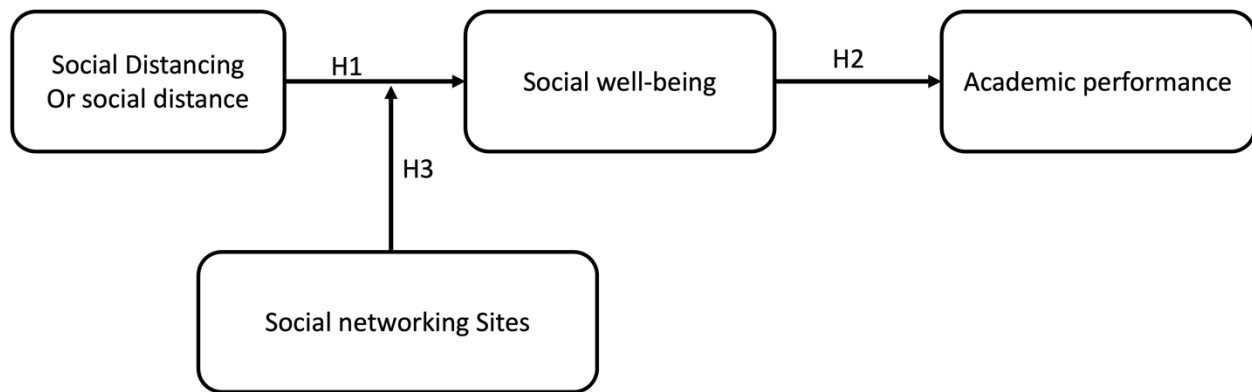
On March 11th, 2020, the World Health Organization declared Covid-19 a pandemic. The adverse effects of the virus were felt worldwide, and countries declared states of emergency (WHO, 2020). As reported by WHO, countries should seek to control the virus by implementing proactive emergency response programs focused on preventing the spread of the virus and saving

the lives of local citizens (WHO, 2020). Covid-19 was highly transmissible, and carriers of the virus were classified as symptomatic or asymptomatic (WHO, 2020). Asymptomatic carriers of the virus became a major concern to health officials as the virus continued to spread at a high rate, and this problem needed to be addressed efficiently and effectively (WHO, 2020).

To prevent the dispersion of infection, social distancing was implemented in countries around the world. The direct connection between the spreading of the virus and social activity led governments to enforce strict laws that prevented social interaction (Karasmanaki & Tsantopoulos, 2021). Lockdowns, curfews, and quarantines were imposed, and consequently, many companies closed indefinitely (Karasmanaki & Tsantopoulos, 2021).

As the adverse effects of Covid-19 increased globally, governments responded by restricting social activities. As a result, educational institutions such as universities and high schools closed temporarily (Loades et al., 2020). Students at the primary, secondary, and tertiary educational levels all experienced separation from professional and social network groups (Loades et al., 2020). Extended quarantines in isolation during the pandemic could be linked to negative psychological factors such as fear of infection from Covid-19, boredom, anger, and confusion (Loades et al., 2020). Loneliness is defined, drawing from Loades et al. (2020), as emotional distress experienced when there is a lack of consistency between actual and desired social attention. Currently, there is no clear association that links loneliness and quarantines. However, there is a plethora of information available on the connection between loneliness and mental health (Loades et al., 2020).

III. RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT



1. SOCIAL WELL-BEING AND SOCIAL DISTANCE

Traumatic life events can directly impact the mental state of people around the world. Trauma can lead individuals to experience common mental disorders like anxiety, depression, and stress, and these negative psychological effects are experienced by people worldwide (Silva et al., 2021). The Covid-19 pandemic has placed the world in a state of shock, especially negatively impacting professionals and students involved at the tertiary education level (Clabaugh et al., 2021). Social distancing, mask mandates, and transition to full online course curriculums were a few of the measures implemented to combat the spread of Covid-19 (Clabaugh et al., 2021). Covid-19 had temporarily ceased social interactions on a global level, causing students to feel fear and frustration (Karasmanaki & Tsantopoulos, 2021).

In the academic sectors of public health and epidemiology, there is no official agreed-upon definition amongst researchers for a term to define social connectedness (Wickramaratne et al., 2022). According to Wickramaratne et al., social connectedness is a blend of three main elements: social networks, social support, and absence of social isolation (Wickramaratne et al., 2022). The self-psychology theory highlights the importance of social characteristics such as companionship, affiliation, and togetherness that develop as people age (Rivera et al., 2022). Bronfenbrenner's Ecological Systems theory states that social connectedness consists of multiple

interactions in a person's lifetime that take place across diverse social environments such as neighborhood communities and family groups (Rivera et al., 2022). It is important to note that social networks and social environments have the power to shape and model the behavior of individuals (Rivera et al., 2022). Babies and toddlers have social interactions that consist more of family and authority figures, in comparison to adolescents who normally experience social interactions consisting of individuals around the same age group (Rivera et al., 2022). Social connectedness can have a positive impact on the well-being of an individual (Rivera et al., 2022). High amounts of social support for an individual generally lead to reduced levels of stress, high self-esteem, and the overall improved health of society (Humphrey et al., 2022). After the pandemic had taken place, many students reported experiencing negative psychological conditions such as fear about the uncertainty of the future and lack of human social interaction (Karasmanaki & Tsantopoulos, 2021). Undergraduate students would have been susceptible to high levels of anger and confusion as educational institutions closed, and traditional face-to-face courses transitioned to fully online classes (Karasmanaki & Tsantopoulos, 2021). Regardless of a student's socio-economic background, students tend to suffer from mental disorders such as insomnia, irritability, and fatigue in their daily lives (Silva et al., 2021). The Covid-19 pandemic exacerbated negative psychological conditions such as insomnia and irritability and negatively impacted the mental health of students, which led to poor academic performance (Silva et al., 2021) (Karasmanaki & Tsantopoulos, 2021).

Hypothesis 1: Social distance is negatively associated with social well-being.

2. SOCIAL WELL-BEING AND ACADEMIC PERFORMANCE

Academic performance is an important factor in measuring a student's success. According to Ito (2022), academic performance can be defined as the amount of success a student has in

understanding and processing information provided, as well as their ability to think creatively. Academic performance relies heavily on three main factors: cognitive, emotional, and behavioral engagement (Ito, 2022). Cognitive engagement refers to how well a person is able to think critically and creatively during a learning process. Emotional engagement refers to how a student feels toward the learning process. Behavioral engagement is a combination of cognitive and emotional engagement that defines the academic behaviors of students. Of those three factors, behavioral engagement has the most direct impact on the academic performance of a student in a collaborative setting (Ito, 2022).

