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The Year 2016 was another good year for *The Journal of Business Inquiry (JBI)*. Volume 15 published six articles. We received many high-quality papers with a 40.0 percent acceptance rate. The articles were written by authors, whose primary affiliations include 21 institutions from 5 countries - **Iran**, **Malaysia, Saudi Arabia, South Korea,** and the **United States**. Turnaround time took, with 13.3 percent of the editorial decisions, less than or 30 days, 40.0 percent between 31 and 90 days, 46.7 percent, between 91 and 200 days.

The ISI Impact Factor Value of *The Journal of Business Inquiry* is 2.642 for the year 2015-16.

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Ethical Attitudes of Business Professionals in China and the United States: Same or Different?

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With rapid globalization, Asian economies account for a greater proportion of world output and provide important investment opportunities. Thus understanding differences in ethical attitudes between business professionals in these countries and in the West is imperative. This cross-cultural comparison of the ethical attitudes of business professionals found that ethical attitudes of Chinese respondents were more permissive toward ethically questionable situations than were those in the United States. Additionally, in a test of explanations for ethical attitudes, the associations across cultures differed by moral foundations, formal and informal organizational characteristics, and moral issue characteristics. Implications for doing business cross-culturally are discussed.

Keywords: Ethics, Comparative Systems, China, Business Professionals, Attitudes

JEL Classification: K4, P2, P3, P5

I. Introduction

One of the more significant developments in the global economy in recent decades has been the rise of the Chinese economy. Throughout much of its long history, China was among the world's more advanced civilizations and its more sophisticated economies. As recently as 1820, China is estimated to have accounted for one-third of total world output (Hale and Hale, 2003). However, due to inner turmoil, China was largely bypassed by the Industrial Revolution that so dramatically increased living standards in the West. During the post-World War II era, when a number of Asian economies began to progress rapidly, China largely isolated itself from the world economy. Economic progress in China was stifled by this isolation, by the inefficiencies of a planned economic system, and by traumatic disruptions such as the Cultural Revolution.

Beginning in 1978, under the influence of Communist Party head Deng Xiaoping, China embarked on a process of economic reforms and opening to the world that would have a most dramatic effect. In the thirty-year period between 1980 and 2010, the Chinese economy grew in real terms at almost ten percent per annum, doubling in size approximately every seven years. Because of China's very large population, this rapid growth has had an unprecedented impact upon the world economy. Goldman Sachs projects that the size of the Chinese economy will surpass that of the United States by 2027, but the research group of *The Economist* magazine predicts that this could occur as soon as 2019 (Rachman, 2011).

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As a result of its economic progress, China is becoming increasingly integrated into the global economy as more and more companies from the West are doing business in China through both trade and investment. To achieve success in China, these firms are recognizing the importance of understanding the business environment there, which can present potential complications from a wide range of concerns, including intellectual property violations, insider trading, environmental degradation, and unsafe workplace conditions, to name just a few. Because legal standards and ethical perspectives can vary so greatly between countries, decision makers need to be aware of these differences.

The purpose of this paper is to shed greater light on differences in the attitudes of business professionals in the United States and China when it comes to ethically questionable situations, as well as exploring the individual, moral, and organizational foundations that support them. While ethical perceptions and practices have been widely studied in the United States, far less is known about such standards in non-English-speaking countries (Vitell and Paolillo, 2004)—many of which present the most promising markets for business growth. Even less is known about the generalizability of US-based theories of ethics to other country contexts. We attempt to bridge this gap by testing in China the theoretical formulations that have been widely studied in the United States, which permits us to compare findings using a parallel US sample. This approach allows us to assess in China the applicability of recognized ethical theories and the potential usefulness of these frameworks for western managers doing business there. Furthermore, because ethical decision making is more complex than most empirical tests would imply, we heeded recommendations from a meta-analysis conducted by Kish-Gephart *et al.* (2010) and pursued a more comprehensive conceptualization. Their analysis revealed that studies of ethical behavior may be incomplete if the underlying models tested do not include individual, organizational, and moral dimensions. Our study expands upon this work by testing the prescribed multidimensional model using samples of practicing business managers in China and the United States. Finally, we go beyond approaches typically followed in ethics research by exploring ethical attitudes in these countries across a relatively comprehensive set of issues by basing our study on a set of 16 vignettes representing a broad range of situations that practicing managers are likely to face in the United States and China. These features of our investigation enhance and expand its contributions to business ethics research.

II. Differences in Ethical Attitudes Between China and the United States

China and the United States differ across several dimensions that might potentially influence the ethical climate in the two countries. Despite its recent progress, China has a much lower per capita income than the United States ($13,216 compared to $54,629 in 2014 purchasing-power-parity terms) (World Bank, 2014). Both as an economically less developed economy and as a relatively recent participant in the global economy, China's institutional structure is less well developed than that of the United States. Through more than two centuries of free market capitalism, the United States has gradually put in place a highly developed legal, regulatory, and institutional structure within which business operations take place. Ethical standards have in many instances been codified, both in the legal structure of the country and in the codes of ethics in professional organizations and in business enterprises.

While business ethics research has focused primarily on industrially advanced countries, some studies have investigated ethical attitudes and practices in less developed countries (for example, see Abratt and Penman, 2002; Al-Khatib *et al.*, 2004). A few studies have compared the

ethical attitudes of managers in such countries with those of more industrially advanced countries (e.g., Beekun *et al.*, 2003; Cooper *et al.*, 2000; Furrer *et al*., 2010). These studies found significant differences in ethical attitudes and perceptions between less developed countries and more developed countries, with generally higher levels of ethical sensitivity in the more developed countries.

In addition to being economically less developed, the Chinese economy is a transition economy, still in the process of transformation from a planned and state-directed economy to a free enterprise economy. Several studies have explored business ethics in transition economies (Bucar *et al*., 2003; Deshpande *et al.*, 2000; Fuxman, 1997; Hisrich and Gratchev, 2001; Kennedy and Lawton, 1996; Vynoslavska et *al*., 2005). Those that have made direct comparisons between transition economies and mature market economies (Bucar *et al*., 2003; Hisrich and Gratchev, 2001; Vynoslavska *et al*., 2005) have found statistically significant differences in ethical attitudes of business managers between these types of economies, with more approving attitudes toward ethically questionable situations in the transition economies.

A third way in which American and Chinese business systems differ is in their underlying philosophical frameworks. United States culture, including business culture, is strongly influenced by Judeo-Christian religious teaching, principles, and traditions. Research exploring ethical judgments has demonstrated that if a person's religion is practiced as an end in itself, instead of for instrumental means such as to meet social needs, it is associated with being less accepting of unethical behavior (Walker *et al.*, 2012). The business culture is also shaped by the economic system of free enterprise capitalism that has been associated with religious motivations in the country since its origins (Weber, 2010). In contrast, the cultural roots of China stretch back more than two thousand years to the teachings of Confucius, who developed a system of practical ethics drawing lessons from Chinese history but devoid of religious content (Hofstede and Bond, 1988). In its recent history China has had superimposed upon the underlying Confucian system other influences: first Chinese communist teaching rooted in Marxism/Leninism, then Maoism during the Cultural Revolution of the 1960s that consciously attempted to root out Confucian thought, and most recently exposure to Western thought and business practices through participation by Chinese business firms in the global economy. However, scholars have noted that the underlying Confucian values and attitudes remain strong in China (Bedford, 2011; Hofstede and Bond, 1988; Steidlmeier, 1999), although some evolution of traditional Chinese attitudes has been noted as a result of exposure to the international economy (Millington *et al.*, 2006).

Given the differences between China and the United States noted above, we offer the following hypothesis:

Hypothesis 1: Ethical attitudes of Chinese and American business professionals are significantly different, with Chinese professionals being more comfortable with ethically questionable behaviors.

III. Bad Apples, Bad Barrels, and Bad Cases

Beyond a straightforward comparison of the ethical attitudes of Chinese and American business professionals, we delve further into the possible determinants of ethical attitudes and behavior. In their attempt to find what contributes to ethical attitudes and behavior, Kish-Gephart *et al.* (2010) explored the influence of bad apples (i.e., individual characteristics), bad barrels (i.e., organizational characteristics), and bad cases (i.e., characteristics of the issue). Using meta-analysis, they were able to demonstrate that individual characteristics of moral development and Machiavellianism were associated with unethical intentions and behavior. Machiavellianism was likely to promote unethical intentions and behavior, while moral development was likely to prevent them. The organizational characteristics of having a benevolent or principled climate and a code of ethics were negatively related to unethical intentions and behavior. Finally, moral issue characteristics that influenced unethical intentions were related to perceiving the consequences to be focused on only a few people, the probability of harm being low, a lack of social consensus that the action is wrong, and perceiving harm to occur only to people who are distant from the actor in proximity or characteristics.

Our investigation builds on the findings of Kish-Gephart *et al*.'s (2010) study by exploring the degree to which ethical attitudes are influenced by the specific moral values that individuals hold as foundations for ethics, the informal and formal organizational characteristics of organizations in which respondents work, and the particular characteristics of the issue. We examine the degree to which these relationships differ across a range of ethical scenarios that have been used in past research.

A. Individual Characteristics (Bad Apples)

Demographic factors are often regarded as significant determinants of ethical conduct; in fact, these are among the most studied individual-level variables in behavioral ethics research (O'Fallon and Butterfield, 2005). But the results of these studies have been inconsistent, and the theories positing their role in shaping behavior are limited. For this reason, when constructing their meta-analysis of research on unethical decisions in the work setting, Kish-Gephart *et al*. (2010) only tentatively included demographics (i.e., age, gender, and education level), and their analyses found weak or null relationships with ethical choices. Indeed their results indicated that focusing on moral and psychological factors may provide a more promising research direction for studies of the individual-level determinants of ethical intentions and behavior.

Our approach to the study of the individual-level determinants of ethical attitudes and conduct is based on the work of social and cultural psychologists Jonathan Haidt and colleagues (e.g., Graham *et al*., 2011; Haidt, 2007; Haidt and Graham, 2007; Haidt and Joseph, 2004), who have attempted to explain the considerable variability of moral standards across cultures despite the similarities and recurrent themes that are also evident in those cultures. Previous researchers (e.g., Rokeach, 1973; Schwartz, 1992) attempted to transform the broad array of human values into a smaller and more manageable set of constructs or dimensions based on their understanding of human social and biological needs. In developing their moral foundations theory, Haidt and his colleagues also set out to formulate a simplifying model of values, but they took a very different approach. This was as reported by Graham *et al.* (2009, p. 1030):

> We began not by measuring moral values and factor analyzing them but by searching for the best links between anthropological and evolutionary accounts of

> morality. Our idea was that moral intuitions derive from innate psychological mechanisms that co-evolved with cultural institutions and practices (Richerson and Boyd, 2005). These innate but modifiable mechanisms (Marcus, 2004) provide parents and other socializing agents the moral "foundations" to build on as they teach their local values, vices, and moral practices.

Because of its emphasis on the psychological mechanisms that shape moral assumptions and beliefs, especially as these vary across cultures, moral foundations theory offers a highly suitable framework for our study of differences in the ethical views of American and Chinese managers.

The moral foundations specified by the model are present in all or nearly all societies, but Koleva *et al*. (2012) stress that their relative emphasis varies across individuals. For example, the notions buttressing two of their moral foundations—Care (interest in looking after and protecting others) and Fairness (concern for justice according to shared values or rules)—are well supported in the literatures explicating the formation of empathy (e.g., de Waal, 2008) and attachment (e.g., Bowlby, 1969). Perhaps more important, they also correspond to Kohlberg's (1969) "ethic of justice" and Gilligan's (1982) "ethic of care," which play a role in shaping the moral judgment of individuals within a society (Graham *et al*., 2009). As revealed by Kish-Gephart *et al*. (2010), frameworks that capture the essence of such psychological and moral development theories can be especially useful in understanding ethical decision making.

These foundations are important to the protection of individuals, but Graham *et al*. (2009) also posit that societies propagate moral values that reinforce what Shweder *et al.* (1997) call the "ethic of community." For Graham *et al*., these include the following two "binding foundations": Ingroup (commitment to group, family, or nation) and Authority (submission to legitimate authority and respect for traditions). The Ingroup foundation derives from the need to establish and maintain mutually beneficial coalitions that can guard against outside threats and help to ensure continuity and progress. This orientation is particularly strong in collectivist cultures, in which individuals are closely linked and tend to think of themselves primarily as members of the group with which they most closely identify, be it a tribe, a village, or even an organization or company. Thus the needs of the ingroup are given great regard, while the interests of all others (the outgroup) tend to be discounted or ignored (Triandis, 1995). Parallel to the Ingroup foundation, Authority is necessary for the support of hierarchies that help to preserve social order. When these foundations are combined with others, they form "moral systems," which Graham *et al*. (2009, p. 1031) define as "interlocking sets of values, practices, institutions, and evolved psychological mechanisms that function to suppress selfishness." Responses to ethical predicaments will clearly be influenced by the moral inclinations that rest upon "individualizing foundations" (Care and Fairness) and/or "binding foundations" (Ingroup and Authority) in any given situation.

Though Graham *et al*. (2009) also offer the foundation of Purity (sensitivity to what is disgusting or impure), we reason that the foundations of Care, Fairness, Ingroup, and Authority are most relevant to our research, and we expect each to be negatively related to acceptance of unethical behavior. Values that are important or salient to one's identity are more likely to sway judgments and behavior (Weaver and Agle, 2002). When personal moral values are important and accepted as absolutes (idealism), this moral orientation has been demonstrated to be associated with ethical intentions across cultures (Marta *et al*., 2012). Similarly, when a moral value is indicated as important to a person, we expect it to guide ethical judgments. Specifically, we expect Care, Fairness, and Authority values to be negatively related to the acceptability of all scenarios, while the Ingroup value will be negatively associated with acceptability for harm to stakeholders

within the organization but positively associated with acceptability if the harm done is to stakeholders outside the organization.

Thus, we formulate the following hypotheses:

Hypothesis 2a: The individual values of Care, Fairness, and Authority will prompt business professionals to be less comfortable with questionable behaviors for all ethical scenarios across both cultures.

Hypothesis 2b: The individual value of loyalty toward the group (Ingroup) will prompt business professionals to be less comfortable with questionable behaviors for ethical scenarios involving internal stakeholders but more comfortable with questionable attitudes for ethical scenarios involving external stakeholders across both cultures.

B. Organizational Characteristics (Bad Barrels)

The organizational characteristics of interest to us were the informal and formal components of the ethical infrastructure that are likely to deter unethical or counterproductive behavior and that promote ethical or productive behavior (Tenbrunsel *et al.*, 2003; Weaver *et al.*, 1999). The informal components include an organization's ethical climate and culture (Treviño *et al.*, 1998). We focused on the latter component (culture), conceptualized as "a broad system of assumptions and deeply held shared meanings," which theoretically can be discerned in the attitudes organizational members feel and the behaviors they express (Schaubroeck *et al*., 2012, p. 1054).

Social learning theory suggests that salient role models, in this case organizational leaders, can influence the ethical attitudes and behaviors of observers (employees) to the extent to which they model the same (Bandura, 1986). Applications of social learning theory to ethics have supported the influential role of leaders as trickling down throughout their organizations' ethical leadership, which has been logically and empirically associated with ethical behavior (e.g., Brown and Treviño, 2006) and levels of workplace deviance (Mayer *et al*., 2009). However, the paths of these trickle-down influences can follow more than one influence vector. Schein (2010) posits that leaders at all levels of an organization play a role in forming its culture, typically through the norms, standards, sanctions, and rewards that shape the (un)ethical conduct of its members. The shared cultural elements that result from these negotiated influences represent the informal organizational characteristic of greatest interest in our study, one that has not been thoroughly tested in studies of Chinese managers and their ethical perceptions.

The culture of an organization can greatly influence the ethical conduct of its members, and it is likely to be internalized over time so that decisions are largely made instinctively, based on an instilled sense of right and wrong. For example, a salesperson may choose not to lie to a customer simply because "that's not the way we do things around here" (Treviño *et al.*, 2014). But this informal sense of appropriate behavior can be shaped very deliberately by means of formal mechanisms, which we also considered.

The formal components of ethical infrastructure may include a variety of structures or systems related to ethics (Tenbrunsel *et al*., 2003). We focused the second part of our assessment of organizational characteristics (i.e., bad barrels) on the existence of an ethics code, ethics training, and a reporting system for ethical violations. Each characteristic, if present in the respondent's organization, should either constrain unethical behavior due to the possibility of punishments, or should promote positive ethical judgments through the signaling of appropriate

behavior (Gibbs, 1975; McKinney *et al.*, 2010). Though these components have been far more widely tested in the US than in China, theory and previous findings suggest that these informal (ethical culture) and formal (ethical structure) characteristics of an organization's ethical infrastructure will be negatively related to the acceptability of unethical behavior in both countries.

Thus, we formulate the following hypotheses:

Hypothesis 3a: Informal characteristics (ethical culture) of an organization's ethical infrastructure will prompt business professionals to be less comfortable with all questionable ethical scenarios across both cultures.

Hypothesis 3b: Formal characteristics (ethical structures) of an organization's ethical infrastructure will prompt business professionals to be less comfortable with all questionable ethical scenarios across both cultures.

C. Moral Characteristics (Bad Cases)

The final component of Kish-Gephart *et al.*'s (2010) model relates to the moral issue characteristics (bad cases) that might influence ethical attitudes and behaviors. Across the 16 ethical scenarios in this research, we posit that the moral issue characteristics could vary in terms of magnitude and concentration of consequences for people (the scale of harm produced and the number of people impacted, respectively); probability that harm will be caused; degree of social consensus regarding its ethicality; amount of time that will pass before the harmful consequences will take effect (i.e., "temporal immediacy"); and the cultural, physical, psychological, and social proximity of the actor to those who face the consequences. Jones (1991) describes these issue characteristics as contributing to the moral intensity of an ethical situation. If a moral issue characteristic is salient in a situation, the moral intensity of the situation increases as the sense of personal responsibility for the consequences to others shifts psychologically to the actor. That is, as moral intensity increases, the likelihood of unethical intentions and behaviors falls. Kish-Gephart *et al.* (2010) illustrate this phenomenon via the case of dumping toxic waste into a river. If the people drinking the water are very likely to get sick and the wrongdoer is close to those who are harmed (perhaps even knowing them personally), the moral intensity of the situation is high and the temptation to pollute will thereby decrease. Indeed, vignette-based studies such as ours have shown at least some support for Jones' hypotheses using domestic (e.g., May and Pauli, 2002; Paolillo and Vitell, 2002) and international (e.g., Nill and Schibrowsky, 2005) samples.

In this research, we focus our attention on the issue characteristics that Kish-Gephart and colleagues found to be significantly related to unethical intentions—that is, concentration of consequences, probability of harm, social consensus, and proximity. Though it is possible that the salience of the moral issue characteristics in any situation also may differ by culture, there is no clear theoretical direction to suggest that the relative importance of these characteristics in shaping ethical attitudes will vary from country to country. Thus, while we attempt to test the moral intensity formulation in the United States and China, we have no justification to postulate cultural differences in its effects. We therefore offer the following hypothesis:

Hypothesis 4: The moral intensity of an issue related to concentration, probability, consensus, and proximity will prompt business professionals to be less comfortable with all questionable ethical scenarios across both cultures.