The importance of social communities contributing to the positive success of academic performance has piqued the interest of researchers in recent years (Wagner et al., 2022). Student engagement, retention, and integration contribute to improving academic performance (Lenning & Ebbers, 1999, as cited in Ma-Kellams & Kwon, 2021). Social networks establish healthy group activity and engagement through classrooms, course curriculums, and sometimes in student housing areas. Additionally, social networks influence students' academic performance in a positive manner (Perdomo et al., 2022). Family bonds and social communities have the potential to act as buffers against mental disorders such as stress and anxiety (Masten & Monn, 2015, as cited in Ma-Kellams & Kwon, 2021). Social networks add value to a student's well-being by helping to improve their communal strength and resilience in the face of adversity.

Hypothesis 2: Social well-being is positively associated with academic performance.

3. SOCIAL NETWORK SITES

As technology evolves, it continues to improve in efficiency and so do various forms of online communication. Social network sites are increasing in popularity as it allows members to create unique profiles and express personal opinions on their public platforms (Kuss and Griffiths 2011,

p. 3529, as cited in Nie et al., 2020). The increased usage of SNSs has drawn concern from researchers who describe the behavioral overuse of SNSs as an addiction or problematic (Hussain and Griffiths 2018; Andreassen 2015; Griffiths 2013, as cited in Nie et al., 2020). Problematic SNS usage can be described as developing an unhealthy dependency on SNS that negatively affects a person's social well-being (Andreassen and Pallesen 2014, p. 4054, as cited in Nie et al., 2020). It is important to note that the amount of time spent browsing social network sites is directly related to the state of a person's wellbeing (Bhaskara et al., 2020). As the desire to be part of an online community increases, social media users tend to rely on social network sites to enhance their happiness or mental wellbeing (Bhaskara et al., 2020). In addition, users of SNSs fall into a common dilemma of social comparison and this is becoming more of a frequent theme amongst social users (Wirtz et al., 2020). The main idea behind this dilemma is that social media users portray embellished positive features of their lives, and this leads to others negatively judging their own lifestyles (Wirtz et al., 2020).

While there have been concerns about the potential negative effects of excessive SNS usage, research suggests that SNSs can have a positive moderate impact on the relationships between social distancing and social well-being. SNS use can enhance social connectedness and provide emotional support, particularly during times of social distancing. SNS use is associated with higher levels of social support, which can help reduce stress and improve overall well-being (Lee et al., 2020; Yan et al., 2021). Furthermore, SNS use provide opportunities for individuals to engage in virtual social interactions, which can help maintain social connections and reduce feelings of isolation and loneliness (Ellison et al., 2014).

Moreover, SNS use provides opportunities for entertainment and distraction, which can help alleviate negative emotions associated with social distancing. SNS use is associated with

increased positive affect and decreased negative affect, particularly when individuals engage in passive forms of SNS use such as browsing and consuming content (Hsu et al., 2019; Lin and Utz, 2015). Thus, this research suggests that SNS use positively moderates the relationships between social distancing and social well-being.

Hypothesis 3: Social network sites will moderate the relationship between the social distance and social well-being such that high levels of social network sites will weaken this relationship.

IV. RESEARCH DESIGN AND METHODOLOGY

In this section, we describe the participants, their selection, the instrument and validation, and the data collection process. To conduct our research, we used a structured survey method. We created a questionnaire that was administered to university students who had social network profiles. A series of surveys was used to collect data from university students and 108 users in fill out the survey and a total of 103 completed surveys were collected. Table 1 shows demographic information about the respondents.

Table 1: Respondents Demographics

Demographics	Frequency (percentage)
AGE	
Under 20	2 (1.9%)
20-29	89 (86.1%)
30-39	7 (6.9%)
40-49	3 (2.9%)
50-59	2 (1.9%)
Gender	
Male	41 (40%)
Female	62 (60%)

SCD: Social distancing; SWB: Social well-being; USNS: Usage of social networking sites; PER: Academic performance;

Cronbach's alpha was used to assess the reliability of the measures (as shown in Table 2). For most variables, the Cronbach's alpha values were .70 or greater, indicating that the measures were reliable. Table 3 presents descriptive statistics, internal consistency reliabilities (ICR), the average variance extracted (AVE), and a correlation matrix for all constructs in the study. These findings supported the reliability of the constructs. The factor loadings for all constructs were greater than .65, further indicating the reliability of the measures. The square root of AVEs for each construct in Table 2 were greater than the inter-construct correlations, supporting both convergent and discriminant validity (Komiak & Benbasat, 2006).

Table 2: Composite Reliability and Cronbach's Alpha

	Number of items	Composite reliability	Cronbach's alpha
SCD	4	0.78	0.82
SWB	6	0.67	0.64
USNS	4	0.86	0.83
PER	4	0.92	0.89

SCD: Social distancing; SWB: Social well-being; USNS: Usage of social networking sites; PER: Academic performance;

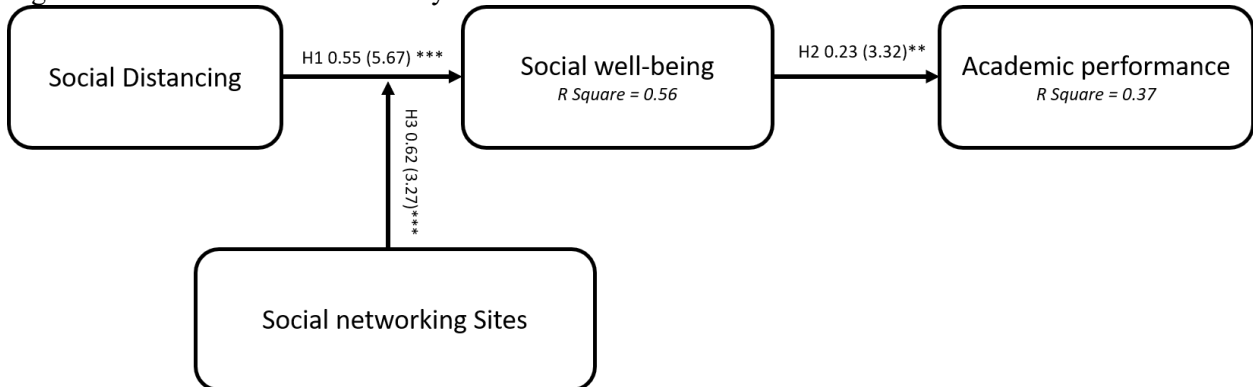
Table 3: Descriptive Statistics, Correlations, and Reliabilities

	SCD	SWB	USNS	PER
SCD	0.7701			
SWB	0.3394***	0.7825		
USNS	0.5782***	0.5628***	0.8699	
PER	0.7538***	0.6272***	0.7519***	0.6883

1. SCD: Social distancing; SWB: Social well-being; USNS: Usage of social networking sites; PER: Academic performance;
2. *** $p < 0.001$
3. Diagonal elements are the square root of the shared average variance extracted (AVE) between the construct measures and their measures; off-diagonal elements are correlations between constructs.