IV. Methods

A. Sample

The United States data were collected by mailing a survey to a random sample of addresses of 10,000 business persons who had been identified as business leaders by a major publisher of business periodicals. This was followed by a reminder postcard six weeks after the initial mailing. Approximately 600 surveys were returned due to inaccurate addresses. We received 454 usable surveys for a response rate of 4.8 percent. The Chinese sample resulted from a convenience sampling process with contacts in China conducting business seminars. The survey instrument was translated from English into Mandarin in China. The Chinese version was then back translated and refined for consistency with the English version by a native Chinese speaker who is also fluent in English. It was further checked by a bilingual professor of business to be sure that linguistic equivalence and transparency had been attained. We received 248 usable surveys from Chinese business persons. After filtering out retirees from both samples, we were able to use 270 American respondents and 238 Chinese respondents.

Table 1 provides a profile of respondents for the US and Chinese samples. Respondents were presented with sixteen vignettes describing ethically charged situations (see Appendix). The set of sixteen vignettes has been used extensively in business ethics research in the United States (e.g., Walker *et al.*, 2012; Weeks *et al.*, 1999; Wood *et al.*, 1988). Respondents were asked to indicate the degree to which they found the behavior described in the scenarios acceptable according to a seven-point Likert-type scale, ranging from 1 - "never acceptable" on one end to 7 - "always acceptable" on the other.

Table 1: Demographic Comparisons Across Samples

Profile of Respondents		
Organization Size	**U.S.**	**China**
<20	19.4%	17.0%
20-49	5.2%	11.3%
50-99	6.7%	30.9%
100-249	7.5%	14.3%
250-499	11.6%	7.8%
500-749	4.1%	4.8%
750-999	3.0%	3.5%
1,000-10,000	23.9%	8.7%
>10,000	18.7%	1.7%

Table 1: Demographic Comparisons Across Samples: Continues

Gender		
Males	77.0%	77.0%
Females	23.0%	23.0%
Age	**U.S.**	**China**
<20	0.0%	9.0%
21-30	3.7%	45.7%
31-40	10.8%	41.9%
41-50	29.7%	9.8%
51-60	33.1%	1.7%
61-70	17.5%	
>70	5.2%	
Position		
Top Management	25.9%	7.0%
Middle Management	30.0%	21.4%
Lower Management	10.7%	32.4%
Non- Management	33.3%	36.6%
No Designation		2.6%

Notes: Organizational size [1 – (under 20 employees), 2 – (20-49), 3 – (50-99), 4 – (100-249), 5 – (250-499), 6 – (500-749), 7 – (750-999), 8 – (1,000-10,000), 9 – (over 10,000 employees)] was included as an organizational characteristic control, and age [1 – (20 or less years of age), 2 – (21-30), 3 – (31-40), 4 – (41-50), 5 – (51-60), 6 – (61-70), 7 – (over 70 years of age)] and gender (male =1, female=0) were included as individual characteristic controls.

B. Measures

Organizational size was included as an organizational characteristic control. Age and gender (male =1, female=0) were included as individual characteristics controls.

Individual Moral Foundations. Drawing on Moral Foundations Theory, we used items from Graham *et al.* (2009) to measure the moral/psychological foundations of study participants. We included one item to represent each of the following five foundations of Care, Fairness, Ingroup, Authority, and Purity. All three of the authors independently rated the appropriateness of each moral foundation for the scenarios under consideration and were unanimous in agreeing that the concept of moral disgust was not relevant. As such, we did not use Purity in the analysis. The items included, as defined by Graham *et al*. (2009), were thus as follows:

- Care: "Compassion for those who are suffering or disadvantaged is the most crucial virtue."
- Fairness: "Justice, fairness, and equality are the most important requirements for a society."
- Ingroup: "Loyalty to one's group is more important than one's individual concerns."
- Authority: "Respect for authority is something everyone needs to learn."

Study participants responded on a scale from 1-7, with 1 being labeled "Never Acceptable" and 7 being labeled "Always Acceptable."

Ethical Culture. This seven-item measure of ethical culture is found in Treviño *et al*. (1998). It includes the following questions with a response scale of Always, Often, Seldom, or Never:

- Is ethical behavior the norm in this organization?
- Is ethical behavior rewarded in your organization?
- Are penalties for unethical behavior strictly enforced in your organization?
- Is unethical behavior punished in your organization?
- Are people of integrity rewarded in your organization?
- Do the top managers in your organization show that they care about ethics?
- Do the top managers of your organization demonstrate high ethical standards?

Ethical Structure. Ethical structure was assessed by three questions, with a response scale of Yes, No, or Uncertain. In the analyses, No and Uncertain were combined. The questions were as follows:

- Does your organization have a written code of ethics?
- Does your organization require ethics training?
- Does your organization have procedures for reporting unethical behavior?

Moral Issue Characteristics. The scenarios were independently coded by the authors as to whether a moral characteristic was clearly evident in the scenario. The coding response scale was Yes, No, or Uncertain. After comparing the coding, areas of disagreement where discussed and a final rating was decided.

- Scenarios C, J, and M were rated as salient in proximity.
- Scenarios C, J, M, and P were rated as salient in concentration of effect.
- Scenarios C, F, G, J, M, O, and P were rated as salient in probability of effect.
- Scenarios A, B, D, E, G, I, K, O, and P were rated as salient in social consensus.

V. Results

The means, standard deviations, and correlations for the focal variables are included in Table 2. The fact that the mean responses were significantly different between Chinese and American respondents for every scenario, and that in every case Chinese respondents indicated a more accepting attitude toward unethical behavior, provides support for Hypothesis 1. Comparing these means via ANOVA showed that all differences were significant at $p<.001$.

Table 2: Correlations and Descriptive Statistics

	US Mean	US SD	China Mean	China SD	Org size	Ethical Structure	Ethical Culture	Age	Gender	Care	Fairness	Ingroup	Authority
Org size	5.42	3.011	3.67	2.146	1	.62**	-.10	-.04	.09	-.09	.04	-.08	.04
Ethical Structure	.6610	.39150	.2549	.33601	.19**	1	.16**	.03	.03	.00	.08	-.09	.01
Ethical Culture	2.9367	.70928	2.5601	.61953	0.11†	.47**	1	.10	-.06	.13*	.10†	.04	.17**
Age	4.65	1.154	2.66	.737	.12†	.15*	.10	1	.16**	.02	.10	-.05	.00
Gender	.7732	.41952	.7702	.42159	-.04	.08	.02	-.02	1	-.18**	-.08	-.04	.05
Care	5.26	1.511	5.04	1.528	-.09	.12†	.00	-.14*	-.07	1	.26**	.04	.07
Fairness	5.89	1.364	5.62	1.515	.05	.16*	.03	-.07	-.01	.47**	1	.13*	.06
Ingroup	3.61	1.643	5.06	1.666	.03	.14*	.29**	.02	.05	.25**	.28**	1	.23**
Authority	5.33	1.427	4.90	1.786	-.06	.03	.14*	-.03	-.05	.29*	.14*	.54**	1
A	1.19	.720	3.37	2.114	.13*	.01	-.07	-.02	-.02	-.20**	-.15*	-.07	-.11
B	1.25	.842	2.77	1.662	-.07	-.07	-.19**	-.16*	.02	-.21**	-.19**	-.06	-.03
C	1.44	.893	3.17	1.728	.03	-.11†	-.20**	.05	-.04	-.21**	-.19**	-.18**	-.16*
D	1.62	1.278	3.86	1.724	.09	-.08	-.15*	.00	-.01	-.11†	-.21**	-.10	-.03
E	2.34	1.603	4.27	1.867	.08	.06	-.03	-.06	.15*	-.03	-.06	.00	-.05
F	3.44	2.056	4.30	1.762	.11†	.03	-.07	-.07	.06	-.13*	-.01	.01	-.07
G	2.72	2.090	4.64	1.815	.15*	-.02	.00	.01	.03	.03	-.05	.16*	.07
H	2.56	1.624	4.60	1.749	.23**	-.08	-.07	-.02	-.04	-.13*	-.10	.06	.06
I	1.36	1.046	3.36	1.966	-.01	-.11†	-.07	.09	-.01	-.20**	-.08	.02	.06
J	2.78	1.712	3.89	1.795	.17**	-.07	-.05	.16*	-.07	-.11†	-.15*	-.03	-.06
K	1.70	1.194	3.01	1.759	-.04	-.16*	-.12†	.13*	-.06	-.28**	-.24**	-.05	.00
L	3.23	1.832	3.98	1.854	.10	-.14*	-.08	.05	-.04	-.08	-.19**	-.08	-.08
M	2.39	1.682	3.94	1.695	-.01	-.01	-.01	.11	.10	-.15*	-.11†	.13*	-.03
N	2.57	1.764	3.39	2.024	.07	-.06	-.18**	.07	.01	.04	-.11†	.06	.03
O	2.69	2.010	3.67	1.893	-.14*	-.11†	.03	-.01	.04	-.08	-.18**	.00	.10
P	1.95	1.457	4.71	1.658	.06	-.01	.02	-.20**	.03	-.13*	.03	.10	.01

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Org size	-.09	-.06	.10	-.09	-.12*	-.01	-.02	-.02	-.10	.00	.03	-.05	-.04	.15*	.06	-.03
Ethical Structure	-.01	-.05	-.01	-.08	-.10	-.09	.05	-.07	-.05	-.02	.02	-.15*	-.11†	.10	.00	-.06
Ethical Culture	-.12*	-.05	-.05	-.07	-.12†	-.15*	-.10	-.26**	-.21**	-.01	.03	-.11†	-.13*	-.20**	-.08	-.11†
Age	-.04	.06	-.12†	-.10†	-.01	-.13*	-.12†	-.11†	-.18**	-.11†	-.05	-.14*	-.08	-.15*	-.13*	-.10†
Gender	.03	.07	.03	.04	.15*	.21**	-.04	.13*	-.02	.19**	.20**	.04	.21**	.05	.16*	-.10†
Care	-.15*	.00	-.04	-.01	-.12†	-.04	-.02	-.14*	.00	-.17**	-.21**	-.10	-.19**	-.11†	-.15*	.09
Fairness	-.10	-.20**	-.04	-.13*	-.16**	-.14*	-.14*	-.14*	-.08	-.23**	-.21**	-.13*	-.24**	-.11†	-.16**	.03
Ingroup	.09	.06	-.02	.04	-.04	.01	.05	.08	.02	-.02	.10	.06	.04	-.06	-.06	.11†
Authority	-.01	.01	.01	-.04	-.06	-.05	.00	-.09	-.01	-.07	.03	-.03	-.01	-.08	-.01	-.07
A	1	.41**	.22**	.40**	.14*	.18**	.19**	.21**	.32**	.24**	.18**	.13*	.07	.14*	.15*	.13*
B	.33**	1	.22**	.54**	.27**	.14*	.18**	.12*	.18**	.19**	.24**	.10	.21**	.19**	.16**	.29**
C	.36**	.50**	1	.18**	.13*	.23**	.13*	.13*	.12*	.29**	.30**	.24**	.15*	.25**	.26**	.19**
D	.42**	.42**	.47**	1	.31**	.26**	.22**	.22**	.23**	.19**	.18**	.14*	.17**	.24**	.12*	.34**
E	.43**	.25**	.38**	.55**	1	.40**	.22**	.37**	.26**	.26**	.14*	.16**	.22**	.26**	.25**	.15*
F	.24**	.23**	.26**	.35**	.54**	1	.23**	.41**	.13*	.39**	.22**	.36**	.30**	.32**	.29**	.26**
G	.12†	-.05	.11†	.26**	.29**	.32**	1	.37**	.30**	.16**	.13*	.08	.15*	.14*	.10	.22**
H	.27**	.15*	.28**	.39**	.42**	.49**	.39**	1	.16**	.29**	.18**	.21**	.31**	.29**	.26**	.25**
I	.34**	.37**	.33**	.36**	.30**	.33**	.09	.34**	1	.19**	.18**	.19**	.08	.21**	.10	.34**
J	.35**	.27**	.42**	.41**	.49**	.28**	.22**	.42**	.29**	1	.38**	.34**	.32**	.38**	.45**	.11†
K	.23**	.47**	.34**	.26**	.19**	.25**	-.03	.21**	.43**	.25**	1	.31**	.32**	.27**	.29**	.14*
L	.28**	.28**	.39**	.42**	.46**	.38**	.18**	.38**	.42**	.39**	.32**	1	.21**	.32**	.28**	.15*
M	.13†	.31**	.28**	.29**	.20**	.22**	.15*	.19**	.23**	.27**	.29**	.36**	1	.28**	.29**	.13*
N	.25**	.32**	.17*	.28**	.16*	.19**	.05	.20**	.39**	.15*	.32**	.30**	.18**	1	.34**	.17**
O	.23**	.35**	.18**	.21**	.17**	.14*	-.02	.14*	.23**	.11	.28**	.29**	.27**	.25**	1	.07
P	.10	.01	.14*	.18**	.27**	.35**	.25**	.39**	.25**	.14*	.06	.21**	.14*	.06	.06	1

Notes: US sample is in the top right portion of the matrix; the Chinese sample is in the lower left. Significance values are as follows: † = *p*-value of <.10, * = <.05, ** = <.01.

Table 3 lists the regression results when individual characteristics are organizational characteristics and analyzed simultaneously. The results indicate that individual and organizational characteristics influencing ethical attitudes vary by scenario.

- For scenario A (padding an expense account), in the US acceptability of unethical behavior is negatively associated with Organizational Size, Ethical Culture, and Care. In other words, as these variables increase, acceptability of unethical behavior decreases. In the Chinese sample, however, no factors are significant at the .05 level or below.
- For scenario B (exceeding the legal limit of pollution), in the US acceptability of unethical behavior is negatively associated with Fairness, whereas in China it is negatively related to Ethical Culture.
- For scenario C (recommending a bad investment), acceptability of unethical behavior is not associated with any variables in the US, whereas in China it is negatively related to Ethical Culture.
- For scenario D (underreporting taxable income), acceptability of unethical behavior is not associated with any variables in the US, but in China it is negatively related to Fairness.
- For scenario E (bribing a foreign official), in both the US and China the acceptability of unethical behavior is positively associated with Gender, with men more accepting of this than women. In China, acceptability of this unethical behavior is negatively associated with Fairness.
- For scenario F (hiring an employee to get secret information), acceptability of unethical behavior is positively associated with Gender and negatively associated with Age in the US, whereas in China it is negatively related to Care.
- For scenario G (collusion to reduce competition), acceptability of unethical behavior is positively associated with Ethical Structure and negatively associated with Fairness in the US, whereas in China it is positively related to Organization Size and Ingroup.
- For scenario H (bribing purchasing agents), acceptability of unethical behavior is positively associated with Gender and negatively associated with Ethical Culture in the US, whereas in China it is positively related to Organization Size.
- For scenario I (using inside information), acceptability of unethical behavior is negatively associated with Organization Size, Ethical Culture, and Age in the US, whereas in China it is negatively related to Care.
- For scenario J (preference shown to friend in hiring decision), acceptability of unethical behavior is positively associated with Gender and negatively associated with Fairness in the US, whereas in China it is positively related to Organization Size.
- For scenario K (failure to reveal dangerous design flaw), acceptability of unethical behavior is positively associated with Organization Size in the US, whereas in China it is positively related to Gender and negatively related to Fairness.
- For scenario L (concealing embarrassing financial facts), acceptability of unethical behavior is not associated with any variables in the US, whereas in China it is negatively related to Ethical Structure.
- For scenario M (preferential hiring on basis of gender), acceptability of unethical behavior is negatively associated with Fairness in the US, whereas in China it is positively related to Ingroup.
- For scenario N (deceptive advertising), acceptability of unethical behavior is negatively associated with Ethical Culture and Age in the US, whereas in China it is negatively related to Ethical Culture.

- For scenario O (misleading health information), acceptability of unethical behavior is positively associated with Gender and negatively associated with Age in the US, whereas in China it is negatively related to Ethical Structure.
- For scenario P (copyright violation), acceptability of unethical behavior is not associated with any variables in the US, whereas in China it is negatively related to Age and Care.

As these results show, in most every scenario ethical attitudes were affected by different individual and organizational characteristics, depending on whether the respondents were from the United States or from China. Across the scenarios there is partial support for Hypothesis 2a ($p<.05$), regarding the influence of the individual characteristics of valuing Care and Fairness, but not Authority. Care was significantly negatively related to acceptability in 22 percent of the 32 regressions. Fairness was significantly negatively related to acceptability in 31 percent of the 32 regressions. Hypothesis 2b regarding the influence of Ingroup value only received support in scenarios G and M, but the positive association was consistent with the hypothesis that unethical behavior toward external stakeholders would be acceptable for those with strong Ingroup values. Support for hypotheses 3a and 3b also varied by scenario, with 22 percent of the 32 regressions resulting in significant associations ($p<.05$) with ethical culture and 10 percent with ethical structures.

Table 3: Regressions Results by Scenario and Country

Variable	A - US	A - China	B - US	B - China	C - US	C - China	D - US	D - China	E - US	E - China	F - US	F - China	G - US	G - China	H - US	H - China
Org size	-.20*	.13†	-.07	-.07	.14	.04	-.09	.12†	-.16†	.11	-.02	.10	-.14†	.19**	-.07	.27**
Ethical Structure	.16†	.01	.02	.02	-.08	.01	.01	-.01	.01	0.5	-.07	.06	.18*	-.06	.02	-.10
Ethical Cultural	-.14*	-.07	-.05	-.22**	-.02	-.20*	-.05	-.13	-.09	-.03	-.08	-.08	-.11†	.00	-.21**	-.04
Age	-.01	-.02	.08	.19**	-.11†	.03	-.08	.00	-.04	-.07	-.16**	-.10	-.09	*.04	-.10	-.05
Gender	.02	-.03	.06	.00	.01	-.04	.06	-.01	.14*	.13*	.24*	.03	-.03	.04	.12*	-.03
Care	-.14*	-.15†	.06	-.16*	-.01	-.12	.03	-.03	-.05	.02	.05	-.17*	.00	.07	-.07	-.12
Fairness	-.07	-.06	-.23**	-.14†	-.03	-.13†	-.12†	-.19*	-.09	-0.13*	-.08	.01	-.15*	-.14†	-.06	*.08
Ingroup	.11†	-.01	.09	.02	-.05	-.01	.06	-.04	-.01	.06	.03	.08	.07	.22**	.11†	.08
Authority	.01	-.05	.01	.05	.02	-.05	-.04	.03	-.04	-.04	-.08	-.05	.01	-.04	-.11†	.11
Total R – Squared	.07	.07	.07	.14	.03	.10	0.4	.08	.07	.05	.11	.05	.06	.08	.12	.12

Variable	I - US	I - China	J - US	J - China	K - US	K - China	L - US	L - China	M - US	M- China	N - US	N - China	O - US	O - China	P - US	P - China
Org size	-.20*	-.01	-.05	.18**	-.01	-.05	.02	.15*	-.03	-.03	.07	.10	.01	-.10	-.03	.06
Ethical Structure	.13†	-.11	.03	-.07	.05	-.12	-.14†	-.23**	-.06	.04	.09	-.04	-.01	-.16*	-.01	.01
Ethical Cultural	-.24**	-.07	.04	.00	.04	-.07	-.05	.05	-.05	-.11	-.17*	-.18*	-.03	.11	-.11†	-.02
Age	-.16*	.10	-.12*	.11	-.05	.13†	-.12†	.09	-.05	.09	-.13*	.07	-.14*	.02	-.06	-.24**
Gender	.00	-.02	.20**	-.06	.17**	-.07	.04	-.04	.19**	.06	.05	.00	.15*	.04	-.08	-.03
Care	.03	-.21**	-.09	-.04	-.14*	-.22**	-.05	.06	-.11†	-.14†	-.05	.11	-.08	-.03	.10	-.23**
Fairness	-.06	.02	-.19**	-.15*	-.20**	-.14†	-.08	-.19*	-.20**	-.09	-.08	-.20*	-.09	-.15†	.03	.07
Ingroup	.01	.06	.01	.04	.10†	0.3	.06	-.04	.06	.24**	-.01	0.15†	-.06	-.09	.10	.15
Authority	.03	.09	-.08	-.06	.02	.07	-.03	-.03	-.02	-.10	-.05	-.05	-.02	.15†	-.11†	.00
Total R – Squared	.10	.07	.12	.09	.12	.15	.06	.10	.13	.08	.09	.08	.07	.09	.06	.10

Notes: Standardized Betas and total R-squared are reported in the final step of the regression.
Significance values are as follows: † = *p*-value of <.10, * = <.05, ** = <.01.