The data analysis for this study utilized PLS (partial least squares) through SmartPLS V3. Structural equation modelling (SEM) was selected over regression analysis because it allowed for the analysis of all paths in one model. PLS was chosen over LISREL because the aim of the study was theory development rather than theory testing, and PLS is suitable for exploratory research. To test the PLS model, we employed a bootstrapping method with 200 randomly selected subsamples. The results of the PLS analysis are presented in Figure 1. As hypothesized, social distancing was significantly and negatively related to social well-being ($\beta = 0.55$, $p < 0.001$). Additionally, social well-being were positively and significantly related to academic performance ($\beta = 0.23$, $p < 0.005$). Lastly, usage of social networking sites as a moderator weaken the relationship between social distancing and social well-being ($\beta = 0.62$, $p < 0.001$).

Figure 1: Results of PLS-SEM Analysis



1. Path coefficient (t-statistics)
2. *** $p < 0.001$, ** $p < 0.005$
3. sample size: $n=103$

V. IMPLICATIONS

This research has three implications that can be drawn from the results of this study. First, the Covid-19 pandemic has had a negative impact on social well-being globally due to social isolation resulting from social distancing mandates. This result suggests that long periods of social isolation are detrimental to the mental and physical well-being of most humans. High levels of academic performance and success are directly linked to having a balanced state of emotional and physical well-being. Furthermore, this implication highlights the importance of obtaining a well balanced well-being in order to achieve high levels of academic success.

In addition, one theoretical implication is that the results of this study suggest that positive academic performance can be achieved by better understanding the concept of social well-being. This study suggests that academic performance is dependent upon a healthy social well-being of an individual.

Last, another theoretical implication is that this study builds upon the UTAUT theoretical model by identifying how high levels of social media use can negatively impact social well-being. It is important to note that there is more research that needs to be done, however this study suggests that high usage of social media has adverse effects on human social well-being.

VI. CONCLUSION

This research examined three main concepts. Firstly, it analyses the impact of social distancing and how it is negatively associated with social well-being. Secondly, we study how social well-being is positively associated with academic performance. Lastly, this study identifies how high level of social network sites use weakens the relationship between social well-being and social distancing. The current research has identified the importance of having a healthy well-being and

how it can impact an individual's social life. The Covid-19 pandemic had negative effects on the well-being of most people. Social distancing was the main culprit driving the lack of social interactions as governments limited the movement of most people. Social Network Sites helped to negate the impact of social distancing; however, high usage of social media tends to have a detrimental effect on social well-being.

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TECHNOLOGY DEPENDENCE

As technology advances in society, the usage rate of technology has increased, and newly developed technology makes life easier for adults and children. A person's need for technology can vary depending on various demographic factors such as age, occupation, and health status

(Concordia St Paul, 2022). Kids and young adolescents are being exposed to technology at very young ages. Data Analysts, software developers, and network security specialists would have a higher technology dependence in comparison to a profession (Spratling et al., 2015). The health status of a person can affect their dependence on technology, the advancement of medical science has been saving the lives of many people over the years (Spratling et al., 2015). There is no doubt that technology improves our daily life. However, the overuse of technology has been linked to having side effects that are like substance abuse. When technology dependence is too high, and classified as addictive, people who overuse technology tend to experience adverse effects such as lack of socialization, lower productivity, and lower grades (Concordia St Paul, 2022). As a result, loneliness and depression is also linked to individuals that have a strong technology dependence (Concordia St Paul, 2022). There is nothing wrong with using technology, however gauging how technology is used can improve the chances of preventing a strong dependence on technology.

Similarly, mobile phone dependency is becoming more important to address in our society. Mobile phone dependency is defined as the long-term effects experienced from over usage of mobile phone technology. Young adolescents using their cellphone consistently every day for entertainment purposes can be at risk for experiencing psychological or emotional behavioral problems (Concordia St Paul, 2022). Overusing a mobile device is similar with the negative effect of exposure of a substance on human. Nomophobia is a term used to describe the behavioral dependence of smart phone usage. When people aren't connected with their mobile devices, they tend to experience anxiety and stress because they are away from their phones (Concordia St Paul, 2022). Previous studies suggest that there must be more work done to identify and address this problem that is increasing in society (Concordia St Paul, 2022).

ACADEMIC PERFORMANCE

Traditionally students learn in a social setting where a group of them engage in learning activities. However, the pandemic temporarily made learning more isolated and strictly online based as a result some students' academic performances suffered (Gewalt et al., 2020). A key determinant of academic performance depends on student's attitude and perception towards an online learning environment (Chen, Lou, and Luo 2002, as cited in Kosiba et al., 2022). A positive attitude towards virtual learning tends to lead to better academic performance (Kosiba et al., 2022). Globally, students in different countries would have faced several challenges such as access to the internet, the speed of the internet and access to adequate technology to complete online assignments (Almomani & Almomany, 2021). Regardless of challenges that students faced, some students reported that they were able to retain new learning skills with the aid of technology during the pandemic (Almomani & Almomany, 2021).

Is It Matter To Be A First Entrant? Cultural Analysis Of Pioneering Advantages

Sungwoo Jung

ABSTRACT

From the buyers, most of pioneers look to have a positive image infused with innovativeness and progressiveness, while later entrants are stuck with a copycat image, which tarnishes the appeal of their products and hinders the firm's performance. It is because pioneers have often been to offer products of higher quality, on average, than those of later market entrants. The long-term orientation culture influences buyers because pioneers are believed to have the longest market experience in the market. Buyers in the short-term orientation culture are concerned only with the options and outcomes of the current period, whereas buyers in the long-term orientation culture focus on achieving future goals and are concerned with both current and future outcomes. In this paper, it is proposed that buyers' intention to purchase early entering brands will be higher in the long-term orientation culture than in the short-term orientation culture.

INTRODUCTION

Pioneering a new market is widely considered to be a cause of success. Several studies demonstrated an order-of-entry effect on market share, profitability, and even on stock price. This indicates that pioneers outperform later entrants (for detail, see Garcia-Villaverde, et. al. 2017). Studies also provide various sources for pioneers to have advantages over later entrants, such as preemption of assets, technological leadership, and buyer's switching costs.

However, some research pointed out the limitations of these studies and argued that it is not the pioneer but later entrants that have more advantages (Golder and Tellis 1993). These 'later mover advantages' theories include: free-rider effects when a late entrant can acquire the same technology at a lower cost; good opportunities for successful late entry with technological discontinuities; changes in consumers' tastes; changing resource requirements and incumbent inertia; and improper positioning missing ideal point in attribute space (Lieberman and Montgomery 1988).

In order to overcome the limitations of studies on pioneering advantages, the concept of 'Perceived Pioneering Advantages (PPA)' has been suggested (Jung 2002). Unlike previous studies which are based on pioneers or later mover, this study approaches from buyers' perspective. The buyers' perception of the object firm's order of entry is more important than the fact that the company is a pioneer.