The analytic approach to testing Hypothesis 4 involved simple comparisons of means based on moral issue characteristics. Table 4 reports the results of these comparisons. There was no significant difference between scenarios with a high concentration of harmful effects and scenarios with a low concentration of effects. There is a marginally significant difference (p=.05) between scenarios with a high proximity to those who are harmed in comparison to a low proximity, with high proximity being less acceptable. This is consistent with the assertion in Hypothesis 4 that moral intensity will be related to lower acceptability. There is a significant difference between scenarios with a high probability of harm to those with a low probability of harm, with high probability being more acceptable. This is opposite the assertion in Hypothesis 4 that moral intensity will be related to lower acceptability. There is a significant difference between scenarios with a high social consensus to those with low social consensus, with high social consensus being less acceptable. This is consistent with the assertion in Hypothesis 4 that moral intensity will be related to lower acceptability.

Table 4: Moral Issue Characteristics Comparisons

		Total Sample				US Sample				China Sample			
Moral Issue Characteristics Comparisons		Mean	Std. Dev.	*t*	Sig.	Mean	Std. Dev.	*t*	Sig.	Mean	Std. Dev.	*t*	Sig.
Pair 1	High Concentration	2.98	1.36	0.94	0.35	2.14	0.92	-1.81	0.07	3.93	1.12	2.77	0.01
	Low Concentration	2.95	1.23			2.22	0.83			3.77	1.08		
Pair 2	High Proximity	2.89	1.38	-1.95	0.05	2.20	1.04	0.06	0.95	3.67	1.29	-2.66	0.01
	Low Proximity	2.97	1.24			2.20	0.82			3.84	1.05		
Pair 3	High Probability	3.22	1.27	13.65	0.00	2.49	1.01	11.63	0.00	4.05	1.00	7.85	0.00
	Low Probability	2.75	1.27			1.98	0.75			3.62	1.18		
Pair 4	High Consensus	2.74	1.30	-12.97	0.00	1.87	0.75	-15.28	0.00	3.74	1.05	-3.35	0.00
	Low Consensus	3.22	1.26			2.63	1.05			3.90	1.13		

In exploratory analyses across cultures, there is no difference in acceptability for scenarios differing on concentration or proximity in the US, but in the Chinese sample, a high concentration of harmful effects is associated with greater acceptability, while high proximity is related to lower acceptability. The former finding is contrary to Hypothesis 4, while the latter is consistent with its prediction that moral intensity will be related to lower acceptability. In both samples, a high probability of harm occurring is related to higher acceptability, which is contrary to Hypothesis 4; however, high social consensus is related to lower acceptability, which is consistent with its assertion. Overall, the findings for Hypothesis 4 are mixed.

VI. Discussion

Our cross-cultural comparison of the ethical attitudes of business professionals in China and the United States has revealed that there are stark differences between the two cultures. As revealed in Table 1, we found that in every instance the ethical attitudes of Chinese respondents overall were more permissive toward ethically questionable situations than were those of US respondents, thus providing very strong support for Hypothesis 1. In line with our reasoning and in light of the

findings of a number of previous studies of business ethics across North America and China that have found American managers to be more ethical in their perspectives and decision making (e.g., Danon-Leva *et al.,* 2010; Ma, 2010), this is not surprising.

It is widely believed that a positive relationship exists between the levels of economic development across countries and their general embrace of ethical values, which may help to explain our findings. Many scholars (e.g., Inglehart and Baker, 2000) have commented that individuals who live in wealthy countries are more likely to exhibit "post-materialist" values (e.g., emphasizing subjective well-being, quality of life, environmental concern) than those who live in less developed countries where self-interested values are more likely to prevail and ethical expectations tend to be more lax. As home to one of the world's most advanced economies, where ethical behavior is more likely to be the norm, the United States is supported by high levels of education, technology development, and economic security. While China has shown remarkable economic performance over the past few decades, this may not be influencing ethical attitudes and practices there in a broad way because the wealth created is relatively new and is not widely distributed, and it is still considered to be a developing economy by IMF standards (International Monetary Fund, 2014). For this reason, it seems reasonable to expect Chinese managers to exhibit at least somewhat less ethical attitudes and behaviors.

But high GDP and other measures of country wealth may not tell the full story when it comes to explaining standards of ethical behavior; economic growth may provide additional insight. For example, there is evidence to suggest that ethical attitudes may be more permissive in countries that are experiencing either significant economic growth or decline. Bageac *et al.* (2011) observe that individuals in high-growth countries are more inclined to focus on personal economic self-interest, whereas stable economies lead to more muted business aspirations and increased attention on other considerations. On the other hand, when economic conditions fall into decline, the need for adjustments for the sake of economic well-being (often to ensure survival) understandably become paramount concerns that drive out many others. Kemmelmeier *et al.* (2002) use this argument to explain why ethical commitments to environmental protection so often are pushed aside during periods of economic decline, and it fits with the documented negative relationship between corruption and economic growth (Mauro, 1995) and the greater emphasis on both environmental and social responsibility in Europe in those countries that have lower rates of economic growth (Reynaud *et al.,* 2008). By this reasoning, the United States may fall within an "economic sweet spot" where decision making is most likely to be shaped by high ethical standards. In China, on the other hand, the spectacular economic growth since 1978 may be creating conditions under which ethics receive less emphasis as economic self-interest becomes the overarching preoccupation, thereby pushing ethical considerations closer to the decision-making fringe.

Economic ideologies also may have played a role in shaping the ethical perspectives of US and Chinese managers in our study. The two primary models of interest are capitalism, which highlights self-interest and the power of the market, and socialism, which shifts decision making and control from the individual to the state. Transitioning between the two—from a planned to a market-based economy—is far from straightforward. It takes time and resources to develop the institutional framework that is supportive of high standards of business ethics, and China has had more than its share of problems on its path to transition (Chandler, 2004; Tam, 2002). This should be a warning to firms that are increasingly engaging in trade and investment in China. That is, China is a very different environment, so assumptions typically made concerning ethical issues in the West may not transfer readily to the Chinese setting.

Finally, we acknowledge the cultural influences that have shaped the ethical responses in our study. For example, individualism (high in American culture) and collectivism (the norm in China) are linked to the perceived locus of control, with the former being more internal and the latter more external. Spector *et al*. (2002 p. 454-5) explain that members of individualist cultures:

> … are taught to value independence and achievement through their own actions. They view themselves and others as having direct control over various aspects of life. Members of collectivist cultures are taught to value harmony and solidarity with others (Markus and Kitayama, 1991). Because they accept subordination of individual to group interests, they view the group as having legitimate control over their actions.

Relating this understanding to research on ethical behavior, the meta-analysis conducted by Kish-Gephart *et al*. (2010) found that individuals high in internal locus of control are likely to be more concerned about the consequences of their behavior on others and therefore are less prone to behaving unethically. This is only one of a number of plausible culture-based explanations for the overall patterns of ethical choices that we observed in our study.

Drilling down further, we found evidence to show that ethical attitudes were affected in one way or another and for nearly every scenario by differing individual and organizational characteristics in the two societies. Beginning with the person-specific moral foundations that shade individuals' ethical judgments and behavior (which can create "bad apples," to use the language of Kish-Gephart *et al*., 2010), we hypothesized that American and Chinese managers placing greater importance on the moral considerations of (1) caring for and not harming others, (2) acting with fairness and appropriate reciprocity, and (3) respecting authority would also find questionable ethical scenarios less acceptable (Hypothesis 2a). Similarly, we posited that those managers who valued loyalty to the group highly would find scenarios depicting harm to stakeholders inside the firm or organization less acceptable, while assessing those indicating harm to outside stakeholders more favorably (Hypothesis 2b). Our results, reported in Table 3, provided partial support for Hypothesis 2a, with supportive findings for 22 percent of the tests for Caring and 31 percent for Fairness, though we did not find significant effects on any scenario for those managers indicating a strong commitment to the moral foundation of authority. Hypothesis 2b was also partially supported for those with strong Ingroup values, but only for scenarios G (contractor collusion) and M (unfair selection of a male job candidate over a more qualified female candidate).

One of the important trends to note in these findings is the pattern of results. Of the 16 scenarios in our study, responses to most (12) were significantly influenced by one or more of the moral values measured by our questionnaire. This indicates that these foundations appear to be active at some level in the shaping of responses to ethical situations. But when comparing the ethical reactions of American and Chinese managers, it is interesting to note the considerable differences in patterns of responses. Our tests found significant relationships between moral values and ethical assessments from *both* sets of managers (for one or more of the values included in the study) for only five of the 16 scenarios, and their responses to those five scenarios were opposite to one another in two of these. Interestingly, the *agreement* came in situations involving the sacrifice of pollution standards for the sake of profit, promoting a loyal friend over a more qualified candidate, and not reporting a design flaw that could compromise quality. The two groups had opposing responses to scenarios representing contractor collusion and gender discrimination in hiring, with the Chinese managers indicating more assenting responses to these ethically questionable practices in both cases. While a precise explanation is not evident from our data, we note that this is consistent with numerous reports indicating that such practices are common in China (Steinfeld, 2014; Zhang and Round, 2011).

We also addressed the question of whether informal components of a firm's ethical infrastructure (ethical culture) or the formal elements of the same (efforts to establish an ethics code, an ethics training program, and a reporting system for ethical misconduct) would discourage unethical perceptions and decisions. This is the "bad barrels" element that Kish-Gephart *et al*. (2010) mention, which focuses on a firm's organizational environment. We hypothesized that the components identified above would be associated with more ethical outcomes (hypotheses 3a and 3b, respectively) and found partial or mixed support for these assertions (see Table 3). For informal components, our regression tests found that ethical culture orientations led to more ethical responses to 38 percent of our scenarios (six out of 16) when American and Chinese responses are considered *together* (50 percent if a significance level of $p<.10$ were used). But for only one of these scenarios (using a "new and improved" advertising campaign to promote an essentially unchanged product) did managers from *both* countries indicate more ethical responses. Perhaps this practice is so widespread in both countries that only those who work in companies with an ethical culture that discourages the use of such promotional strategies would respond negatively. Interestingly, recent neuroimaging research has shown that subjects exhibit much greater brain activity when they are exposed to advertising claims that are moderately deceptive than when they review claims that are either high or low in deceptiveness (Craig *et al.*, 2012). Because the neural reaction to less deceptive campaigns, like the one depicted in our scenario, tends to be limited, perhaps only those who are sensitized to such practices by their firm's ethical culture will be primed to recognize the problem and then react negatively.

Our expectation that formal components of a firm's ethical infrastructure would lead to more ethical decisions received very limited support in our findings for Chinese managers. That is, our regression analyses indicated that the use of ethics codes, training, and reporting systems may have prepared Chinese participants to respond more ethically to only 13 percent of our scenarios (two out of 16). This is not encouraging, but the results for American managers were even worse! Contrary to the hypothesis, US managers who indicated that their firms provided higher levels of formal ethics support actually responded significantly *less* ethically to the scenario depicting contractor collusion, while the remainder of their responses were nonsignificant.

What is to be made of these unpredicted findings? It is unthinkable that a firm would draft an ethics code or provide training and reporting systems to encourage collusion in the form of bid rigging, which is illegal under nearly all circumstances (Federal Trade Commission, 2014). The fact that these formal arrangements failed to promote ethical behavior overall suggests that more research is needed. In line with our findings, Kish-Gephart *et al*. (2010) found that while strong ethical climates and cultures tend to be associated with fewer unethical decisions in the workplace (Treviño, 1990), having a code of conduct often does not lead to more ethical thinking and behavior. This is consistent with the mixed results reported in the literature (O'Fallon and Butterfield, 2005). As Kish-Gephart *et al*. observe, ethics codes have little chance to change behavior if (a) they have become so common that no one notices them, (b) they are merely window dressing that allows business to go on as usual, or (c) they are poorly communicated or enforced. The same could be said about ethics training and reporting systems. It is one thing to have these programs in place and quite another to manage and use them well.

Finally, we tested Kish-Gephart *et al*.'s (2010) assertion that "bad cases" (the ethical dimensions of the issue itself) can play an important role in shaping ethical decision making. They posited that the greater the moral intensity of an issue, the more likely an actor will make ethical choices, recognizing that the consequences of his or her actions will have greater impact on others. According to Jones (1991), the moral intensity of an ethical issue comprises six distinct elements,

but we adapted his framework by including only the four issue characteristics that Kish-Gephart *et al*. found to be significantly related to ethical intentions in their meta-analysis: *Concentration* of effect (the number of people impacted), *probability* that the act will cause harm, *social consensus* (peer agreement that an action is wrong), and *proximity* (sensed agent-victim closeness in social, psychological, cultural, and physical terms). Although previous vignette-based research has shown some support for Jones' framework (e.g., May and Pauli, 2002; Nill and Schibrowsky, 2005; Paolillo and Vitell, 2002), these tests did not examine the separate effects of the individual dimensions of moral intensity. Our study takes this next step.

In Hypothesis 4 we predicted that managers would make more ethical assessments when moral intensity is high, and our tests provided mixed support for this notion. Our regression results for a combined US and Chinese sample (see Table 4) did not find effect concentration to significantly influence ethical assessments. However, consensus and probability demonstrated significant associations with ethical perceptions, though the direction of the relationship for the latter ran counter to our hypothesis. Finally, proximity showed a marginally significant ($p=.052$) association with ethical judgment, with high proximity deemed more acceptable, as anticipated.

Examining separately the moral intensity-shaped responses of American and Chinese managers revealed some interesting findings. The regression test for concentration of harmful effects was not significant for the combined sample, but individual tests on each group were significant for the Chinese sample (albeit opposite to our prediction) and marginally significant ($p<.10$) for the American sample. It is possible that the subject of these scenarios had something to do with the responses. The nature of the issues depicted (recommending a bad investment, promoting a loyal friend over other more qualified employees, hiring an equally qualified male job candidate over a female prospect, saving money by buying pirated software) are representative of very common practices in China, and these decisions may be seen as serving the broader good of the organization and thus as wise. Also, in three of the four involved scenarios, the decision maker (a corporate executive, an employer, and a small firm owner) is a very authoritative figure in the organization, and in the fourth situation the actor (a stockbroker) is responding to pressure from his firm. Since employees in high power distance countries like China tend to take their ethical cues from their superiors (Pan *et al.*, 2010)—especially when the institutional environment is underdeveloped and often fails to stand as a legal bulwark against such behavior, as in China—the Chinese managers in our study may have interpreted these acts as acceptable, even though they were, in fact, less ethical (Curtis *et al.*, 2012; Danon-Leva *et al*., 2010). The Confucian foundation of China's culture, with its emphasis on authority and hierarchy, further reinforces this inclination (Pan *et al*., 2010). Additionally, three of these four scenarios depicted victims who were company outsiders (likely outgroup members), which is an important consideration in a collectivist society like China's. When Ma (2010) investigated the negotiation strategies recommended by Chinese and Canadian graduate and undergraduate students, he found that the Chinese participants were significantly more likely to offer false promises, attack an opponent's network, employ distortion, and engage in inappropriate information gathering. Where individualists tend to treat all negotiating opponents the same (Pan *et al*., 2010), collectivists are more likely to feel solidarity only toward ingroup members and thus use more inappropriate negotiating strategies when dealing with outgroup members (Jackson, 2001; Rivers and Lytle, 2007; Ma, 2010) and are more competitive toward these counterparts (Espinoza and Garza, 1985).

The individualism-collectivism explanation may also be germane to making sense of our findings regarding discerned proximity. For American managers, ethical perceptions did not appear to form based on this factor, but tests of differences in Chinese participants' assessments

were significant, and exactly as predicted. Why this dissimilarity? Since high proximity suggests more likely ingroup status, perhaps Chinese managers found this element more salient and then were primed to respond with greater ethical sensitivity (Ma, 2010; Pan *et al*., 2010).

The most baffling of the findings in this study may be those stemming from the probability dimension of moral intensity. Managers should be more inclined to consider an action unethical if it had a high probability of doing harm to victims. Our tests of this association were all highly significant ($p<.01$), but the relationship is opposite to the one hypothesized—that is, more probable scenarios were assessed as more ethical. Perhaps respondents rationalized away harm and focused on potential benefits to themselves or others. Grant and Campbell (2007) found that the relationship between employees' harmful behavior and attitudes toward their work were moderated by perceived benefits of the harmful behavior to others, so that more perceived benefits reduced the influence of perceived harm on work attitudes. Similarly, managers in our study could be focusing attention on the benefits to others, thereby attenuating the influence of probable harm to others in weighing the acceptability of the scenarios. It is also possible that this result was an artifact of the way we set up our analysis. Given the exploratory nature of our research on bases of moral intensity and ethical choices, we tested these dimensions individually. Though this is in keeping with accepted practice, Kish-Gephart *et al*. (2010, p. 20) found four of Jones' (1991) six dimensions to be highly interrelated and suggested that there may be reason to combine this set of components into one, interpreting them as being associated with "aspects of the potentially risky consequences to the victim." Two of the dimensions that we included, based on Kish-Gephart *et al*.'s (2010) findings (i.e., concentration and probability of effect) turned out to be the most problematic in our test. Our results might have been different if these had been added to our analysis as representing a cluster and not as individual dimensions of moral intensity. This issue will have to be explored in future research.

The fact that both American and Chinese managers considered unethical those scenarios that social consensus deemed inappropriate is completely in line with Jones' moral intensity theory. Vitell and Patwardhan (2008) assert that this should be especially true in a collectivist culture like China's where the emphasis on harmony within the ingroup is great, and indeed their findings bear this out. But the power of social consensus to shape behavior in the US and elsewhere has been extensively documented in various other streams of research as well (e.g., social influence: Cialdini, 2008) and is difficult to question.

VII. Study Limitations and Future Research Directions

The underpinnings of ethical decision making are not nearly as simple or straightforward as most research approaches would imply, as suggested by Kish-Gephart *et al*. (2010 p. 17):

> [O]ur findings reveal a high degree of underlying complexity in unethical choices. That is, such choices cannot be explained by one or two dominant antecedents. Rather, they are multidetermined, with substrates spread widely, even within the distinct realms of individual, moral issue, and organizational environment characteristics. In that regard, it is time for behavioral ethics researchers to empirically integrate these multiple sets of predictors (studying bad apples, cases, and barrels simultaneously) to fully understand this complicated phenomenon.

We have attempted to follow this prescription by including all three of these sets of predictors in our study. And while our approach could not be as expansive as their detailed meta-analysis, it is

certainly more inclusive than most of the ethics research published to date. Nonetheless, no study is without its limitations, and we outline here some of those that apply to our research.

Scenario-based ethics studies like ours have their drawbacks, especially if such decisions are typically less deliberative than is often assumed. As Messick (2009, p. 74) says of ethical decision making, "Our brains … make 'judgments' outside of consciousness." However, while the processes underlying some ethical decisions are more automatic, others tend to be quite calculated (e.g., deciding whether to accept a bribe). Moreover, responses to scenarios may have less social desirability bias than answering questions about actual unethical behavior (Walker *et al*., 2012). As such, we think scenario-based approaches are appropriate for ethics research.

As reflected in the Profile of Respondents (see Table 1), the American managers in our study are older and more experienced than the Chinese managers, and this presents another potential complication. However, from their massive review of the ethical decision making literature, O'Fallon and Butterfield (2005) found that the research on age has produced mixed and inconsistent results at best. Kish-Gephart *et al*.'s (2010) meta-analysis backed up these conclusions by showing weak and nonsignificant relationships with both unethical intentions and behavior, suggesting that the age imbalance is not an issue. Factoring in culture does not change this conclusion. Because the Chinese managers were younger, they were most likely among the more westernized members of their society. This is suggested by Pan *et al*. (2010), who found that even though the younger Chinese managers in their study exhibited aspects of Confucianism, they were still significantly more individualistic than the generation that preceded them. When considered along with gender (where the breakdowns between men and women were almost perfectly identical), it appears that differences in demographics were not a problem in this study. Moreover, follow-up tests showed that there were no significant differences ($p<.05$) in responses to the acceptability of the scenarios across organizational size and managerial level for the US sample, taken separately, nor were there differences in acceptability across organizational size, managerial level, and age for our sample of Chinese respondents. The only significant difference on acceptability was found on age in the United States. However, since no such differences exist across the age ranges for Chinese managers, a more parallel sample would likely have produced the same results. Taken together, this suggests that imbalances between our country samples do not seem to explain our findings.

Our research improves upon many studies of ethical decision making by moving beyond the use of student samples. To ensure generalizability, we analyzed practicing managers in the United States and China. Nonetheless, our country samples were not drawn in such a way as to assure that they accurately represented the populations from which they were taken, and the data were not collected in the same way for each country. Consistent with the multi-decade research program led by Longenecker and his colleagues (e.g., Longenecker *et al*., 1988; Vynoslavska *et al*., 2005; Weeks *et al*., 1999; Wood *et al*, 1988), data from American managers were collected via a survey mailed to a random sample of 10,000 business leaders. Our Chinese data, on the other hand, were gathered from managers as they attended business seminars in China. The sample sizes are relatively balanced (270 from the US and 238 from China), but we offer no guarantees that the samples are truly representative of these countries. This is a common problem—affecting even very large-scale sampling efforts (cf. Nosek *et al*., 2007)—that should be considered in future ethics research. However, our samples generated mixed to strong support for frameworks corroborated by previous research (cf. Kish-Gephart *et al*., 2010), suggesting that we captured at least some of the important features of ethical decision making for the two country populations.

VIII. Implications and Conclusions

Given the rapid rise of the Chinese economy and the escalating impact it will have on the economies of other countries, it is increasingly important to understand the conduct of business there. This would include the nature of decision making processes and the ethical attitudes and inclinations that underlie them. As Ma (2010) has asserted, ethics research in China can provide "a powerful test of … western theory on business ethics because Chinese culture is unique [in that] there are a number of cultural barriers that make it very difficult or even impossible to implement western standards and ethical codes" (p. 124). We endeavor to compare reactions of American and Chinese managers to descriptions of unethical acts and to help explain differences between the two. Knowing of and understanding these differences will help global business leaders make better and more ethically acceptable decisions while in one country or the other.

Our findings reveal that Chinese and American business professionals differ significantly in their ethical attitudes (with unethical situations being more acceptable to the former), and the explanations for these attitudes differ by individual moral foundations, formal and informal organizational characteristics, and moral issue characteristics. That is, though ethical sensitivities differ between the two countries, western theory using the logic of bad apples, bad barrels, and bad cases to explain differences (see Kish-Gephart *et al*., 2010) applies to some degree in China, too—though not always in the same way. This suggests that ethical decision-making phenomena may represent a variform universal; that is to say, though foundations supporting these decisions may be shared across cultures, country-specific factors naturally lead to differences in the way these principles are enacted (Resick *et al.,* 2006). It is certainly true that the cultural frame of reference is distinctly different between the United States and China. China is still a developing economy, which has been shown to affect ethical environment. And China is still in transition from a planned economy with state ownership of industries to a private enterprise economy, which involves profound changes in how business is conducted. Much more research will be necessary to determine the precise nature of these dissimilarities.

In the final analysis, the value of ethics research is determined by the practical usefulness of its findings. Our study certainly leads to actionable recommendations. First, it indicates that global business professionals should not expect reactions in China to ethics-laden situations to be the same as in the United States. This is no surprise, given findings from previous research (e.g., Danon-Leva *et al*., 2010; Ma, 2010), but awareness of bad apples, bad barrels, and bad cases may help managers understand why and predict when this may be so. We did not find managers with high levels of respect for authority to be inclined to make more ethical assessments, but those indicating higher levels of care for others and fairness in dealings made decisions that were significantly more ethical. Finally, greater ingroup loyalty affected the decisions of Chinese managers, leading to less ethical choices toward firm outsiders, as predicted. These findings indicate that selecting employees with these moral foundations in mind may lead to more ethical behavior at work. Fortunately, both care and fairness led to positive effects, so testing for these foundations can take a similar direction whether selecting mangers in China or the United States. This should make selection processes for a multinational firm easier to design and manage.

As for bad barrels, our study found that ethical culture orientations led to more ethical decision making under many of the conditions described in our scenarios. This is encouraging, suggesting that firms doing business in China or the US can influence managers to make more ethical choices by establishing a supportive ethical culture. Relying on a formal ethics infrastructure (i.e., written codes, training programs, and reporting systems) appears to be less

effective—in fact, our data show that it may lead to *less* ethical responses among American managers. Of course, our findings may reflect the poor implementation of these components in firms. For example, if a code of ethics is poorly written or inadequately communicated or a reporting system is difficult to access, these infrastructure features would be ineffective (Kish-Gephart *et al*., 2010). We can offer no further insights on this, since our respondents were unable to comment on the quality of these formal components as established in their firms.

Finally, the results for bad cases also offer important insights. As theorized, the moral intensity of an issue appears to play a role in shaping ethical assessments of that issue, though our findings are mixed. When the number of individuals affected by the act is low, the victim is perceived to be close to the act, or society considers the act to be wrong, one or both of the nationalities in our study judged it more ethically unacceptable. (Contrary to theory, unethical acts deemed highly likely to cause harm were judged as *more* acceptable by both American and Chinese participants.) Kish-Gephart *et al*. (2010) contend that such insights can be used to reduce unethical behavior in the workplace by "sharpening the edges" of dilemmas. That is, firms might discourage undesirable behaviors by highlighting the features of moral intensity to which decision makers are most sensitive. For example, as suggested by our findings, decision makers will be more likely to reject unethical behaviors if it is made clear to them that social consensus deems them inappropriate. When such behavioral norms are defined more intentionally and communicated throughout the organization, employees will be less inclined to commit the unacceptable acts that they discourage.

Viewed as a whole, the results of this study provide evidence to show that the catalyst that promotes unethical behavior in the United States and China is multifaceted. Though the optimal application will vary some between countries, examining workplace ethics in terms of bad apples, bad barrels, and bad cases can lead to improved management practice. The results of this study may help to make the best path forward just a little easier to see and follow.

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Appendix: Ethics Scenarios

A. An executive earning $200,000 a year padded his expense account by about $6000 a year.

B. In order to increase profits, a general manager used a production process which exceeded legal limits for environmental pollution.

C. Because of pressure from his brokerage firm, a stockbroker recommended a type of bond which he did not consider a good investment.

D. A small business received one-fourth of its gross revenue in the form of cash. The owner reported only one-half of the cash receipts for income tax purposes.

E. A company paid a $350,000 "consulting" fee to an official of a foreign country. In return, the official promised assistance in obtaining a contract which should produce $10 million profit for the contracting company.

F. A company president found that a competitor had made an important scientific discovery which would sharply reduce the profits of his own company. He then hired a key employee of the competitor in an attempt to learn the details of the discovery.

G. A highway building contractor deplored the chaotic bidding situation and cutthroat competition. He therefore reached an understanding with other major contractors to permit bidding which would provide a reasonable profit.

H. A company president recognized that sending expensive Christmas gifts to purchasing agents might compromise their positions. However, he continued the policy since it was common practice and changing it might result in loss of business.

I. A corporate director learned that his company intended to announce a stock split and increase its dividend. On the basis of this information, he bought additional shares and sold them at a gain following the announcement.

J. A corporate executive promoted a loyal friend and competent manager to the position of divisional vice president in preference to a better qualified manager with whom he had no close ties.

K. An engineer discovered what he perceived to be a product design flaw which constituted a safety hazard. His company declined to correct the flaw. The engineer decided to keep quiet, rather than taking his complaint outside the company.

L. A controller selected a legal method of financial reporting which concealed some embarrassing financial facts which would otherwise become public knowledge.

M. An employer received applications for a supervisor's position from two equally qualified applicants but hired the male applicant because he thought that some employees might resent being supervised by a female.

N. As part of the marketing strategy for a product, the producer changed its color and marketed it as “new and improved,” even though its other characteristics were unchanged.

O. A cigarette manufacturer launched a publicity campaign challenging new evidence from the Surgeon General’s office that cigarette smoking is harmful to the smoker’s health.

P. An owner of a small firm obtained a free copy of a copyrighted computer software program from a business friend rather than spending $500 to obtain his own program from the software dealer.

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Perceptions of Country Brands in Trade and Tourism: Antecedents and Consequences from Latin America and the Middle East

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Although country branding has been a burgeoning theme in international business literature, comparative studies of this construct across cultures have been limited. The development of a deeper understanding of how diverse nations perceive country brands from their own paradigms is important in the complex world of international business. This study develops and tests a survey instrument in Peru and the Kingdom of Saudi Arabia to assess perceptions of country brands as well as the underlying antecedents to brand preferences. Results from a sample of 154 working adults include the findings that trade preferences are related to top tourism destinations and that consumers from Peru and Saudi Arabia differ in antecedents to country trade choices. Managerial implications and future research directions are also discussed.

Keywords: Country Branding, Cross-Cultural Management, Saudi Arabia, Peru

JEL Classification: Z1, O19, N40, M14, M39

I. Introduction

As more and more nations attempt to leverage their national identities in the global marketplace, obtaining a deeper understanding of country brand perceptions by consumers from various cultures of the world will become increasingly important. This phenomenon is of particular interest to business and governmental leaders in emerging economies who face increasing competition from other nations worldwide as they attempt to differentiate and define the added value of products and services from their home countries. The purpose of this study is to empirically examine perceptions of country images, or country brands, by consumers from Peru and Saudi Arabia, through the dual lens of both trade and tourism. We operationalize country branding conceptually through the country of origin (CoO) literature (Roth and Diamantopoulos, 2009).

Scholars have long studied the national origin of a product and its potential to add to the overall perceived image of quality in a given country (Han, 1989). Indeed, it was fifty years ago that Dichter (1962) argued that marketing managers of the future will have to pay more attention to the

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similarities and differences among consumers from different parts of the world. More recently, Papadopoulos and Heslop (2002) found that country-based marketing is either underused or misdirected due to misconceptions surrounding the meaning of country branding. Other scholars have studied country branding from a number of perspectives, and the foundation of this field of research has expanded gradually over time (Laroche *et al.*, 2005).

On the practitioner side, many governments have begun to see the intrinsic value of country branding and have instituted formal offices, programs, and policies. In Colombia and Peru, for example, "MarcaPais" or country branding offices have been created with high level reporting to either Ministers of Trade or Tourism. Consulting firms, such as Bloom Consulting in Madrid, have begun to focus on country branding as a way for nations to augment and clarify their competitive advantages in the global economy. It has become commonplace for firms to place their national flag or logo (yes, many nations now have logos to support the country brand) on products destined for consumers in foreign nations.

Despite governmental progress, and an increase in academic literature in recent years, very little work has been done in the Middle East or Latin America. Indeed, this research stream has been dominated by North American samples (Noer *et al.*, 2007; Robertson *et al.*, 2012; Roth and Diamantopoulos, 2009). Further, a true gap in the literature exists with respect to contrasting perceptions of country brands among different developing nations of the world. One of the major critiques of the CoO literature is that there has been an extraordinarily heavy reliance on U.S. samples in research studies (Roth and Diamantopoulos, 2009). Moreover, few studies have ventured beyond Europe and North America, and any cross-national comparisons of two culturally different developing countries have been virtually nonexistent. The measurement of both trade and tourism constructs simultaneously has also yet to materialize in the literature. We bridge these gaps while also adding two unique contributions. First, we measure perceptions of a large swath of national brands, not just a small subset (over 100 nations); and second, we assess antecedents to CoO perceptions, or what we refer to as *country brand drivers*.

This paper is arranged as follows. In the next section we review the country branding literature as well as differences between Peruvian and Saudi Arabian cultural norms. This is followed by the development of formal hypotheses related to perceptions of country brands in both trade and tourism. A description of our survey instrument, data collection protocol and sample demographics, key variables, and research methodology is then presented. The paper concludes with a discussion of results, post-hoc analyses, future research directions, and managerial implications.

II. Country Branding Across Cultures: Literature Review and Hypotheses

The importance of a national image to consumers of products and services is a factor that may sway an individual from one country to another depending upon the underlying factors that support a perception of a country image or brand (Laroche *et al.*, 2005). Researchers have found that from a tourism perspective many factors are considered when rating potential destinations (Nikolova and Hassan, 2011). For example, Frauman and Norman (2004) found that potential tourists seek a multiplicity of experiences when searching for locations. The ability of a country to brand itself, while unifying the nation's many attributes, is an important factor as well (Gnoth, 2002). One study concluded that countries with more formalized branding strategies tend to do better at attracting tourism than those without (Kotler and Gertner, 2002). Gilmore (2002) proposed a conceptual framework and argued that 'thoughtful brand positioning' can give a country a competitive advantage over other nations. Gilmore's framework contends that a

country's brand must capture the spirit of its people and must incorporate data from four key factors: macro-trends, target groups, competitors, and core competencies. The extent to which scholars and practitioners genuinely understand what drives perceptions is relatively unknown, yet factors such as strength of an economy, traditionally powerful industries, advertising, and external ratings by various consumer groups tend to play an important role in the evaluative process.

The country of origin literature has yet to reach a consensus on either a comprehensive measure of the construct or the primary antecedents to cognitions about country perceptions (Laroche *et al.*, 2005). For the purpose of this paper, we utilize the 'country image' definition set forth by Allred *et al.* (2000, p. 36): "The perception or impression that organizations and consumers have about a country. This impression or perception of a country is based on the country's economic condition, political structure, culture, conflict with other countries, labor conditions, and stand on environmental issues." Some of these antecedent factors that drive perceptions of countries are measurable, but others are not. Also, the weight that consumers may place on one aspect versus another may vary considerably due to a wide range of influential factors.

Although there is an increasing awareness about country branding around the world, the concept in the Middle East appears to have just started to take root. Examples of firms in some GCC (Gulf Cooperation Council) countries[1] actively thinking about CoO, what it means, and how to incorporate it in principle and practice, are becoming more evident (Mellahi *et al.*, 2011). Saudi Arabia, a member of the GCC, is a host to many important industries such as petrochemicals and refining, banking, and healthcare. In the recent years, Saudi firms have started putting more emphasis on country branding best practices and have begun to show greater commitment in terms of instituting a positive and familiar image of the nation in various industries and institutions (Mellahi *et al.*, 2011).

In Peru, country branding has been more visible, and the national campaign has gained many accolades. Peru's country brand logo (inspired by its Incan archaeological sites) can be found on numerous products and websites that originate in the country. In fact, Peru hired the British firm Future Brand to develop the concept and in March of 2011 launched the new logo at the entrance to the New York Stock Exchange on Wall Street (Hirasuna, 2011). Moreover, one of Peru's country brand videos launched in 2012 has received over 1.4 million views on YouTube.

Many researchers of country branding concur that cultural differences play a significant role in the formation of a brand perception (Knight *et al.*, 2003; Roth and Diamantopoulos, 2009). Culture has been referred to as a construct that is not static but rather an ongoing evolutionary process that involves changes in the priorities of values at both individual and societal levels (Triandis, 1995; Wines and Napier, 1992). As a culture changes and evolves, the worldview of the members of that culture will likely face a transformation as well (Robertson *et al.*, 2001, 2012). The cultural dimension of individualism vs. collectivism has been one of the most researched and debated constructs in the cross-cultural management literature (Ralston *et al.* 1997; Schwartz, 1999; Triandis, 1995). Individualism emphasizes the values of independence and self-sufficiency in meeting one's personal needs, interests, and goals, while collectivism emphasizes social harmony, social norms, and duties that serve to meet the needs, interests, and goals of the wider collective rather than those of the individual (Triandis, 1995).

Although Latin America and Saudi Arabia both have been traditionally classified as collectivistic cultures (Hofstede, 1997; Trompenaars, 1994), the degree to which Peruvian

[1] The GCC includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates

collectivism is comparable to Saudi collectivism is not clear. The literature suggests that Saudi Arabia tends to have some collectivistic traits while the Peru is even more collectivistic with a score on Hofstede's individualism scale of less than half of the Saudi 'Arab World' score (Ali, 1993; Hofstede, 1997; Trompenaars, 1994). Another differentiator was revealed in a recent study of managers from twelve Latin American nations in which the Peruvian group ranked highest, relative to its peers, along a dimension titled self-direction (Lenartowicz and Johnson, 2002). Hofstede (1997) also found that Peru scored much higher on uncertainty avoidance than the Saudi cohort, suggesting that Peruvians are less comfortable with risk-taking, stress, and ambiguity. Thus it appears that Peruvians are more in-group, risk avoiding, collectivists when compared to the Saudi Arabian group. This finding is consistent with research that supports in-group collectivism and paternalism in Latin America (Dávila and Elvira, 2012; Dorfman *et al.*, 2012).

From a cross-national paradigm, it appears that differences in cultural traditions, such as individualism versus collectivism, combined with variations in the relative importance placed on different stakeholder groups, has created institutional environments in Saudi Arabia and Peru that facilitate potential variations in perceptions of foreign nations as potential markets for trade or tourism. In addition, the notion that some variation between these countries may exist with respect to low versus high context orientation (the emphasis placed on explicit communication style versus the actual setting of communication) may exacerbate cultural perceptions (Kittler *et al*, 2011). Indeed, the 'context' of communication and respect for hierarchy vary considerably between Peru and Saudi Arabia. This may be attributable, in part, to religious differences and ethnic sub-cultural differences that form the foundation of cultural expectations.