CULTURAL ANALYSIS

"Culture," defined as a society's personality or as the glue that binds people together, involves the study of one's value and beliefs, their ideas and attitudes, and the study of symbols and objects that are used as methods of communication (Gregory, Munch, and Peterson 2002). The culture of the national environment in which an organization operates significantly affects buyers' behavior in marketing. Hofstede's framework (2001) for understanding national differences has been one of the most influential and widely used frameworks in cross-cultural business studies (Eckhardt 2002). Especially these frameworks can be useful to business researches if the goal of the research is to compare actual behavior at the countrywide level.

In cross-cultural research, following five dimensions of the culture are frequently used.

1. Uncertainty avoidance – a society's tolerance of the unpredictable;

2. Power distance – a society’s acceptance of the unequal distribution of power;
3. Individualism/collectivism – the extent to which the interests of the individual prevail over the interests of the group within a society;
4. Masculinity/femininity – the relative strength of masculine vs. feminine values in a society; and
5. Long-term/short-term orientation.

LONG-TERM ORIENTATION AND PIONEERING BRANDS

Long-Term Orientation dimension was originally named as “Confucian Dynamism”, because the value related to it, both on the positive and on the negative side. On the “dynamic” side one finds values oriented towards the future, like thrift (saving) and perseverance. On the opposite side one finds values rather oriented towards the past and present (Hofstede 1994). China, Hong Kong, Taiwan, Japan, and South Korea score high. Most Western countries, like USA and Great Britain low.

From the buyers, most of pioneers look to have a positive image infused with innovativeness and progressiveness, while later entrants are stuck with a copycat image, which tarnishes the appeal of their products and hinders the firm’s performance. It is because pioneers have often been to offer products of higher quality, on average, than those of later market entrants.

Buyers in the short-term orientation culture are concerned only with the options and outcomes of the current period, whereas buyers in the long-term orientation culture focus on achieving future goals and are concerned with both current and future outcomes. In this paper, it is proposed that buyers’ intention to purchase early entering brands will be higher in the long-term orientation culture than in the short-term orientation culture

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A Historical Analysis of Accounting Salaries as a Key Factor in the Staffing Crisis

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Data Availability: Data are available from the public sources cited in the text.

Keywords: accounting salaries, salary gap, salary trends, competitive salaries.

ABSTRACT

The accounting profession is facing a staffing crisis. Addressing the causes for the decline in the number of accounting professionals and collegiate accounting majors is a multifaceted problem. To remain competitive and overcome the staffing shortage, the accounting profession must analyze the causes and make appropriate adjustments. To this point, in February 2023, the American Institute of Certified Public Accountants (AICPA) issued a draft plan that tackles eight root causes that are negatively impacting the accounting talent pipeline. Interestingly, salary challenges are not included in the eight root causes examined by the AICPA's plan. This article analyzes the history of accounting salaries as a possible contributing factor to the decline in the number of accounting professionals in the hiring pool. The analyses include a review of accounting salary trends for a 20-year period (2001-2021) and a state-by-state comparison of accounting salaries to salaries offered in similarly-skilled professions. Nationally, the findings confirm an unfavorable trend in real-term median salary growth rates for accounting positions. On the state level, when comparing the 2021 accounting salaries to the salaries of similarly-skilled professions, the accounting salaries, in all but a few cases, are lower. If slower salary growth rates and lower actual accounting salaries persist over time in comparison to similarly-skilled professions, this will exacerbate the current staffing crisis as even more employees choose to leave the accounting profession for more lucrative external opportunities that increasingly offer better work/life balance (Ellis 2022; Iacone 2022). A further concern for the profession is the negative impact this salary deficit will have on the selection process of incoming college students who may opt into better paying majors that do not require 150 hours of college credits or a rigorous professional certification exam. Finally, the article concludes with recommendations for firms and the profession to stem turnover and create a robust talent pipeline into the accounting profession.

I. INTRODUCTION

The accounting profession is facing a staffing crisis. Recent mainstream media publications have highlighted the decline in the number of accounting professionals and the resulting staffing challenges facing the accounting profession (Ellis 2022; Iacone 2022; Svaldi 2022; Galbreath et al., 2023). Adding to the current staffing shortage is the nationwide decline in accounting majors (Dawkins and Dugan 2023) that will continue to perpetuate the accounting staff shortage for years.

Addressing the causes of the decline in accounting professionals and accounting majors is a multifaceted problem. To remain competitive and overcome the staffing shortage, the accounting profession must analyze the causes and make appropriate adjustments.

In early 2023, the American Institute of Certified Public Accountants (AICPA) issued the AICPA Pipeline Acceleration Plan. This plan outlines a set of actions to address the root causes of issues that are negatively impacting the accounting talent pipeline. The initial eight areas addressed in the plan include: Experience, Learn & Earn Program; 30-hour communication campaign; Extending the 18-month exam window; Addressing jurisdictional inconsistencies for initial licensure; High school and college strategies; STEM recognition; AICPA Foundation; and Stakeholder calls to action. While all of these areas address significant issues hampering the accounting talent pipeline, one obvious area not included in these eight topics is the impact of accounting salary conditions.

This article analyzes the history of accounting salaries as a possible contributing factor to the decline in the number of accounting professionals in the hiring pool. The analyses include a review of accounting salary trends for a 20-year period (2001-2021) and a state-by-state comparison of accounting salaries with salaries offered to similarly-skilled professions. Finally, suggestions for accounting firms and the accounting profession are provided to address the salary

gap in the marketplace.

II. DATA SOURCE

To review historical salaries, data were collected from the Bureau of Labor Statistics Occupational Employment Statistics (OES) survey for the following salary categories: Accountants and Auditors, Computer and Mathematical Occupations, Personal Finance Advisors and Financial Analysts. The Computer and Mathematical Occupations, Personal Finance Advisors and Financial Analysts were selected as comparison groups because they are similarly-skilled professions to Accountants and Auditors. For the analyses the selected salary data were adjusted for inflation based on the appropriate regional Consumer Price Index (CPI) using 2015 as the base year. CPI regional data were retrieved from the Bureau of Labor Statistics CPI database. Using the inflation-adjusted salary data allows comparisons to be made across all years in the analysis to determine the real dollar change in salary over time. All data analyses used the median salary data point because it is less subject to distortion due to extreme salary ranges in the data.

III. NATIONAL SALARY COMPARISON WITH SIMILARLY-SKILLED PROFESSIONS

There is some indication that the decline in the number of accounting professionals is due in part to the increasingly competitive salaries and more desirable work environments offered in other similarly-skilled professions (Iacone 2022; Dawkins and Dugan 2023). To examine this concept, Exhibit 1 reviews the salary growth rates for Accountants and Auditors and three other similarly-skilled professional groups (Computer and Mathematical Occupations, Financial Analysts and Personal Finance Advisors) for two periods: 2001 to 2021 and 2009 to 2021.

In the 20-year period from 2001 to 2021, Accountants and Auditors had the largest growth in median real-term salary (10.67%) when compared to other similarly-skilled professions. The

real-term growth in the median annual salary for Accountants and Auditors between 2001 and 2021 was about \$6,837 in 2015 dollars. While at first glance this growth rate appears somewhat favorable for the accounting profession, a less favorable picture emerges for the accounting profession when looking at the salary growth after 2008.

Exhibit 1 includes salary growth rates for 2009 to 2021 to examine growth rates in the median salaries after the 2008 recession. From 2009 to 2021 the real-term growth in median annual salary for Accountants and Auditors was an anemic 1.35%, or only \$908 in 2015 dollars. This implies that most of the salary growth for Accountants and Auditors occurred in the pre-2009 era. A reasonable explanation is that salary growth before 2009 was mainly driven by the increased demand for accountants due to the enactment of the Sarbanes-Oxley Act in 2002. Meanwhile from 2009 to 2021, the comparison professional groups saw mixed results for the median salary growth rates. Computer and Mathematical Occupations and Personal Financial Advisors saw healthy growth in real-term median salary of 5.76% and 8.91% and in real-term growth in 2015 dollars of \$4,779 and \$7,024, respectively. On the other hand, Financial Analysts saw a decline in real-term growth from 2009 to 2021 of -1.59% with a real-term change in 2015 dollars of -\$1,285.

The stall in salary growth for Accountants and Auditors since 2008 may be one factor that explains the present competitive environment for accounting professionals. This stagnant salary growth rate for accountants in more recent years is concerning, especially in times of declining college enrollments, declining accounting graduates and higher salaries being offered in similarly-skilled professions. This potent mix of factors has likely exacerbated hiring challenges in the profession today.

While this national picture, especially in the more recent years, may appear bleak, taking a look

at the state-by-state salary growth rates and current salary data may identify leaders and laggards, states that perform better or worse in their salary growth rates and in accounting salaries offered as compared to salaries in similarly-skilled professions.

IV. STATE BY STATE SALARY PICTURE FOR ACCOUNTANTS AND AUDITORS

To explore the state salary issue, Exhibit 2 examines the real-term median salary growth rate from 2001 to 2021 for the Accountants and Auditors category in all 50 states and the District of Columbia. As illustrated in this map, dark green states had the greatest growth in real-term median salaries, light green states had moderate growth and yellow states had the least or even negative growth. As this map illustrates, there are states in each region of the country that are at the top, middle and bottom of the real-term median salary growth rates. As a general comparison point, over the 20-year period from 2001 to 2021, the national growth rate in the real-term median salary for Accountants and Auditors grew by 10.67 percent.

A review of Exhibit 2 reveals clear laggards and leaders in terms of the growth rate over this period. While most states have seen some level of growth over the 20-year period in real-term median salaries for Accountants and Auditors, 25 states were below the 10.67 percent national growth rate of the Accountants and Auditors category. States on the lower end of the salary growth rates include Alabama which was flat with a 1.44% growth rate and six states (Kansas, Tennessee, Florida, Nevada, Connecticut, and Vermont) that experienced a decline in the real-term median salary for Accountants and Auditors during this period. On the other hand, several states were clear leaders with growth rates above 20 percent: Montana (28.57%), North Dakota (24.59%), District of Columbia (24.20%), Arizona (23.34%), Oklahoma (21.04%) and New York (20.40%).

While salary growth is always beneficial, until these growth rates are interpreted in light of the current salary levels versus salaries offered in similarly-skilled professions in each respective

state, the picture is not clear. For example, higher salary growth rates in a state may or may not equate to competitive salaries when compared to similarly-skilled professions within the state or even accounting salaries in neighboring states. Some states with significant salary growth rates may still be relatively underpaying their accounting professionals.

Table 1 provides a state analysis of the 2021 Accountants and Auditors' median salary as well as comparison with the 2021 median salaries for three similarly-skilled professional groups. This state-by-state comparison provides accounting firms in each state with one indicator of their present competitive environment relative to the similarly-skilled in-state professions. It also reveals the highest and lowest paying states in 2021, which may in and of itself be either a source of competitive advantage or disadvantage to the respective firms within each.

The data provided in the second column of Table 1 presents the 2021 nominal median salary for Accountants and Auditors for each of the 50 states and the District of Columbia and is arranged with the highest salaries at the top and the lowest at the bottom. Next, columns three through five display the 2021 nominal median salary for Accountants and Auditors as a percentage of the 2021 nominal median salary for each of the three professional categories.

In most cases, the data confirms that 2021 accounting salaries across the country are not competitive with salaries in other similar-skilled professions. A review of columns three through five reveals only 10 states (12 instances) where the 2021 nominal median salary for Accountants and Auditors is higher than the 2021 nominal median salary for one or more of the similarly-skilled professional categories. These 12 instances are indicated in red font in Table 1. In these few instances and in states where the accounting salary percentages are 90% or greater, accounting firms may experience less intense competition in hiring and retaining talent. The inverse of this also holds, that firms located in states with lower percentages in columns three

through five may experience more intense competition in hiring and retaining accounting talent. For example, although the state of Washington has the seventh highest 2021 nominal salary of \$79,680 for Accountants and Auditors, firms in this state may still experience stiff in-state competition for accounting talent because of the relatively low pay of accountants when compared to the salaries of similarly-skilled professional groups in the state. On the other hand, firms in West Virginia, which has only the 34th highest 2021 nominal salary of \$62,980, may face less in-state competition for accounting talent because of their relatively high salary levels as compared to the salaries of similarly-skilled professional groups in the state.

A primary concern is that if lower accounting salaries persist over time in comparison to similarly-skilled professions, this will contribute to even more employees choosing to leave the accounting profession for more lucrative opportunities that also permit for a more even work/life balance (Ellis 2022; Iacone 2022). A further concern for the profession is the impact of this salary deficit on the selection process of incoming college students who may opt out of majoring in accounting at the freshman level in favor of better paying majors in similarly-skilled professions. When alternative majors have the potential to provide higher salaries than accounting, yet do not require 150 hours of college credits or a rigorous professional certification exam, they are likely to appear increasingly enticing.