It appears logical that the underlying antecedents to perceptions of country brands, or *countrybrand drivers,* that we employ in our analysis (geographic location, level of development, people, similarity of culture, many opportunities, experience with country) are likely to vary across diverse cultural groups. The cultural and institutional distance between Peru and Saudi Arabia is not insignificant, and it is expected that a gap along many of these constructs exists. With the exception of geographic proximity, which has been linked to ease of trade, other core factors, such as macro-trends and level of competition, tend to have room for cultural interpretation and valuation (Gilmore, 2002; Roth and Diamantopoulous, 2009). Based on the above analysis of the literature, the following hypotheses have been developed.

III. Hypotheses

Hypothesis 1: Consumers from Saudi Arabia and Peru will embrace different preferences in country brand drivers when selecting preferred trade nations.

Hypothesis 2: Consumers from Saudi Arabia and Peru will embrace different preferences in country brand drivers when selecting preferred tourism destinations.

Hypothesis 3: Regardless of culture, higher preferences to trade with foreign countries are positively related to higher perceptions of top tourism countries.

IV. Research Method

To test our hypotheses, primary data were collected from respondents in Saudi Arabia and Peru. The survey was developed and translated in late 2012 based on country branding principles

and a number of key demographic questions. The survey instrument was translated (and back-translated) from English to Arabic, and English to Spanish, to ensure that proper idiomatic language came across clearly to the Saudi Arabian and Peruvian respondents (Alreck and Settle, 1995). Respondents were informed that participation was voluntary and that their responses were to be kept completely anonymous (Alreck and Settle, 1995). Participants in the study were working adults who were enrolled in evening programs (MBA, certificate, or undergraduate) in Saudi Arabia and Peru. Only citizens from Saudi Arabia and Peru were allowed to participate. Although every attempt was made to obtain a sample from each country that was demographically equivalent, due to cultural constraints and accessibility to subjects some differences were inevitable. The final number of usable surveys for each country was Saudi Arabia n=92 and Peru n=62 for a total sample size of N=154. Although it is plausible that many respondents managed others, we did not obtain specific data related to managerial responsibilities.

The survey consisted of three sections. In the first section, 107 nations were rated on two dimensions: trade and tourism. In our instructions we requested that the respondents rate their perceptions of doing business and tourism in each country. The ratings ranged from 1 (negative) to 5 (positive). The 107 countries were obtained from the Bloom Country Brand rankings for 2012. In section two of the survey, each subject was asked to rate six factors that were important in the formulation of his/her decision regarding trade or tourism ratings of each country. These factors, or *country brand drivers*, were based on constructs suggested by prior scholars and were scored for both trade and tourism (Gilmore, 2002; Roth and Diamantopoulos, 2009). The six country trade drivers were listed as follows: *geographic location, level of development, people, similarity of culture, many opportunities,* and *experience with country*. These items were scored from 1 (not important) to 5 (very important). The third section contained 19 demographic questions. We went beyond standard questions and probed deeper into the international nature and experience of our sampled individuals by asking questions such as "Have you spent time outside your home country?", "Have you been employed outside your home country?" and "Does your firm currently have international operations?"

Table 1: Demographic Profile of Sample

	Peru	Saudi Arabia
Spent anytime outside country		
Yes	53.2%	71.7%
No	45.2%	23.9%
Highest level of education		
High school or less	6.6%	3.3%
Bachelor	24.6%	42.4%
Masters	65.6%	45.7%
Ph.D.		3.3%
Other		2.2%
Employed outside of country		
Yes	26.2%	7.6%
No	73.8%	92.4%

Table 1: Demographic Profile of Sample: Continues

	Peru	Saudi Arabia
Managerial level		
Executive	26.2%	5.4%
Middle Management	32.8%	27.2%
Junior Management	23.05	17.4%
Staff	18.0%	37.0%
Religion		
Muslim	1.6%	98.9%
Christian	90.2%	
Other	8.2%	
Gender		
Male	73.8%	26.1%
Female	26.2%	73.9%
Marital Status		
Single	57.4%	58.7%
Married	42.6%	39.1%
Type of Organization		
Private	78.7%	25.3%
Publicly Traded	4.9%	6.9%
Government	9.8%	60.9%
Family	6.6%	5.7%
Industry of firm		
Manufacturing	29.5%	9.3%
Service	70.5%	84.9%
Size of firm		
Less than 50	16.4%	23.5%
50 to less than 100	8.2%	2.4%
100 to less than 500	23.0%	14.1%
500 to less than 1000	16.4%	7.1%
1,000 or more	36.1%	50.6%
International operations		
Yes	57.4%	50%
No	42.6%	50%

In Table 1, a summary of the demographic makeup of the sample is presented. For the Saudi sample, 71.7 percent had spent time outside of Saudi Arabia while only 53.2 percent of the Peruvians had left their home country. Interestingly, only 7.6 percent of the Saudis had worked abroad, yet 26.2 percent of the Peruvians has spent time as expatriates. Approximately 73.9 percent of the Saudi

sample and 26.2 percent of the Peruvian sample was female and close to 60 percent of both sub-groups indicated that they were not married (57.4 percent Peru and 58.7 percent Saudi Arabia). With respect to religion, 98.9 percent of the Saudis indicated they were Muslims, and 90.2 percent of the Peruvians were Christians. Over 90 percent of each sub-group held at least an undergraduate degree. With regard to employment information, more Peruvians worked for private firms compared to the Saudis (89.7 percent versus 25.3 percent respectively). Both groups had more than 60 percent employed in service jobs, and the majority of each national cohort worked for firms with 500 or more employees. Interestingly, the Peruvian group held a slight advantage in international operations (57 percent compared to 50 percent).

A. Dependent Variables

The first two dependent variables were created to measure global perceptions of trade and tourism at the country level. Thus 107 nations were selected as a representative cross-section of the world's over 200 economies. To compute the trade variable, we calculated the mean score for all trade ratings for each country. The tourism variable calculation was the same using the 107 tourism scores. A third dependent variable, top tourism, was then created by taking the mean scores for the world's top ten countries based on total number of tourist visitors each year (UNWTO World Tourism Barometer). These nations are listed in Table 6, where we compare differences across groups.

B. Independent and Control Variables

In order to ascertain which factors serve as antecedents to trade and tourism country ratings, we next utilized the data collected in the second section of the survey related to *country brand drivers*. Respondents were asked to rate six constructs with respect to the extent to which each mattered when evaluating the 107 countries. The six factors (geographic location, level of development, people, similarity of culture, many opportunities, and experience with country) served as six independent variables and were also combined into two categorical variables: *institutional* (geographic location, level of development, many opportunities) and *cultural* (people, similarity of culture, experience with country). We also created 'expatriate' as an independent variable. This factor was constructed by taking the means of three items from the demographic section: lived abroad, worked abroad, and spent time abroad. In Table 2 the means and standard deviations for the six country brand driver variables are presented. The top trade mean was *many opportunities* for Peru and *level of development* for Saudi Arabia. For tourism, *people* was the highest score for Peru and, again, *level of development* for Saudi Arabia. One interesting observation is that *similarity of culture* was the lowest scoring *country brand driver* for trade and tourism for both countries. Control variables included education, management level, gender, marital status, age, firm size, and expatriate experience.

Table 2: Means and Standard Deviations of Trade Driver Variables Across Samples

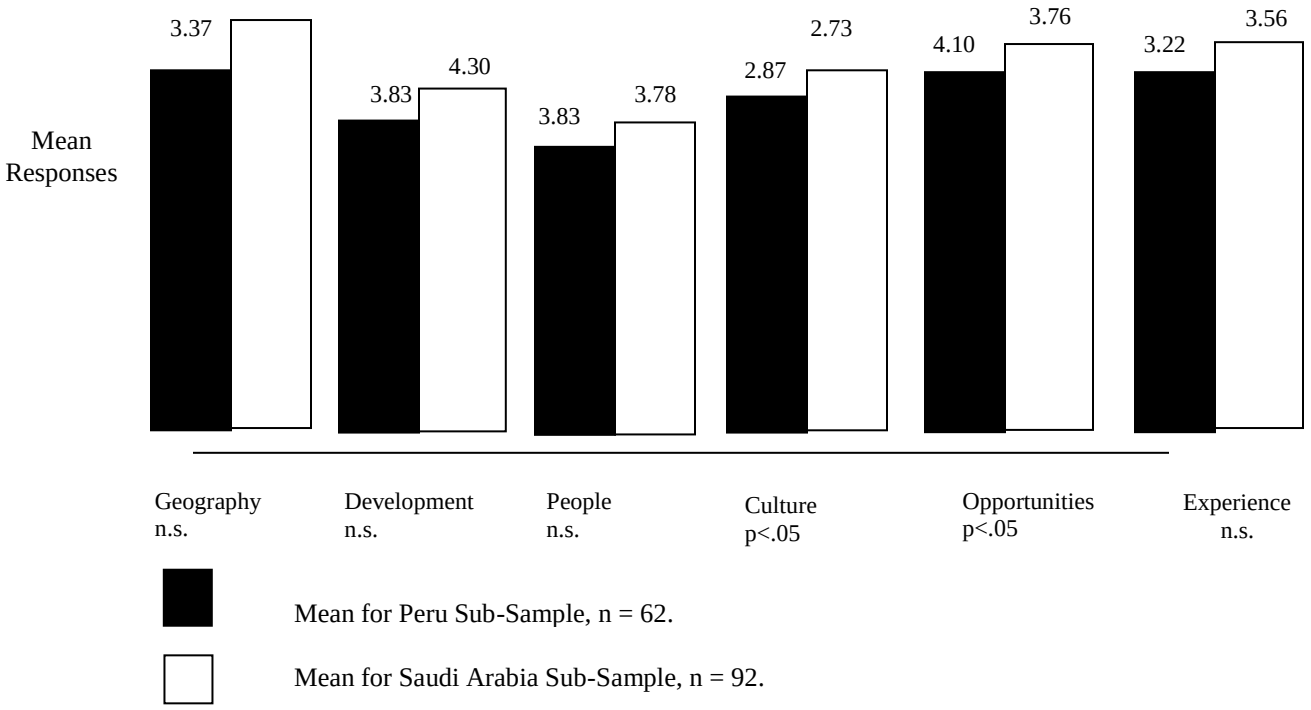
	Peru		Saudi Arabia	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**
Trade				
Geographic Location	3.37	1.36	3.67	1.46
Level of Development	3.84	1.27	4.30	1.14
People	3.84	1.26	3.78	1.27
Similarity of Culture	2.87	1.23	2.74	1.40
Many Opportunities	4.10	1.31	3.76	1.35
Experience with Country	3.23	1.40	3.57	1.45
Tourism				
Geographic Location	3.44	1.60	4.08	1.45
Level of Development	3.11	1.39	4.15	1.14
People	3.77	1.43	3.85	1.45
Similarity of Culture	2.18	1.25	2.71	1.43
Many Opportunities	3.19	1.46	2.99	1.60
Experience with Country	2.94	1.46	3.74	1.38

Table 3: Regression Analysis: Dependent Variable: Trade Preferences

	Peru		Saudi Arabia	
	Model 1 Beta	Model 2 Beta	Model 1 Beta	Model 2 Beta
Demographic Variables				
Expatriate	-0.23*	-0.24*	-0.15	-0.14
Education	0.37**	0.41**	-0.02	-0.04
Management Level	0.22*	0.26*	-0.04	-0.08
Gender	-0.12	-0.09	-0.12	-0.10
Marital status	-0.09	-0.04	0.33**	0.36**
Age	0.01	-0.04	-0.02	0.02
Firm size	-0.03	-0.05	-0.07	-0.07
Country Brand Drivers				
Geography		0.02		-0.24*
Development		0.12		0.06
People		-0.19		-0.01
Culture		0.06		0.09
Opportunities		0.32*		0.15
Experience		-0.10		0.05
F (full model)		1.64*		1.37†
R^2		0.31		0.20
Adjusted R^2		0.12		0.05
N		62		92

†p<.10, *p<0.05, **p<0.01, ***p<0.001.

Table 4: Independent-Samples Test of Mean Differences of Perceptions of Trade Driver Variables Between Saudi Arabia and Peru



V. Results

The results from the two-stage hierarchical regression analysis are presented in Table 3. Two *two-stage* models were run independently for Saudi Arabia and Peru with *trade* serving as the dependent variable. In Stage 1 the following variables were entered into the regression model: expatriate, education, management level, gender, marital status, age, and firm size. In Stage 2 the following variables were entered into the regression equation: geography, development, people, culture, opportunities, and experience. This procedure was performed for both the trade and tourism dependent variables. The final model, Model 2, for Peru was significant (F=1.64) at the $p<0.05$ level with an R^2 of 0.31. The country brand driver variable *opportunities* was significant for Peru (B=.32) at the p<.05 level. Model 2 for Saudi Arabia (F=1.37) was significant at the p<.10 level and the predictor variable *geography* (B=-.24) was significant (negative) at the p<.05 level. In Hypothesis 1 we posited that working adults from Saudi Arabia and Peru will differ in preferences of *country brand drivers* when selecting preferred trade nations. As a follow up analytical procedure we performed an independent samples *t*-test and found significant differences between Peru and Saudi Arabia on the *culture* and *opportunities* country brand driver variables (see Table 4). Although our results are not overwhelmingly strong, we did find, through our regression analyses and *t*-tests, that differences do indeed exist between the two national subgroups: thus Hypothesis 1 is supported.

Table 5: *t*-test for Differences Between Peru and Saudi Arabia on World Top-Ten Tourism Destinations

Country	World Tourism Rank	Peru Mean Rating	Saudi Arabia Mean Rating	*t*-test Result
France	1	4.47	4.55	not significant
United States	2	4.15	4.68	p<.01
China	3	4.24	3.86	p<.01
Spain	4	4.08	4.51	not significant
Italy	5	4.30	4.75	p<.001
Turkey	6	3.01	4.46	p<.05
Germany	7	4.19	4.45	p<.05
U.K.	8	4.13	4.61	p<.01
Russia	9	3.54	2.83	p<.05
Malaysia	10	3.30	4.34	p<.01

Table 6: Regression Analysis with Dependent Variable: Top Tourism

Demographic Variables	Model 1 Beta	Model 2 Beta
Expatriate	-0.16	-0.16*
Education	-0.04	-0.05
Management Level	-0.01	-0.02
Gender	0.07	0.09
Marital status	-0.03	-0.07
Age	-0.11	-0.09
Firm size	0.05	0.07
Institutional		0.17*
Cultural		-0.02
Trade		0.31***
F (full model)		2.93**
R^2		0.17
Adjusted R^2		0.11
N		154

* p<0.05, **p<0.01, ***p<0.001.

In Table 5 our results related to the testing of Hypothesis 2, that Saudi Arabia and Peru differ in their preferences of top tourism destinations, are presented. An independent samples *t*-test was performed to explore significant differences between Peruvian and Saudi perceptions of the top ten tourism destinations in the world. On 8 of the top 10 tourism countries, the Saudi and Peruvian groups differed significantly. Peru scored higher than Saudi Arabia in preferences for China and Russia, whereas Saudi Arabia was higher on six nations: the U.S.A., Italy, Turkey, Germany, U.K. and Malaysia. Thus, Hypothesis 2 is supported. It appears that Saudi Arabia has a stronger preference for either developed nations or nations that embrace Islam as the dominant religion (Turkey and Malaysia). Peru has strong ties to China, culturally and economically, so that preference makes sense. Based on the results, it is plausible that there is an anti-Russia perception in Saudi Arabia that yields the higher preference of Russia by Peruvians.

Hypothesis 3 focuses on relationships between variables utilizing the full sample, therefore regardless of cultural differences. In Hypothesis 3 we theorized that higher preferences for trade with foreign countries are positively related to higher perceptions of top tourism countries. In Table 6 *top tourism* was utilized as the dependent variable while *institutional, cultural*, and *trade* served as the independent variables. Demographic variables were entered in Stage 1 of the regression equation and the independent variables in Stage 2. The overall model was significant ($F=2.93$; $p<.01$) and the R^2 was .17. Independent variables of *institutional* ($B=.17$; $p<.05$) and *trade* ($B=.31$; $p<.001$) were significantly related to *top tourism.* These findings support Hypothesis 3 and suggest that regardless of culture, working adults prefer top tourism destinations in which they also have a positive impression of trade, as well as a high regard for the institutional environment.

Support of our hypotheses suggests two key findings. First, the cognitive driving forces, or antecedents, behind perceptions of country brands tend to vary across cultural groups. Our findings suggest that business opportunities carry significant weight in the mind of Peruvian consumers, while geography is not an important factor in Saudi Arabia. Second, preferred tourism destinations tend to vary across national groups. Although unsurprising, our finding in Hypothesis 3 builds on the identification of a positive relationship between preferred trade and tourism destinations. Thus, people rate tourism destinations higher if they have a positive image of doing business in the country being considered.

VI. Discussion

The purpose of this study was to extend the body of research published on country branding through the development of a survey instrument and subsequent collection and analysis of data in Saudi Arabia and Peru. Although only two nations were examined in this study, the translation of the survey to Spanish and Arabic will hopefully set the stage for additional research endeavors. Future researchers may elect to refine and expand upon our hypotheses and research design. For example, more targeted hypotheses, such as the impact of geographic distance of preferred trade partners, could be analyzed with a larger sample under the context of country brand strategy. By exploring Saudi Arabian and Peruvian perceptions of country brands in the current study, and identifying potential differences across national groups, we believe that the literature in this area is now stronger as we have identified potential constructs that may help determine how cultural differences may impact institutional environments across borders. The focus in this study on how certain perceptions of country brands on trade and tourism may have different 'drivers' or antecedents led to some interesting findings.

From a practitioner perspective, individuals working for MNCs may indeed find the initial results interesting for a variety of reasons. First, very little information is available about how

people from Middle Eastern and Latin American nations perceive the rest of the world. Second, any firm that intends to engage in business in Saudi Arabia or Peru may find it prudent to consider altering brand identification strategies and policies based on the local traditions, best practices, and perceptions of external governance techniques. And third, firms may elect to seek additional information related to impressions that managers and consumers may have of brands that originate from different world regions, and the variation in perceptions of those brands that may exist. On a global scale, the pattern of convergence versus divergence of values has significant implications for multinational firms that view the world as one market.

To further build on our hypothesis testing, we performed two post-hoc analyses. First, we split the entire sample into two groups based on the variable 'expatriate.' This facilitated a comparison between people who lived, worked, or spent time abroad and those who have not (regardless if they were from Saudi Arabia or Peru). We suspected that the individuals who have lived abroad would differ in their preferences of *country brand drivers.* Roughly two-thirds of the sample fell into the expatriate category with one-third in the 'local' group. A *t*-test revealed a number of significant differences. When assessing perceptions of countries for trade, the 'local' group rated *geography* higher. With respect to tourism, the 'expatriate' group was significantly higher on *level of development*, *culture*, and *experience with country*. This suggests that, especially with tourism perceptions, individuals who have substantial experience abroad tend to have different factors that they weigh when evaluating foreign nations.