V. WHAT CAN ACCOUNTING FIRMS DO TO ADDRESS THE SALARY CHALLENGES?

Many accounting firms recognize this issue and are already starting to address salary challenges. For example, in 2022 many KPMG employees received three pay increases (Ellis 2022). Another way to attract new hires, beyond just straight compensation, is to award them paid time off to study for the CPA exam. While this may seem extreme, it is exactly the program that KPMG launched with its CPA Kickstart Program. This program allows new employees two months of

paid study time with benefits (Sweeney 2023). In a recent interview, Vic Alexander, CPA, ABV, CFF, chief manager for KraftCPAs in Nashville, TN stated, “Talent acquisition is highly competitive. We have no choice but to meet market compensation demands and pass [on] these costs to our clients.” Alexander expects starting salaries in his region to increase to about \$70,000 in the next three to five years. Jimmy Jobe, CPA, CGMA, managing partner for Jobe, Hastings & Associates in Murfreesboro, TN is of a similar mindset and offered that, “in the next three to five years, I can see [starting salaries] increasing to a range of \$60,000 to \$65,000.” As for current employees, Jobe predicted a five to seven percent increase in salaries and wages within the next 12 to 18 months. This is on top of the last raise cycle at Jobe Hastings where wages were increased “by a larger percentage than has been the case in many years.” Similarly, Alexander said that KraftCPAs has already started addressing inflation’s impact on the salaries of their current employees “and [we] will have to continue until inflation or demand for talent declines.” Alexander expects salaries to experience a “greater than a normal increase” in most cases in the next 12 months.

The following are recommendations for accounting firms to address these salary issues. While some of these measures may require a multi-year plan to fully achieve, there are other actions that can be implemented now to enhance recruiting and retention efforts.

1. **Identify the competitive market.** Firms should consider both geographic location and similarly-skilled professions when determining their competitive markets. With the possibility of remote work becoming an increasingly viable option, firms may find that their competitive market for talent has now expanded to include a larger geographic region. In addition, accounting employers may also see competition for employees who are selecting more attractive positions from non-accounting industries. Therefore, it may

be beneficial for firms to review the salaries offered by similarly-skilled professions in their region. This knowledge will allow firms to adjust their own offers in response to the broader competitive market in their region. A more complete understanding of the competitive landscape will also enable firms to target their recruiting efforts for remote workers to states where they enjoy significant salary advantages.

2. **Review the salary structure.** Offering a competitive salary is essential in this competitive market. Firms should regularly review their salary structure for both potential and existing employees to ensure that it is aligned with the firm's competitive market. With the prevalence of online salary databases such as Glassdoor, ZipRecruiter, Indeed, Salary.com and others, employees and employers have easy access to salary ranges by job title, industry sector and region or state. Access to this information provides instant salary comparisons, which in the past were difficult if not impossible, for both employees and employers to obtain. Knowing the competitive salary ranges in a given region provides firms with valuable information that is useful in both the recruiting and retention process and helps ensure that offers are competitive and existing salary levels are appropriate.

In addition, firms that recruit remote employees may want to consider adjusting salary offers to align with the cost-of-living rates in the employee's home locale. For example, if a North Carolina firm hires a remote employee whose home base is in Tennessee, it may consider offering median salaries closer to the Tennessee (\$62,680) average versus offering median salaries in the \$77,030 range for employees physically based in North Carolina.

3. **Create an ongoing salary improvement program.** Once salary information is collected and reviewed, create a three to five-year salary plan to address any identified salary gaps. Some firms find it helpful to use mid-year market-based salary increases to retain talent rather than just relying on traditional annual salary evaluations. This cannot be a one-time static plan, but instead must encompass the creation of an on-going compensation program that continuously surveys the competitive landscape and quickly adjusts to the competitive environment.
4. **Consider one-time monetary improvements.** If a permanent change to the salary structure is not possible at this time, consider offering other one-time monetary benefits such as signing bonuses to new employees and performance bonuses to existing employees. Especially in times when inflation is increasing, any additional monetary benefits would help offset the lower purchasing power of the employees' regular salary dollars and signal their value to the firm. Signing bonuses for internships, once rare, are now becoming increasingly common in tight markets. Firms should structure their internship programs so that they specifically identify and incentivize repeated internships with high-quality interns over the course of their undergraduate education. This program will help firms land prized recruits who are able to immediately contribute to the firm at an accelerated pace once their academic courses are complete. After a student has completed multiple internships with the same firm, the new employee is much more akin to staff level employees than new recruits straight out of school.
5. **Prepare your clients.** All of these changes will impact client relationships for CPA firms. Whether by a possible increase in billing or in the client's interaction with more remote staff, clients also need to be prepared for these changes. Jobe stated, "We are

trying to slowly increase billing rates to compensate for increasing costs. It is not really possible to increase rates as quickly as costs are increasing since we might encounter some resistance from clients.” It is not too early to begin conversations with clients so that they understand the reasons for the changes and are more likely to partner with you as your firm’s practice evolves in the coming months and years. This should also include an evaluation of existing clients for profitability. Long-standing relationships may need to be severed to create room for more profitable clients who can help cover the increasing salary costs.

6. **Embrace Technology.** Embrace technology that can financially propel firm growth and profitability. Effective use of artificial intelligence (AI) and other technology products permit firms to automate mundane accounting tasks and free employees so they can provide higher value advising, work products and exceptional customer service. This enables firms to do more with less overhead. Employee job satisfaction will increase, turnover will diminish, and compensation for these more value-added activities will likely rise, making the accounting salaries more competitive with the similarly-skilled professions.

VI. WHAT CAN THE ACCOUNTING PROFESSION DO TO ADDRESS THE SALARY CHALLENGES?

Some of the barriers to the profession can only be addressed at the national or state level, such as the 150-hour education requirement and the CPA Exam structure and policies. There are also other things that state and national accounting professional organizations can do to help specifically with salary challenges. The following are recommendations.

1. **Salary reports.** It would be helpful to firms, especially smaller ones, if there were regular surveys on both accounting salaries and salaries in near-peer comparison

professions. This information would enable firms to track current and anticipate future salary trends, and in turn aid in the development of appropriate salary offers and desirable benefit packages.

2. **Marketing campaigns.** The profession must inform and educate high school and college-age students on the important role accounting plays in our society. State and national professional accounting organizations should take the lead in producing and distributing these marketing campaigns. And as salary conditions improve in the profession, this too, needs to be openly communicated. The old saying goes that “perception is reality.” This saying emphasizes that an incorrect perception can misinform potential employees about the accounting profession. The profession needs to take control of its narrative to effectively share its vision. In short, the narrative must change in order to attract the best and brightest minds into our profession.
3. **Pipeline monitoring.** National accounting associations provide valuable reports on trends in accounting enrollment and CPA Exam pass rates. This information is helpful in describing the current state of the accounting pipeline. In addition to these status reports, activities to systematically survey high school and college prospects in the accounting pipeline and regularly report on the factors impacting their decisions to major or not major in accounting would be beneficial. This information can be used by the professional associations, accounting firms and accounting faculty to address the required changes and attract more students in the accounting pipeline. On the other end of the spectrum, professional associations must also keep a close watch on the attrition rate from retirements. Raising the question of continuing mandatory retirements and perhaps whether this is a model that has outlived its benefit.

4. **Improve professional image.** Negative perceptions exist about accountants and the accounting profession. Sadly, many of these perceptions are realistically based. Work-life balance and competitive salaries remain elusive goals in the profession. The stress levels that come with most accounting work and the shortage of qualified personnel are all real issues. Accountants have long been typecast as boring individuals, working in a tired profession. These negative narratives must change quickly if the goal is to attract more people to the profession. Changing the narrative to a truthful but more positive one is essential. The accounting profession attracts dynamic individuals who are tech savvy, have an eye for detail and are experts in solving complex problems and puzzles. As firms address the work-life balance and salary issues, these more positive narratives need to be publicized as well. Providing and publicizing this more positive narrative about the accounting profession is an important endeavor that is best led at the national level.

VII. CONCLUSION

The information presented in this article shows that there is some variation in both the real-term median salary growth and the nominal median salary offered for accounting positions across the country. Some of the national variation in salaries is expected due to the differences in the regional cost of living. For example, the cost of living in New York is different from that in Mississippi. However, when comparing the 2021 accounting salaries in a state with the salaries of similar professions in the same state, the accounting salaries, far too often, are lower when compared to jobs that require similar skills and interests.

This tight market for accounting professionals is expected to continue for some time. The AICPA's master plan to tackle this talent gap addresses eight issues and aims to help shore up and increase the accounting pipeline. But unfortunately this plan has a glaring weakness, salary

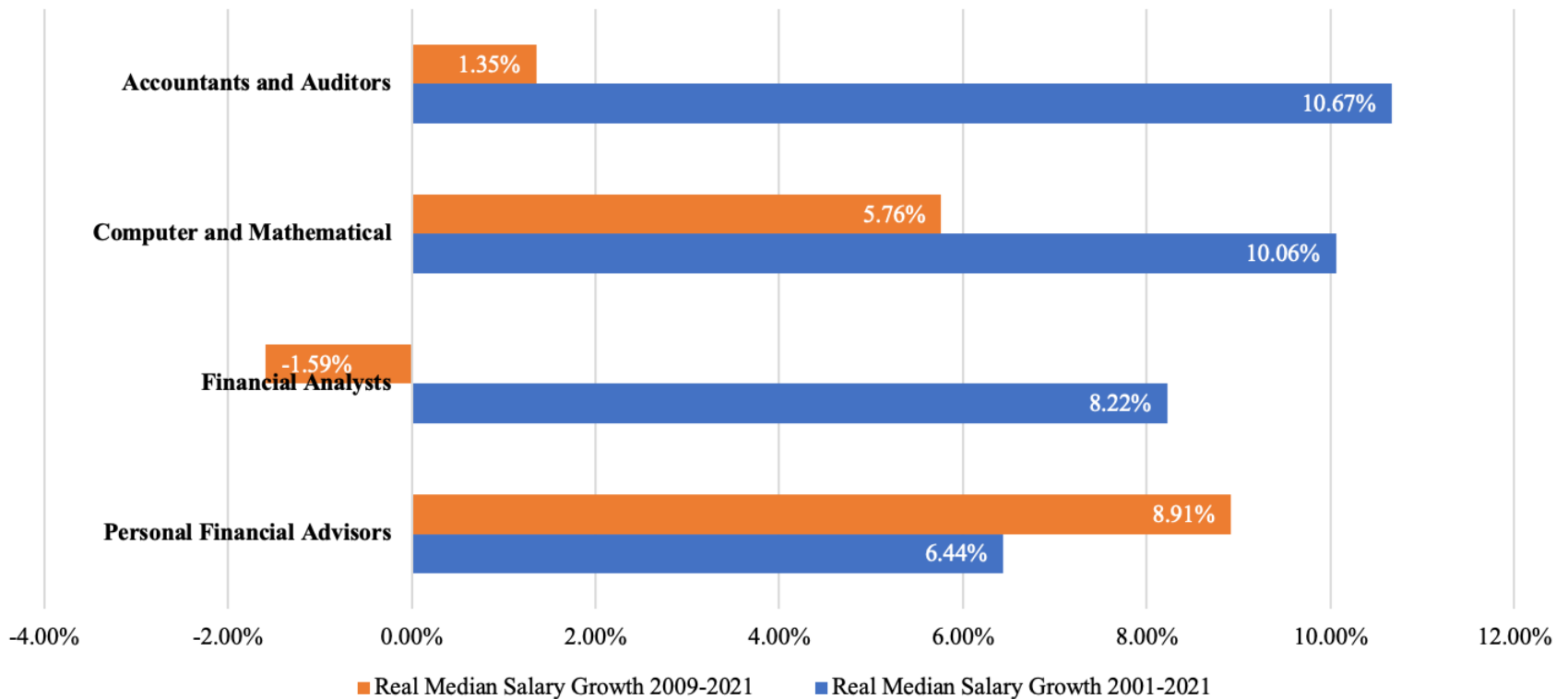
is not included in any of the eight issues under review. To achieve meaningful results, salaries must also be addressed. Firms need to give serious thoughts to their work models, including salaries, in order to provide more attractive work environments to both entry-level and more experienced professionals. Otherwise, the pipeline challenges and the migration of potential accountants into other careers are likely to continue.

Future research extensions include considering cost of living changes for various regions, focusing on salary changes in metropolitan regions, and surveying current accountants and auditors as well as college majors to determine the impact of salary and other employee benefits on their career decisions.