Table 7: Peru and Saudi Arabia: Top-Ten Nations for Trade and Tourism

Peru			
Trade	**Mean**	**Tourism**	**Mean**
1. China	4.4603	1. France	4.4762
2. United States	4.4194	2. Hong Kong	4.4603
3. Australia	4.3333	3. Belgium	4.3492
4. Peru	4.2857	4. Brazil	4.3492
5. Brazil	4.2698	5. Italy	4.3016
6. Canada	4.2698	6. Peru	4.2857
7. Japan	4.2222	7. China	4.2381
8. Hong Kong	4.1746	8. Germany	4.1905
9. Colombia	4.0317	9. Netherlands	4.1746
10. Chile	4.0000	10. United States	4.1452

Table 7: Peru and Saudi Arabia: Top-Ten Nations for Trade and Tourism: Continues

Saudi Arabia			
Trade	**Mean**	**Tourism**	**Mean**
1. China	4.6196	1. Italy	4.7500
2. United States	4.4891	2. United States	4.6848
3. Japan	4.3261	3. United Kingdom	4.6087
4. United Kingdom	4.1087	4. France	4.5543
5. Turkey	4.0870	5. Spain	4.5109
6. Hong Kong	4.0870	6. Germany	4.4457
7. Canada	4.0435	7. Turkey	4.4457
8. Germany	4.0326	8. Switzerland	4.4348
9. Malaysia	3.9891	9. Canada	4.4130
10. United Arab Emirates	3.9565	10. United Arab Emirates	4.3804

VII. Conclusion

Although we assessed differences between Peru and Saudi Arabia on top tourism destinations, we did not determine the rankings of nations from our overall list of 107 countries. As a second follow up we decided to rank, by means, the top ten nations based on scores from our respondents from both countries (see Table 7). A few observations are noteworthy. Both groups rated China and the United States (the world's largest economies) as their highest trade preferences. Yet in the top ten, nations from the same world region tended to rate quite high with four Latin American nations in Peru's top ten and three Middle East nations for Saudi Arabia. The tourism rankings revealed that both Saudis and Peruvians have a very high perception of Europe as a tourism destination, with five European nations in the top ten for each group.

Any study that includes data collection in emerging economies can have some limitations. Normally, obtaining a sample with an even distribution of men and women in Saudi Arabia is a challenge due to a much higher percentage of the working population stemming from the male group for religious and cultural reasons. As a result we made an extra effort to target female groups, which ended up skewing our sample a bit in the opposite direction. Although this challenge was partially overcome, the samples were slightly uneven with respect to certain other demographic variables, such as education. However, the research questions have been more than adequately addressed and cultural differences have been captured in the current analyses. Also, the convenience samples have some drawbacks, although the size, consistency in data collection, and sample uniqueness trump any major issues. Recent research has also revealed that factors such as economic distance and economic freedom distance could be contributing factors to the survival of firms in the Middle East, and this could play into the transference of corporate citizenship values between home and host subsidiaries (Demirbag *et al.*, 2011). A number of precautions were taken to help minimize the threat of potential response bias. For example, all respondents were given a statement insuring anonymity as part of their participation. Survey administrators left the room during survey administration. Surveys were translated by local native speakers to ensure that any colloquialisms or slang did not lead to misinterpretation. An additional limitation is the theoretical link between our country brand metrics and tourism preferences. For example, some tourists may indeed seek cultural differences when they travel and may prefer to travel to destinations with greater cultural distance. Moreover, although some country brand metrics (such as Bloom Consulting's index)

split trade and tourism rankings, others, such as Future Brand, lump the two constructs together. So the conceptual impact of the country brand drivers is not completely clear. Future studies may elect to split these phenomena into separate categories and perform independent analyses. With larger sample sizes, this could strengthen the results unveiled in the current study while probing deeper into the antecedents to country brand preferences.

A deeper analysis of cultural differences between Saudi Arabia and Peru, especially with respect to collectivism, may be worthy of future research. The Peruvian variety of collectivism seems to be a bit more influenced by the dual pressures of foreign influences on society and the traditional values of the Incan Empire. A recent study of Peruvian cultural values found that the Hispanic subculture embraces European values more than the indigenous subculture and therefore tends to be more self-oriented than the deeply communal indigenous population that stems from the socialistic Incan civilization (Robertson and Guerrero, 2009). Nonetheless, future researchers of country brands must consider the various subcultures that exist in a society and how their perceptions may vary based on historical and ethnic factors. It is our hope that this study has established a new foothold for scholars who are attempting to unravel both the driving forces behind country brand perceptions and interrelationships and variations between trade and tourism as a new paradigm for this research stream.

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The Value of Tenure in Higher Education

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Our findings indicate that tenure has an important impact on job satisfaction in academia, depending to some extent on the type of academic institution at which one is employed. We estimate its monetary value by determining the additional income needed to keep job satisfaction constant if the benefit of tenure were taken away. Because income has a relatively modest effect on job satisfaction, the increase needed to offset the loss of tenure is quite large. Thus, it would be difficult to compensate for the decrease in job satisfaction if tenure were unilaterally abolished by an institution or educational system.

Keywords: Job Satisfaction, Professional Labor Markets, Compensation Packages, Nonwage Labor Costs and Benefits

JEL Classification: J28, J44, J33, J32

I. Introduction

Academic tenure in higher education is under attack. Wisconsin Governor Scott Walker recently asked his state's Board of Regents to reconsider state university tenure with a goal of removing it from state law.[1] Northwestern University law professors McGinnis and Schanzenbach (2015) argued that tenure has reached its "sell-by" date and imposes significant costs on higher education. These costs include reduced productivity from a graying professoriate, "crowding out" of younger and more productive faculty, and limitations on a university's ability to reallocate resources into growing academic fields. They further argue that these costs have been exacerbated by the 1994 law abolishing mandatory retirement and propose replacing tenure with long-term faculty contracts. A paper by Zemsky (2008) finds the percent of tenured/tenure-track faculty has been in decline for three decades and speculates that tenure abolition may begin to appear on future ballot initiatives. In 2012, a bill was introduced, but defeated, in the Utah legislature that would have forbidden state colleges and universities from offering tenure to incoming faculty members. A similar bill was considered in 2011. Representative Christopher Herrod, who proposed the measure, said: "There's been no academic research that tenure benefits the system."[2]

This paper shows that—while it may have costs—tenure does provide at least one important benefit to the state system: it allows colleges and universities to attract and retain qualified faculty at a substantially lower monetary price than would otherwise be possible. Tenure, which provides a degree of job security and status, is an important non-pecuniary benefit that is highly valued in

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[1] See Ehlke (2015)

[2] See Maffly (2012).

academia. Unilaterally eliminating it would force an institution or state system to increase other compensation to attract the same quality of faculty.

Moreover, the institution of tenure benefits society in general by increasing the number of highly educated persons. Largely due to the high opportunity costs associated with prolonged time-to-degree and postdoctoral appointments, estimates indicate that for many disciplines the pecuniary returns on obtaining a PhD are substantially inferior to what might otherwise be realized.[3] Thus, the non-pecuniary job attributes associated with a doctoral degree, such as intellectual satisfaction, must be substantial to compensate.[4] Our results show that tenure is an important component of the non-pecuniary benefits associated with a doctoral degree and suggest that abolishing it throughout academia, without offsetting increases in salaries or other benefits, would essentially shift the demand curve for PhDs downward and, in the long run, result in a lower quantity and/or quality of persons with doctoral degrees. Fewer of our best and brightest students would pursue PhDs.

This raises an important question: if tenure were abolished, how much would PhD faculty have to be compensated to offset the loss of this job benefit? This paper estimates the dollar value of academic tenure to PhDs collectively in the fields of physical and life sciences, technology, engineering, math, and social science (hereafter called "PhDs"). We use data from the 2003 Survey of Doctorate Recipients to explain job satisfaction as a function of demographic characteristics and job attributes, including tenure or the possibility of tenure. We then calculate the increase in salary required to hold job satisfaction constant if tenure were removed from the equation. The estimated number is relevant to an institution or state system that might unilaterally abolish tenure, and then have to compete with tenure-granting institutions for qualified faculty. Admittedly, if tenure were abolished generally throughout academia, there would be market and other adjustments over time, and we make no attempt to predict what these might be.

II. Previous Research

The existing body of research on job satisfaction has produced some consistent findings.[5] Job satisfaction is inversely correlated with quit rates and absenteeism. Age and job satisfaction are related in a convex manner—job satisfaction is highest for younger and older workers. Non-union workers have higher job satisfaction. Job satisfaction is found to decrease as average weekly work hours increase. Workers generally report higher job satisfaction in small firms. Minorities tend to report lower job satisfaction than whites. Female workers tend to report higher job satisfaction than male workers *ceteris paribus* (Bender *et al*., 2005; Hull, 1999; Clark, 1997).

A consistent finding is a weak association between pay and job satisfaction. Hamermesh (2004) found that workers in high-income categories do not report higher job satisfaction. Clark and Oswald (1996) find evidence that being "overpaid" compared to expectations, and not absolute income, is what produces satisfaction. Groot and van den Brink (1999) argue the absence of a pay/job satisfaction association occurs from "preference drift," which means that as workers become accustomed to higher wages, the wage effect on job satisfaction disappears.

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[3] A recent paper estimates the internal rate of return on PhD training in the sciences and engineering to be less than four percent. See Baker *et al*. 2010.

[4] Job satisfaction of PhD S&Es exceeds that of the professions save medicine. However, this is largely the result of a disproportionate share of PhDs employed in the academic sector, which produces higher job satisfaction for professionals as well as PhDs. See Baker *et al*. 2010.

[5] This review is based upon an excellent job satisfaction literature survey in Bender *et al*. (2005).

Although the literature on job satisfaction for doctoral degree holders is meager, the findings for this group tend to be consistent with studies of other populations (see for example Sloane and Ward, 2001; Sabharwal and Corley, 2009; Bender and Heywood, 2006; Baker *et al.*, 2010). Some exceptions were observed by Moguérou (2001), whose study found that certain PhD job satisfaction characteristics ran counter to previous findings (e.g., females with PhDs were more likely to have lower job satisfaction; higher work hours were associated with increased job satisfaction). However, a very robust finding of the work involving PhDs in academia is a strong association between job satisfaction and tenure status.

To the authors' knowledge there have been no previous estimates of the economic value of tenure. Steven Levitt, a prominent economist and author of the popular book *Freakonomics*, indicated that he would gladly accept another $15,000 in pay instead of tenure. Economist Gregory Mankiw responded that Levitt's "star power" allows him to place a much lower value on tenure than typical academic economists.[6]

Previous research on the tenure-salary tradeoff has focused upon the effect of tenure on salaries. Formby and Hoover (2002) and Monks (2007) found that tenure status had a substantial impact on entry level faculty salaries with tenure-track hires receiving salary premiums over non-tenure-track hires. Barbezat and Donihue (1998) argued that tenure resulted in "golden handcuffs" by reducing labor mobility. This reduced mobility created monopsony power over senior tenured faculty and lower wages especially in late career. Ehrenberg *et al.* (1998) found evidence that a trade-off existed between tenure probability and pay; economic departments that had low tenure rates paid higher salaries.

III. Data

This study uses data from the 2003 Survey of Doctorate Recipients (SDR), conducted in October 2003 by the U.S. Census Bureau for the National Science Foundation. The SDR provides information from a nationally representative sample of individuals who received a doctorate from a U.S. university in a science, engineering, or health field; were citizens or non-citizens residing in the U.S.; and were under 76 years old. The survey response rate was 79.1 percent overall, and generally within the range of 75-85 percent when stratifying by key respondent characteristics; thus, non-response bias is minimal. The full data set consists of 29,923 raw cases, 23,531 usable cases of persons employed in the non-health fields and, for purposes of this study, 10,728 usable cases of PhDs employed in the academic sector.

The dependent variable is based on the response to a survey question indicating overall job satisfaction on a 4-item scale of "very satisfied," "somewhat satisfied," "somewhat dissatisfied," or "very dissatisfied." Since the large majority of respondents rated their level of job satisfaction as either very satisfied (49 percent) or somewhat satisfied (42 percent), and to simplify the analysis, the dependent variable was specified as a binary response equal to 1 if very satisfied and 0 otherwise.[7] We use the term "job satisfaction" to paraphrase the estimated probability that a doctorate would report being "very satisfied."

Table 1 provides descriptions of the dependent variable and all explanatory variables considered in this analysis. Information on persons working outside of academia in the government and business sectors is shown for comparison. Most of the explanatory variables listed in Table 1

[6] This was discussed in Mankiw's Blog (http://gregmankiw.blogspot.com/2007/03/levitt-on-tenure.html, accessed November 5, 2013).

[7] We also estimated ordered probit models, with a dependent variable indicating each of the four levels of overall job satisfaction. Since the key results were essentially the same, we used the binary model for simplicity.

are commonly used to explain job satisfaction, and definitions are evident.[8] Note that sets of exhaustive categorical variables are grouped together and set apart by spaces.

We expected the type of employing academic institution to be an important factor for this analysis and therefore constructed a set of dummy variables to capture this effect based upon the Carnegie Classification system. The 2003 Carnegie system was composed of 11 different categories which we collapsed into five categories as follows:[9]

1. Research 1 (R1) universities correspond to Carnegie R1. Institutions that award at least 20 doctorates annually and engage in very high levels of research. (49%)
2. Doctorate Institution includes Carnegie Classification schools Research 2, Doctoral 1, and Doctoral 2. Institutions that award at least 20 doctorates annually but perform less research than R1 institutions. (19%)
3. Comprehensive Institutions include Carnegie Classification schools Comprehensive 1 and Comprehensive 2. These institutions award at least 50 master's degrees annually. (18%)
4. Liberal Arts 1 corresponds to Carnegie LA1. Small, mostly private, very selective institutions that award primarily baccalaureate degrees. (4%)
5. Other Institutions include remaining Carnegie Classifications Liberal Arts 2, two-year schools, theological schools, and medical schools. (10%)

Table 1: Variable Descriptions

		Employment Sector							
		Academic		Government		Business		Total	
Description	**Type**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
Dependent variable: very satisfied w/ job	Binary choice	0.51	0.50	0.50	0.50	0.47	0.50	0.49	0.50
2002 earnings from all sources, in $1000s	Quant	80.8	52.5	88.6	47.2	113.3	98.2	96.4	78.0
Career age	Quant	16.9	11.2	17.4	10.3	16.8	10.5	16.9	10.8
Female	Binary	0.28	0.45	0.24	0.43	0.23	0.42	0.25	0.43
Married	Binary	0.77	0.42	0.76	0.43	0.79	0.41	0.78	0.42
Children present	Binary	0.48	0.50	0.47	0.50	0.52	0.50	0.50	0.50
Disability	Binary	0.08	0.27	0.07	0.26	0.07	0.25	0.07	0.26
Not a US citizen	Binary	0.10	0.29	0.04	0.19	0.12	0.32	0.10	0.30
Typical work hours per week	Quant	48.2	12.6	44.1	8.4	44.1	12.2	45.9	12.2

[8] We included a unique variable that identifies graduates of highly ranked PhD programs, defined as graduate programs with a reputational ranking in the top 20 departments in a given PhD field (Finn, 2010), to see if this factor might have an impact—it did not.

[9] We experimented with different aggregations; this mix was chosen based upon statistical significance and like institutions.

Table 1: Variable Descriptions: Continues

		Employment Sector							
		Academic		Government		Business		Total	
Description	**Type**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
Job involves supervising others	Binary	0.56	0.50	0.55	0.50	0.54	0.50	0.55	0.50
Organization has less than 500 employees	Binary	0.10	0.30	0.03	0.17	0.50	0.50	0.27	0.45
Job and degree closely related	Binary	0.82	0.38	0.61	0.49	0.52	0.50	0.66	0.47
More than 4 articles or books, last 5 years	Binary	0.49	0.50	0.32	0.47	0.15	0.35	0.32	0.47
Received a patent within last 5 years	Binary	0.09	0.29	0.09	0.29	0.26	0.44	0.17	0.38
White (omitted)	Binary	0.79	0.40	0.81	0.39	0.74	0.44	0.77	0.42
Black	Binary	0.04	0.19	0.03	0.18	0.02	0.13	0.03	0.17
Asian	Binary	0.13	0.33	0.12	0.32	0.22	0.41	0.17	0.37
Hispanic	Binary	0.03	0.18	0.02	0.15	0.02	0.14	0.03	0.16
Other race	Binary	0.01	0.09	0.01	0.11	0.01	0.09	0.01	0.09
PhD field in social science (omitted)	Binary	0.34	0.47	0.31	0.46	0.26	0.44	0.30	0.46
PhD field in engineering	Binary	0.11	0.32	0.15	0.36	0.26	0.44	0.18	0.39
PhD field in biology, ag or environment	Binary	0.31	0.46	0.29	0.45	0.20	0.40	0.25	0.44
PhD field in computer or math	Binary	0.09	0.28	0.04	0.19	0.06	0.23	0.07	0.25
PhD field in physical science	Binary	0.16	0.37	0.22	0.41	0.23	0.42	0.20	0.40
Primary job activity is research (omitted)	Binary	0.39	0.49	0.49	0.50	0.42	0.49	0.41	0.49
Primary job activity is teaching	Binary	0.43	0.50	0.01	0.08	0.01	0.10	0.19	0.40
Primary job activity is management	Binary	0.11	0.31	0.28	0.45	0.25	0.43	0.19	0.39
Primary job activity is other	Binary	0.07	0.25	0.23	0.42	0.32	0.47	0.20	0.40
Graduate of a top 20 PhD program	Binary	0.35	0.48	0.28	0.45	0.33	0.47	0.33	0.47
Employed at R1 institution or med. school	Binary	0.49	0.50					0.22	0.41
Employed at Doctoral institution	Binary	0.19	0.39					0.08	0.27
Employed at Comprehensive institution	Binary	0.18	0.39					0.08	0.27
Employed at Liberal Arts 1 institution	Binary	0.04	0.20					0.02	0.14
Employed at Other academic institution	Binary	0.10	0.30					0.04	0.20
Tenured faculty	Binary	0.51	0.50					0.23	0.42
Tenure-track faculty	Binary	0.16	0.37					0.07	0.26
Not-tenure-track faculty	Binary	0.10	0.30					0.04	0.21
Tenure not applicable	Binary	0.22	0.42					0.10	0.30
Employed in the academic sector	Binary							0.44	0.50
Employed in the business sector	Binary							0.46	0.50
Employed in the government sector	Binary							0.10	0.30
No. of Observations (raw count)		10,728		2,425		10,378		23,531	

Source: 2003 Survey of Doctorate Recipients.

Following previous work (e.g., Clark and Oswald, 1996; Bender and Heywood 2006), we assumed that relative or comparison income, which is income relative to benchmark or expected income, is the most appropriate factor to control for the effects of income on job satisfaction. Most empirical studies of job satisfaction find that absolute income has an insignificant, and sometimes even negative, effect while relative income has a statistically and economically significant, positive effect. The income benchmark was created by estimating an earnings equation in the standard way: the natural log of earnings was regressed on factors that are expected to affect income including career age, average work hours per week, professional field, primary work activity, supervisor status, publication success, patent success, and geographic region. The residual from this regression was then used as an explanatory variable to control for salary.

Relative or comparison income can be interpreted as the amount one is over- or underpaid relative to the average person with similar observed characteristics. Therefore, our analysis considers how much a non-tenured PhD would have to be "overpaid" relative to the average non-tenured faculty salary to increase their job satisfaction such that it is comparable to tenured faculty, *ceteris paribus*.

IV. Determinants of Job Satisfaction

A binary probit model was estimated to explain job satisfaction for persons with PhDs working in the academic sector. For comparison, we estimated similar models for the government and business sectors, and for all sectors combined. Table 2 presents the marginal effects, evaluated at the sample means, of each explanatory variable.[10] Statistical significance, based on the underlying coefficients rather than the marginal effects, is indicated with asterisks. With respect to the control variables, the results are generally consistent with the received literature on job satisfaction in general and PhD job satisfaction in particular. Key findings are briefly described below.

Table 2: Binary Probit Regression Results Marginal Effects on Probability of Being Very Satisfied

	Sector of Employment			
	Academic	**Government**	**Business**	**All Sectors**
Relative income, in $1000s	0.14% ***	0.13% ***	0.07% ***	0.08% ***
Career age	0.32% ***	0.31% ***	0.49% ***	0.42% ***
Female	2.51% **	4.78% *	5.06% ***	3.76% ***
Married	3.77% ***	9.65% ***	5.39% ***	5.09% ***
Children present	0.69%	-0.22%	-1.37%	-0.23%
Disability	-5.64% ***	-7.96% *	-7.28% ***	-6.52% ***
Not a US citizen	-5.49% ***	10.48% *	-5.87% ***	-5.27% ***
Typical work hours per week	0.05%	0.53% ***	0.20% ***	0.13% ***
Job involves supervising others	5.41% ***	7.44% ***	5.33% ***	5.72% ***
Organization has less than 500 employees	-0.44%	0.50%	12.05% ***	9.76% ***
Job and degree closely related	9.06% ***	10.57% ***	11.11% ***	10.67% ***
More than 4 articles or books, last 5 years	2.11% *	6.56% **	6.20% ***	4.91% ***
Received a patent within last 5 years	0.23%	5.39%	-3.81% ***	-2.81% ***

[10] An appendix table shows the estimated probit coefficients and corresponding standard errors.

Table 2: Binary Probit Regression Results Marginal Effects on Probability of Being Very Satisfied: Continues

	Sector of Employment			
	Academic	**Government**	**Business**	**All Sectors**
Black	-7.79% ***	-2.80%	-4.04%	-5.94% ***
Asian	-9.70% ***	-14.06% ***	-10.44% ***	-10.94% ***
Hispanic	1.68%	4.29%	2.13%	2.11%
Other race	-7.18%	-7.43%	-6.09%	-7.07% *
PhD field in engineering	-1.45%	4.67%	-5.35% ***	-3.05% ***
PhD field in biology, ag or environment	-3.35% **	1.11%	-4.31% ***	-3.05% ***
PhD field in computer or math	-2.29%	0.76%	-7.41% ***	-4.06% ***
PhD field in physical science	-1.29%	8.05% **	-7.16% ***	-3.41% ***
Primary job activity is teaching	-7.52% ***	-1.77%	16.39% ***	-5.46% ***
Primary job activity is management	0.18%	4.58% *	1.60%	1.63%
Primary job activity is other	-0.09%	-1.05%	4.27% ***	3.14% ***
PhD from a top 20 program	0.95%	-4.19% *	1.78%	0.74%
Not tenured/ten. track at R1 institution	-14.30% ***	--	--	-12.35% ***
Tenured/ten. track at Doctorate institution	-9.78% ***	--	--	-9.73% ***
Not tenured/ten. track at Doctorate institution	-16.11% ***	--	--	-13.81% ***
Tenured/ten. track at Comp. institution	-1.76%	--	--	-2.54%
Not tenured/ten.track track at Comp. institution	-15.46% ***	--	--	-14.52% ***
Tenured/ten. track at Liberal Arts 1 institution	9.44% ***	--	--	3.70%
Not tenured/ten. track at Liberal Arts 1 institution	1.56%	--	--	-0.51%
Tenured/ten. track at Other institution	3.39%	--	--	0.73%
Not tenured/ten.track track at Other institution	-8.10% ***	--	--	-7.86% ***
Employed in business sector	--	--	--	-9.86% ***
Employed in government sector	--	--	--	-5.35% ***
No. of Observations (raw count)	10,728	2,425	10,378	23,531
McFadden Pseudo R^2	0.060	0.057	0.081	0.064
Log likelihood function	-6,986	-1,585	-6,594	-15,271
Percent correctly predicted	60.3	60.4	63.4	61.1
Predicted prob of very satisfied, at sample means	50.7%	49.4%	46.5%	48.7%

Notes: Asterisks indicate significance at 10% (*), 5% (**) or 1% (***) levels, based on corresponding parameter estimates. Marginal effects are changes in the probability of being in the very satisfied category, evaluated at sample means. Excluded variables for each set of mutually exclusive and exhaustive categorical variables are as follows: White, PhD field in social science, primary job activity research, tenured at R1 institution.

Relative income (i.e., the residual from the earnings function) has a significant positive effect on job satisfaction in all sectors, but the impact is relatively small. An annual increase of $10,000 relative to expected earnings increases the probability of being very satisfied by less than 1.5 percentage points in all cases. It is somewhat surprising that the effect of relative earnings is least in the business sector, where one would think pecuniary benefits are more valued. Another surprising result is that relative earnings have the strongest impact on job satisfaction in the academic sector, although the effect is still modest.

Career age has a positive and significant effect on satisfaction in all sectors. While the marginal effects at the sample means are given in Table 2, the variable enters the underlying latent regression model in quadratic form. Estimates imply the function is convex for all sectors and achieves a minimum at a career age of about 4 for the business sector, 11 for the government

sector, and 12 for the academic sector. Females have a somewhat higher probability of being very satisfied in all sectors, but statistical significance is questionable (p=.07) in the government sector. Married persons are more likely to be very satisfied in all sectors. Having children appears to have no effect on job satisfaction.

Persons with disabilities are generally less likely to be very satisfied. Non-US citizens are also less likely to be very satisfied in the academic and business sectors, but are more likely to be satisfied in the government sector.

An increase in typical weekly work hours is associated with higher job satisfaction in the government sector, has a weaker positive effect in the business sector, and is not significant in the academic sector. It should be noted that work hours could be an endogenous factor, if more satisfied persons tend to work longer hours, and, if this is the case, our estimation method is biased with respect to this effect. Nevertheless, work hours is a control variable of relatively minor importance for this study, and the key conclusions do not change if it is omitted from the regression.

Jobs involving supervision have a strong positive effect on job satisfaction in all sectors. Smaller organizations lead to substantially higher job satisfaction in the business sector but, as expected, have no impact in the academic or government sectors.

A somewhat unexpected result is that the variable measuring publishing productivity (a dummy variable indicating more than four articles or books published within the last five years) has a fairly strong positive effect in the government and business sectors but a relatively weak impact in the academic sector. This may have to do with the fact that, as discussed in more detail below, the model controls for tenure status and type of academic institution. Another rather notable result involves the variable indicating whether a person has received a patent within the last five years. Its effect is insignificant in the academic and government sectors and negative in the business sector. We speculate that this occurs because some in the business sector feel they do not receive sufficient rewards for their creations.

In terms of racial differences, blacks have a lower probability of being very satisfied in the academic sector but are not significantly different from whites (the omitted category) in other sectors. Asians are substantially less likely to be very satisfied in all sectors. No other racial group is significantly different when viewed by sector.

PhD field has little impact on satisfaction in the academic sector. In the business sector, all fields are less likely to be very satisfied than social sciences (the omitted category). In the government sector, those in the physical sciences are substantially, and significantly, more likely to be very satisfied than those in other fields.

The last set of categorical control variables involves primary job activity. In the academic sector, controlling for tenure status and type of institution, it is interesting to note that those whose primary activity is teaching are substantially less likely to be very satisfied than those whose primary activity is research (the omitted category). Other primary activities are not statistically different from research. Management jobs appear to have a small positive effect on job satisfaction in the government sector. A focus on teaching in the business sector increases the probability of being very satisfied by 16.4 percentage points, which is the largest marginal effect observed in this study.

V. The Impact of Tenure Status on Job Satisfaction

Because we suspected that job satisfaction might be affected by both the tenure status and the type of academic institution together, additional job classification categories were defined to analyze this issue. Three tenure status indicators were initially defined: (1) tenured, (2) tenure-track and (3) not tenured or tenure-track (includes both "not tenure-track" and "tenure not applicable," hereafter paraphrased as "no-tenure"). Each of these variables was interacted with the five institution-type indicators to create 15 additional categories: tenured at an R1 institution, tenure-track at an R1 institution, no-tenure at an R1 institution, etc.

A related question is whether there is any difference in job satisfaction between tenured faculty, who enjoy greater status and security, and tenure-track faculty, most of whom expect to eventually receive the benefits of tenure. A test of parameter equality across the tenured and tenure-track categories, for each type of institution simultaneously, did not reject the implied restrictions at any usual significance level.[11] A subsequent test of parameter equality across the tenured/tenure-track and no-tenure groups strongly rejected the restriction.[12] Thus the final model was estimated with two tenure-status categories, tenured/tenure-track and no-tenure, interacted with the five institution-type categories, making 10 total tenure-institution categories. The omitted category is tenured/tenure-track at an R1 institution.

To summarize the pertinent results regarding the effects of sector, tenure-status and institution type, Table 3 gives a rank ordering of the various categories with respect to impact on the probability of being very satisfied. The ranking is based primarily on results from the academic sector, but it includes the estimates for business and government PhDs from the combined model so that these two non-academic groups can be incorporated in the comparisons. The benchmark category, tenured/tenure-track at an R1 institution, is shown in bold, and those categories with statistically insignificant coefficients are grouped with the benchmark category (ordered according to the magnitude of the estimated coefficient).

Table 3: Estimated Partial Effects of Tenure Status And Institution Type on Job Satisfaction

Rank	Tenure Status	Academic Institution or Sector	Marginal Effect
1	Tenured or tenure-track	Liberal Arts 1	9.4%
2	Tenured or tenure-track	Other	Insignificant
3	No tenure	Liberal Arts 1	Insignificant
4	**Tenured or tenure-track**	**R1**	**Benchmark**
5	Tenured or tenure-track	Comprehensive	Insignificant
6	--	*Government*	-5.3%
7	No-tenure	Other	-8.1%
8	Tenured or tenure-track	Doctorate	-9.8%
9	--	*Business*	-9.9%
10	No-tenure	R1	-14.3%
11	No-tenure	Comprehensive	-15.5%
12	No-tenure	Doctorate	-16.1%

[11] A likelihood ratio test for the hypothesis involving equality across the tenured and tenure-track categories yielded $\chi^2 = 6.80$ (significance level = 0.24); a Wald test gave similar results. This differs from Bender and Heywood's finding that tenure-track PhDs were significantly less satisfied than those with tenure.

[12] A likelihood ratio test for the hypothesis involving equality across the tenured/tenure-track and no tenure categories yielded $\chi^2 = 106.8$ (significance level = 0.00).

The persons most likely to be very satisfied, by a substantial margin, are those who are tenured/ tenure-track at Liberal Arts1 institutions; moreover, the no-tenure Liberal Arts 1 group is more likely to be very satisfied than any other no-tenure group. Given that Liberal Arts 1 schools have relatively few positions (about 4.3% of the academic sample) with somewhat unique characteristics, perhaps the labor market does especially well in this case of matching idiosyncratic preferences to job characteristics.

In general, the results clearly show the benefits of tenure as the most satisfied tend to be tenured/ tenure-track while the least satisfied tend to be no-tenure. In particular, no-tenure PhDs at Doctorate, Comprehensive and R1 institutions are the least likely to be very satisfied, possibly because they feel disadvantaged relative to their tenure/tenure-track colleagues.

Tenured/tenure-track faculty at R1, Comprehensive, and Other institutions have about the same level of job satisfaction, *ceteris paribus*, and are more likely to be very satisfied than any group save those associated with Liberal Arts 1 institutions. Since R1, Comprehensive, and Other institutions are in many ways quite different from each other, it may be the case that individuals are able to clearly identify and self-select into the respective positions for which they are best suited and thus obtain nearly equal levels of job satisfaction. In contrast, tenured/tenure-track persons at Doctorate institutions are substantially less likely to be satisfied than their counterparts at other types of institutions. A possible explanation is Doctorate institutions may tend to be the second choice for PhDs who would have preferred to obtain positions at other institutions but were unable to do so.

PhDs in the business and government sectors are generally less likely to be very satisfied than those in tenured/tenure-track faculty positions, but are more likely to be very satisfied compared to those in no-tenure academic positions. Persons working in the government sector tend to have higher levels of job satisfaction compared to individuals in the business sector, and the difference is statistically significant.[13]

VI. The Monetary Value of Tenure

To obtain a dollar estimate of the value of tenure we consider the partial effect of tenure on a representative professor. All control variables are held fixed at either the sample mean or mode (for binary variables) and, in particular, relative income is assumed to be zero—thus, the representative professor is neither under- nor overpaid. We then calculate the additional income required to equate the job satisfaction of the representative professor without tenure to that of the representative professor with tenure. This provides an estimate of the premium a no-tenure professor would have to be paid to achieve the same level of job satisfaction as a tenured professor with similar characteristics.

As shown in the prior section, the impact of tenure depends on the type of employing institution. For an R1 institution the probability of our representative PhD being very satisfied is 60.7 percent with tenure/tenure-track status and 46.4 percent without, giving a difference of 14.3 percent. To raise the no-tenure PhD satisfaction from 46.4 to 60.7 percent would require an increase in relative salary of approximately $105,000.

Table 4 shows the results of similar calculations for all institutional categories. The estimated relative salary offsets are astonishingly high, ranging from $48,000 to over $100,000, with a

[13] A likelihood ratio test of the restriction that the coefficients associated with the government and business sectors are equal gave $\chi^2 = 12.73$ (significance level = 0.00).

weighted average of approximately $93,000. These large numbers are driven by both the high value academics put on tenure and the low value they place on relative salary.[14]

Table 4: Estimated Relative Salary Change Required to Offset Tenure Loss, by Type of Institution

Institution Type	Change in Satisfaction From Loss of Tenure	Relative Income Offset
R1	-14.3%	$104,900
Doctorate	-6.6%	$48,100
Comprehensive	-13.9%	$102,000
Liberal Arts 1	-7.3%	$58,000
Other	-11.3%	$83,900

We are not claiming that a non-tenure-granting institution would necessarily have to pay an average premium of $93,000 per person to attract and retain well-qualified faculty. It is possible that other benefits or types of compensation, such as long-term contracts, could offset the loss of tenure. Moreover, a number of factors can affect job choice and satisfaction besides those explicitly captured in our model (e.g., location). Finally, some faculty might be willing to work in a position in which they feel "somewhat satisfied," as opposed to feeling "very satisfied." Nevertheless, these results indicate that tenure has a high monetary value, and it would most likely be impractical to use salary to compensate for tenure abolition.[15] It is clear that tenure results in considerable salary savings for institutions and states—whether these savings exceed the full economic cost of tenure is beyond the scope of this paper.

VII. Summary and Discussion

Consistent with previous research, our findings indicate tenure is an important determinant of job satisfaction. This study adds to the existing literature on job satisfaction for college faculty by showing that the type of academic institution interacts with tenure in determining overall job satisfaction. Among tenured/tenure-track PhDs those at Liberal Arts 1 colleges are the most likely to be very satisfied, while those at Doctorate institutions (save R1) are the least likely to be very satisfied. PhDs working in the private sector are generally more satisfied than no-tenure academics, but tend to be less satisfied than those in the government sector.

Our results suggest that the monetary value of tenure to PhDs in academia is quite high. Because income has a relatively modest effect on job satisfaction while tenure has a relatively large impact, the estimated increase in salary required to offset the removal of tenure is along the order of $50,000 to over $100,000 per annum, depending on type of academic institution. Tenure is therefore a significant benefit in the academic sector and if it were unilaterally abolished by

[14] Since only 3.0% of the no-tenure academics in the sample have a salary that is large enough to offset the lack of tenure, these are out-of-sample predictions to some degree and their accuracy is therefore subject to a higher level of uncertainty—we thank an anonymous referee for pointing this out. In any case, we believe the general point that tenure has a substantial monetary value is strongly supported by the results.

[15] Tenure is also an untaxed job benefit while salary is taxed. This may partially explain the large required relative income offset, i.e., relative income is pre-tax. Some have argued (McArdle, 2004) that the value of tenure should be taxed.

some institution or educational system, it would be difficult to compensate for the decreased satisfaction by changing other job attributes or increasing salary.

Part of the tenure effect on job satisfaction possibly comes from the relative "second-class" status associated with no-tenure positions. If tenure were abolished universally this stigma would be removed and the potential effects of tenure abolition on PhD quantity and quality would be mitigated. But it is more likely that tenure would be abolished one institution or state at a time. In this instance the "relative income offset" gives an idea of the amount a typical PhD in the no-tenure institution or state would have to be "overpaid" relative to her tenured peers. Thus, if Wisconsin Governor Walker's proposals are adopted, the UW system would clearly be at a competitive hiring disadvantage relative to other states, all else being equal. To maintain faculty quality in the long run, UW salaries would need to be increased or other job attributes changed.[16]

Could McGinnis and Schanzenbach's (2015) suggestion to replace tenure with long-term contracts offset the removal of tenure? [17] Some insight into this can be gleaned by examining job satisfaction of PhDs employed in the government sector, which offers a level of job security that could be very similar to long-term contracts in academia. Our representative PhD would have a 53.3 percent probability of being very satisfied in the government sector, 7.4 percentage points short of a tenured faculty member at an R1 institution with otherwise similar characteristics. Since taking tenure away from the same faculty member would reduce the probability of being very satisfied by 14.3 percentage points, we infer that long-term contracts could potentially make up roughly one half of the job satisfaction gap between tenured and non-tenured faculty at R1 institutions.

A thought provoking result of our analysis is that job satisfaction of no-tenure PhDs at Liberal Arts 1 institutions is statistically indistinguishable from that of tenured PhDs at R1 institutions, all else being equal (Table 3). Since they offer salaries that are comparable to R1 institutions, it would seem that Liberal Arts 1 institutions provide non-pecuniary benefits that are able to compensate for a lack of tenure. These benefits or job attributes are likely to be unique to the Liberal Arts 1 environment, such as small classes composed of highly motivated and academically gifted students, and would be difficult for other types of institutions to replicate on a large scale.

The justification for tenure has traditionally been tied to issues of academic freedom. Our results indicate there are strong economic benefits as well. Tenure is an important component of PhD compensation. It allows academic institutions to have a very satisfied faculty at a lower direct cost than would otherwise be possible.

[16] It is interesting to note that Ehrenberg and Zhang (2005) found that a higher number of tenured faculty was associated with an increase in university graduation rates. This might be because faculty having a positive impact on graduation rates are more likely to get tenure or because having tenure influences faculty to have a more positive impact on graduation rates.

[17] For example, a new faculty hire would receive a three-year contract. At the end of three years (corresponding to the standard university tenure practice of a third year review) a decision to award a second three-year contract would be made. After the second three-year contract a decision would be made similar to the tenure decision. Thereafter long-term contracts (such as five years) could be made sequentially and correspond to the growing practice of post-tenure review.