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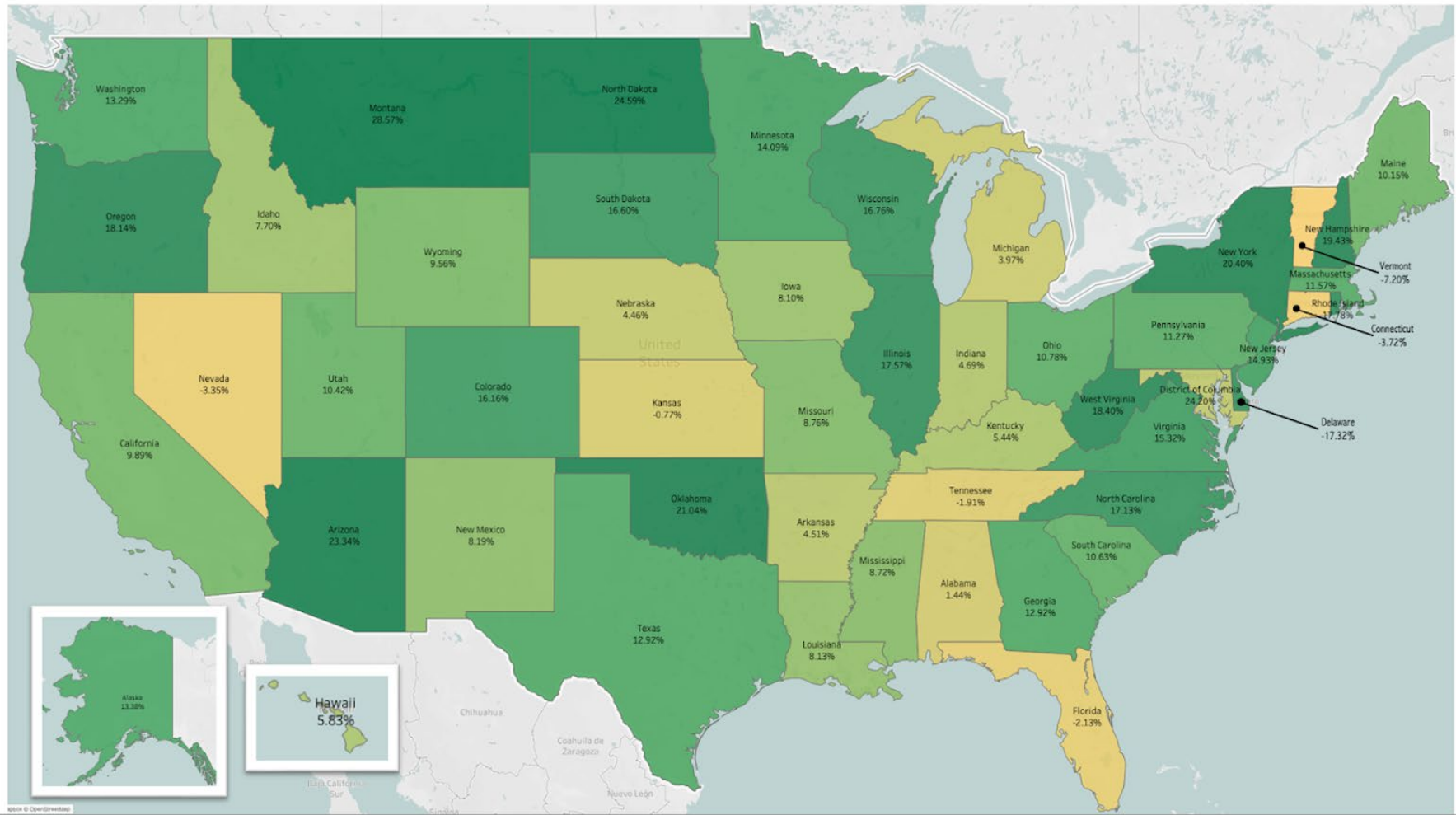
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Exhibit 1 Real Median Salary Growth 2001-2021 and 2009-2021



Source: Bureau of Labor Statistics Occupational Employment Statistics (OES) Survey

Exhibit 2
Accountants and Auditors' Real-Term Median Salary Growth Rate by State
2001-2021



Source: Bureau of Labor Statistics Occupational Employment Statistics (OES) Survey

**Table 1
2021 Nominal Median Salary Analysis**

State	Accountants and Auditors Nominal Median Salary	Accountants and Auditors Nominal Median Salary as Percentage of Other Professions' Salary		
		Computer and Mathematical Occupations	Personal Financial Advisors	Financial Analysts
District of Columbia	\$101,280	91.58	79.17	101.57
New York	\$97,640	97.36	74.24	89.91
New Jersey	\$95,640	93.85	117.48	96.28
Massachusetts	\$80,910	78.78	66.34	82.95
California	\$80,540	66.72	80.33	81.21
Rhode Island	\$79,890	81.02	80.38	98.58
Washington	\$79,680	62.56	67.90	80.21
Virginia	\$78,780	77.48	78.25	80.92
Connecticut	\$78,780	79.86	76.22	78.58
Delaware	\$78,760	77.98	73.95	91.18
Colorado	\$78,470	78.34	97.95	80.71
Maryland	\$78,050	76.00	81.44	82.12
Texas	\$77,640	86.38	97.78	97.55
Alaska	\$77,450	97.98	99.33	62.81
North Carolina	\$77,030	78.18	89.78	94.62
Minnesota	\$76,450	78.77	95.75	86.41
New Hampshire	\$76,270	82.49	94.22	93.43
Arizona	\$76,060	91.29	118.66	97.88

**Table 1
2021 Nominal Median Salary Analysis**

State	Accountants and Auditors Nominal Median Salary	Accountants and Auditors Nominal Median Salary as Percentage of Other Professions' Salary		
		Computer and Mathematical Occupations	Personal Financial Advisors	Financial Analysts
Oregon	\$75,880	78.80	93.21	76.39
Illinois	\$75,400	80.85	76.77	90.63
Wisconsin	\$74,770	95.72	75.12	91.84
Georgia	\$74,700	77.53	92.91	92.83
Pennsylvania	\$73,490	91.67	73.19	94.52
Michigan	\$72,100	91.24	92.73	91.59
Oklahoma	\$71,320	96.27	92.26	111.96
Ohio	\$69,600	87.61	85.33	89.7
Vermont	\$69,530	89.72	73.59	89.95
Montana	\$65,500	104.48	63.59	81.95
Indiana	\$64,280	83.58	82.54	82.94
Maine	\$63,780	82.03	51.27	82.2
Florida	\$63,640	81.2	82.04	82.12
Utah	\$63,540	80.45	100.47	104.33
Hawaii	\$63,020	77.83	102.16	79.12
West Virginia	\$62,980	101.04	100.59	98.11
Kansas	\$62,980	81.00	78.33	82.03
Wyoming	\$62,980	101.79	79.77	74.99
Louisiana	\$62,750	97.82	77.91	82.5
Idaho	\$62,750	84.60	80.97	81.99

**Table 1
2021 Nominal Median Salary Analysis**

State	Accountants and Auditors Nominal Median Salary	Accountants and Auditors Nominal Median Salary as Percentage of Other Professions' Salary		
		Computer and Mathematical Occupations	Personal Financial Advisors	Financial Analysts
South Dakota	\$62,750	90.48	50.16	81.18
Nebraska	\$62,750	79.51	78.78	83.52
Iowa	\$62,750	78.58	80.01	80.71
Tennessee	\$62,680	85.72	82.99	81.09
New Mexico	\$62,480	80.99	75.79	77.94
Kentucky	\$62,470	92.11	63.03	80.82
Missouri	\$62,320	79.78	78.24	79.84
North Dakota	\$62,320	90.31	99.9	80.91
Alabama	\$62,200	77.87	64.07	64.16
Nevada	\$61,920	81.6	80.10	77.99
South Carolina	\$61,900	79.87	81.03	83.23
Arkansas	\$61,770	80.49	75.61	79.7
Mississippi	\$60,320	96.33	124.24	82.75

Source: Bureau of Labor Statistics Occupational Employment Statistics (OES) Survey