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Appendix: Binary Probit Regression Results
Coefficient Estimates with Standard Errors in Parentheses

	Sector of Employment			
	Academic	**Government**	**Business**	**All Sectors**
Relative income, in $1000s	0.003 ***	0.003 ***	0.002 ***	0.002 ***
	(0.000)	(0.001)	(0.000)	(0.000)
Career age	-0.024 ***	-0.015	-0.004	-0.015 ***
	(0.005)	(0.010)	(0.005)	(0.003)
Career age squared	0.001 ***	0.001 ***	0.001 ***	0.001 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.063 **	0.120 *	0.127 ***	0.094 ***
	(0.030)	(0.066)	(0.034)	(0.021)
Married	0.095 ***	0.243 ***	0.136 ***	0.128 ***
	(0.033)	(0.069)	(0.035)	(0.022)
Children present	0.017	-0.006	-0.034	-0.006
	(0.029)	(0.060)	(0.030)	(0.020)
Disability	-0.142 ***	-0.201 *	-0.185 ***	-0.165 ***
	(0.047)	(0.105)	(0.052)	(0.033)
Not a US citizen	-0.138 ***	0.265 *	-0.149 ***	-0.133 ***
	(0.048)	(0.149)	(0.048)	(0.033)
Typical work hours per week	0.001	0.013 ***	0.005 ***	0.003 ***
	(0.001)	(0.003)	(0.001)	(0.001)
Job involves supervising others	0.136 ***	0.187 ***	0.134 ***	0.144 ***
	(0.028)	(0.058)	(0.028)	(0.019)
Organization has less than 500 employees	-0.011	0.013	0.304 ***	0.245 ***
	(0.045)	(0.158)	(0.028)	(0.023)
Job and degree closely related	0.228 ***	0.266 ***	0.281 ***	0.269 ***
	(0.035)	(0.056)	(0.027)	(0.020)
More than 4 articles or books, last 5 years	0.053 *	0.165 **	0.156 ***	0.123 ***
	(0.029)	(0.065)	(0.038)	(0.022)
Received a patent within last 5 years	0.006	0.135	-0.096 ***	-0.071 ***
	(0.046)	(0.093)	(0.033)	(0.025)
Black	-0.196 ***	-0.070	-0.102	-0.150 ***
	(0.066)	(0.145)	(0.098)	(0.051)
Asian	-0.244 ***	-0.358 ***	-0.266 ***	-0.277 ***
	(0.041)	(0.087)	(0.036)	(0.026)
Hispanic	0.042	0.108	0.054	0.053
	(0.070)	(0.175)	(0.091)	(0.053)
Other race	-0.181	-0.187	-0.155	-0.179 *
	(0.135)	(0.246)	(0.148)	(0.092)
PhD field in engineering	-0.036	0.117	-0.135 ***	-0.077 ***
	(0.045)	(0.089)	(0.044)	(0.029)
PhD field in biology, ag or environment	-0.084 **	0.028	-0.109 ***	-0.077 ***
	(0.033)	(0.074)	(0.041)	(0.024)
PhD field in computer or math	-0.057	0.019	-0.189 ***	-0.102 ***
	(0.049)	(0.146)	(0.063)	(0.037)
PhD field in physical science	-0.032	0.202 **	-0.181 ***	-0.086 ***
	(0.040)	(0.080)	(0.043)	(0.027)

Appendix: Binary Probit Regression Results
Coefficient Estimates with Standard Errors in Parentheses: Continues

	Sector of Employment			
	Academic	**Government**	**Business**	**All Sectors**
Primary job activity is teaching	-0.189 ***	-0.044	0.417 ***	-0.137 ***
	(0.034)	(0.352)	(0.139)	(0.030)
Primary job activity is management	0.005	0.115 *	0.040	0.041
	(0.046)	(0.069)	(0.035)	(0.025)
Primary job activity is other	-0.002	-0.026	0.107 ***	0.079 ***
	(0.054)	(0.075)	(0.034)	(0.026)
PhD from a top 20 program	0.024	-0.105 *	0.045	0.019
	(0.027)	(0.060)	(0.028)	(0.018)
Not tenured/ten. track at R1 institution	-0.362 ***			-0.315 ***
	(0.038)	(0.000)	(0.000)	(0.037)
Tenured/ten. track at Doctorate institution	-0.247 ***			-0.247 ***
	(0.044)	(0.000)	(0.000)	(0.043)
Not tenured/ten. track at Doctorate institution	-0.413 ***			-0.355 ***
	(0.066)	(0.000)	(0.000)	(0.066)
Tenured/ten. track at Comp. institution	-0.044			-0.064
	(0.045)	(0.000)	(0.000)	(0.044)
Not tenured/ten. track at Comp. institution	-0.396 ***			-0.375 ***
	(0.083)	(0.000)	(0.000)	(0.083)
Tenured/ten. track at Liberal Arts 1 institution	0.239 ***			0.093
	(0.086)	(0.000)	(0.000)	(0.083)
Not tenured/ten. track at Liberal Arts 1 institution	0.039			-0.013
	(0.145)	(0.000)	(0.000)	(0.146)
Tenured/ten. track at Other institution	0.085			0.018
	(0.065)	(0.000)	(0.000)	(0.064)
Not tenured/ten. Track at Other institution	-0.204 ***			-0.199 ***
	(0.074)	(0.000)	(0.000)	(0.073)
Employed in business sector	--	--	--	-0.248 ***
				(0.033)
Employed in government sector	--	--	--	-0.135 ***
				(0.037)
Constant term	-0.130	-1.193 ***	-0.814 ***	-0.421 ***
	(0.090)	(0.191)	(0.083)	(0.063)
No. of Observations (raw count)	10,728	2,425	10,378	23,531
McFadden Pseudo R^2	0.060	0.057	0.081	0.064
Log likelihood function	-6,986	-1,585	-6,594	-15,271
χ^2 statistic for overall significance	891	191	1,166	2,075
Percent correctly predicted	60.3	60.4	63.4	61.1
Predicted prob of very satisfied, at sample means	50.7%	49.4%	46.5%	48.7%

Notes: Asterisks indicate significance at 10% (*), 5% (**), or 1% (***) levels. Excluded variables for each set of mutually exclusive and exhaustive categorical variables are as follows: White, PhD field in social science, primary job activity research, tenured at R1 institution.

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Two New Sequencing Rules for the Non-Preemptive Single Machine Scheduling Problem

By MOHSEN HAMIDI*

In this paper, two new job sequencing rules are introduced for the non-preemptive single machine scheduling problem. Through a simulation study, these new rules are compared to First Come - First Served, Shortest Process Time, Earliest Due Date, Critical Ratio, and Shortest Slack sequencing rules. The rules are compared based on five performance criteria of average delay, average flow time, number of delayed jobs, longest delay, and average total of earliness and delay. Simulation results show that the new rules are promising and effective.

Keywords: Job Sequencing, Sequencing Rules, Single Machine Scheduling

JEL Classification: D02, D24, D29

I. Introduction

The non-preemptive single machine scheduling problem deals with sequencing *n* independent jobs to be processed by one machine. Jobs have to be performed sequentially and cannot be processed simultaneously. Jobs cannot be preempted; once a job starts, it has to finish before another job can start.

The objective of this scheduling problem is to find the optimal sequence that minimizes a performance metric such as average delay, average flow time, number of delayed jobs, longest delay, or average total of earliness and delay. For a problem with *n* jobs, there are *n!* distinct sequences (Baker and Trietsch, 2013). Therefore, this scheduling problem becomes very complex for large *n*'s. As the number of jobs, *n*, increases, the number of distinct sequences, *n!*, increases exponentially. In other words, finding the optimal sequence is a difficult, and time consuming, task for problems with large *n*'s. Hence, sequencing rules have been developed to tackle the problem. Although these sequencing rules do not necessarily generate the optimal solution, they aim to find high-quality solutions in a very short amount of time. The well-known sequencing rules for the non-preemptive single machine scheduling problem are as follows (Pinedo and Seshadri, 2001; T'Kindt and Billaut, 2006; Brucker, 2007; Pinedo, 2009; Pinedo, 2012; Jacobs and Chase, 2013; Stevenson, 2014; Reid and Sanders, 2015; Cachon and Terwiesch, 2016; and Heizer *et. al*., 2016):

(1) First Come - First Served (FCFS): Jobs are sequenced according to arrival time – earliest arrival time first.
(2) Shortest Process Time (SPT): Jobs are sequenced according to process time – shortest process time first.
(3) Earliest Due Date (EDD): Jobs are sequenced according to due date – earliest due date first.

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(4) Critical Ratio (CR): Jobs are sequenced according to ratio of time remaining until due date to process time – lowest ratio first.
(5) Shortest Slack (SS): Jobs are sequenced according to slack (time remaining until due date minus process time) – shortest slack first.

The motivation of this study has been to find more effective sequencing rules. In this paper, two new sequencing rules are introduced. Through a simulation study, these new proposed rules are compared with the above sequencing rules based on five performance criteria of average delay, average flow time, number of delayed jobs, longest delay, and average total of earliness and delay. The results show that the proposed sequencing rules are overall more effective and generate better job sequences. However, there are no studies in the literature that have presented these two sequencing rules. These new sequencing rules can specifically help businesses minimize order (job) delays. Minimizing order delays increases customer satisfaction and improves the image and reputation of the company. In long term, this leads to attracting more customers and increasing revenue and profits for the business.

In Sections 2 and 3 of this paper, the first and second proposed sequencing rules are presented respectively and the comparison results are discussed. Conclusions are presented in Section 4.

II. First Proposed Sequencing Rule

SPT and EDD sequencing rules are more promising and overall generate better sequences than FCFS, CR, and SS. This can be seen later in this paper where the rules are compared based on five performance measures of average delay, average flow time, number of delayed jobs, longest delay, and average total of earliness and delay. The idea explored in this paper is combining SPT and EDD rules to achieve even better sequences. When SPT is used, process times are considered to sequence jobs and due dates are ignored. When EDD is used, due dates are considered and process times are ignored. To consider both parameters, the Process time and Due date Total (PDT) rule is introduced in this paper as the first proposed sequencing rule. In this new rule, jobs are sequenced according to the total of process time and due date (days from now), the smallest total first. Although the total of process time and due date does not have a particular meaning, this rule simultaneously takes both process time and due date into account to sequence jobs.

To evaluate the effectiveness of PDT, this proposed rule is compared with other sequencing rules in a simulation study. In this simulation study, 10,000 different problems are generated randomly. Each problem has 10 jobs. For each job, the job arrival time, the job process time, and its due date are generated from the uniform distribution. Arrival times are drawn from a uniform distribution on the interval of 0 to 15 days ago, process times on the interval of 1 to 15 days, and due dates (days from arrival time) on the interval of 3 times the process time and 60 days. For each randomly generated problem, jobs are sequenced using the five traditional sequencing rules as well as the proposed sequencing rule. In other words, for each problem six sequences of jobs have been created. The problems are generated and the sequencing rules are coded in MATLAB.

The sequencing rules are compared based on five criteria or performance measures (Chen *et al*., 1999; Pindeo and Seshadri, 2001; T'Kindt and Billaut, 2006; Brucker, 2007; Pinedo, 2009; Pinedo, 2012; Baker and Trietsch, 2013; Reid and Sanders, 2015; Cachon and Terwiesch, 2016; and Heizer *et al*., 2016):

(1) Average delay
(2) Average flow time: Flow time is the time a job spends in the system or the time a customer has to wait.
(3) Number of delayed jobs
(4) Longest delay
(5) Average total of earliness and delay

A sample problem solved based on EDD is shown in Table 1. In Table 1, jobs are sequenced based on due dates. The description of each column is as follows:

(1) Arrival time (days ago): The arrival time of 0 means today and the arrival time of -3 means 3 days ago.
(2) Process time (in days)
(3) Due date (days from now)
(4) Finish Time (days from now): Finish time of the previous job + (2)
(5) Delay: Max ((4) – (3),0)
(6) Flow time: (4) – (1)
(7) Earliness: Max ((3) – (4),0)
(8) Total of earliness and delay: (5) + (7)

Table 1: A Solved Problem Based on EDD

Job	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
7	-14	3	1	3	2	17	0	2
4	-12	1	16	4	0	16	12	12
8	-8	10	22	14	0	22	8	8
1	-3	9	31	23	0	26	8	8
10	-2	4	34	27	0	29	7	7
9	-3	9	39	36	0	39	3	3
6	-3	14	42	50	8	53	0	8
2	-10	5	43	55	12	65	0	12
3	0	15	50	70	20	70	0	20
5	-2	8	54	78	24	80	0	24

For the EDD sequence shown in Table 1, the average delay is 6.6 days, the average flow time is 41.7 days, the number of delayed jobs is 5, the longest delay is 24 days, and the average total of earliness and delay is 10.4 days.

The above sample problem is solved based on PDT, the proposed sequencing rule in this paper. The results are presented in Table 2. In Table 2, jobs are sequenced based on the total of process time and due date. The total is shown in column (9).

Table 2: A Solved Problem Based on PDT

Job	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7	-14	3	1	3	2	17	0	2	4
4	-12	1	16	4	0	16	12	12	17
8	-8	10	22	14	0	22	8	8	32
10	-2	4	34	18	0	20	16	16	38
1	-3	9	31	27	0	30	4	4	40
9	-3	9	39	36	0	39	3	3	48
2	-10	5	43	41	0	51	2	2	48
6	-3	14	42	55	13	58	0	13	56
5	-2	8	54	63	9	65	0	9	62
3	0	15	50	78	28	78	0	28	65

For the PDT sequence shown in Table 2, the average delay is 5.2 days, the average flow time is 39.6 days, the number of delayed jobs is 4, the longest delay is 28 days, and the average total of earliness and delay is 9.7 days.

Simulation results are presented in Table 3, Figure 1, Figure 2, Figure 3, Figure 4, and Figure 5, which are MATLAB outputs. The numbers are the averages for the 10,000 randomly generated problems. As seen, PDT has generated the lowest average delay and outperforms all sequencing rules. PDT has generated the second-lowest average flow time after SPT. As mentioned by Pinedo and Seshadri (2001), T'Kindt and Billaut (2006), and Pinedo (2012), SPT provides the optimal sequence with regard to the flow time criterion. PDT has generated the second-lowest number of delayed jobs slightly more than SPT. PDT has generated the second-lowest longest delay after EDD. EDD provides the optimal sequence with respect to the longest delay criterion (Pinedo and Seshadri 2001; T'Kindt and Billaut 2006; and Pinedo 2009). Also, PDT has generated the third-lowest average total of earliness and delay, after CR and EDD.

Table 3: Simulation Results

Criterion	FCFS	SPT	EDD	CR	SS	PDT
Average delay	15.1	9.1	8.9	9.8	11.0	7.9
Average flow time	51.5	40.4	46.7	49.4	49.9	44.1
Number of delayed jobs	6.2	4.4	5.2	7.1	5.9	4.6
Longest delay	45.8	37.5	28.6	29.8	30.8	29.7
Average total of earliness and delay	20.8	19.8	13.1	12.2	14.1	13.7

Figure 1: Average Delay

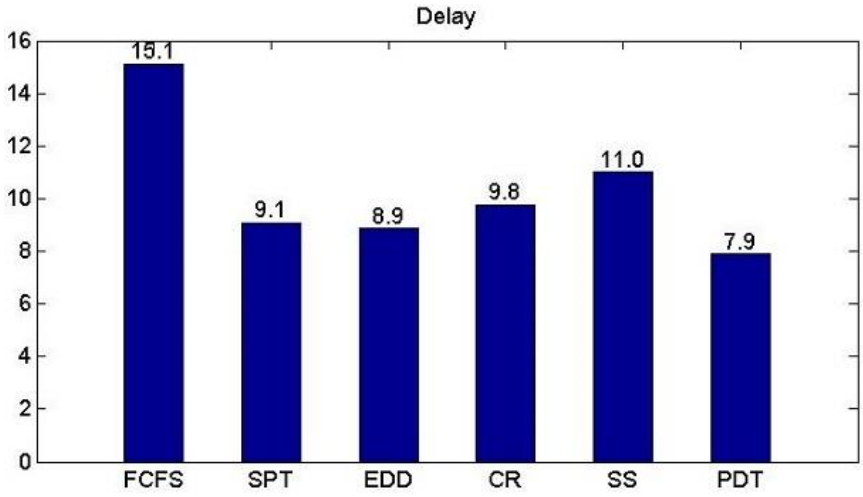


Figure 2: Average Flow Time

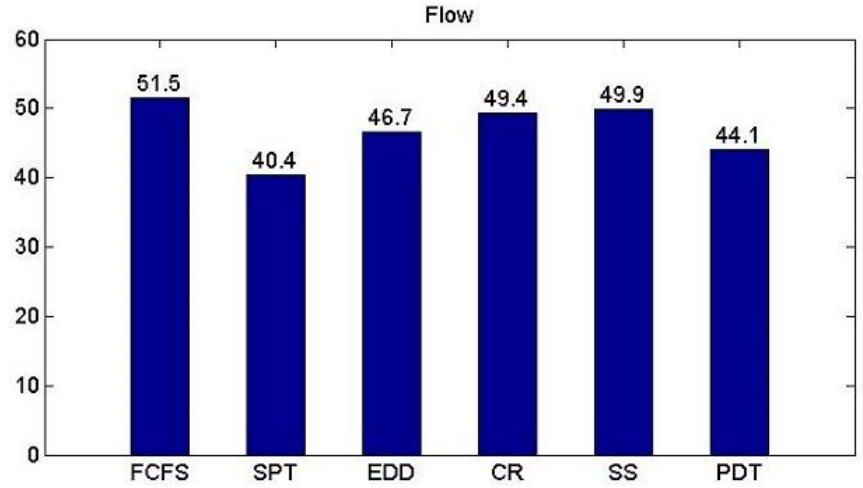


Figure 3: Number of Delayed Jobs

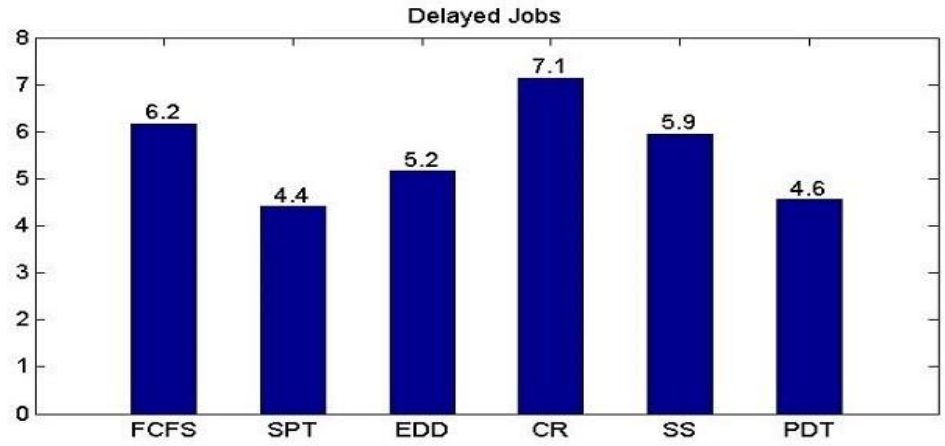


Figure 4: Longest Delay

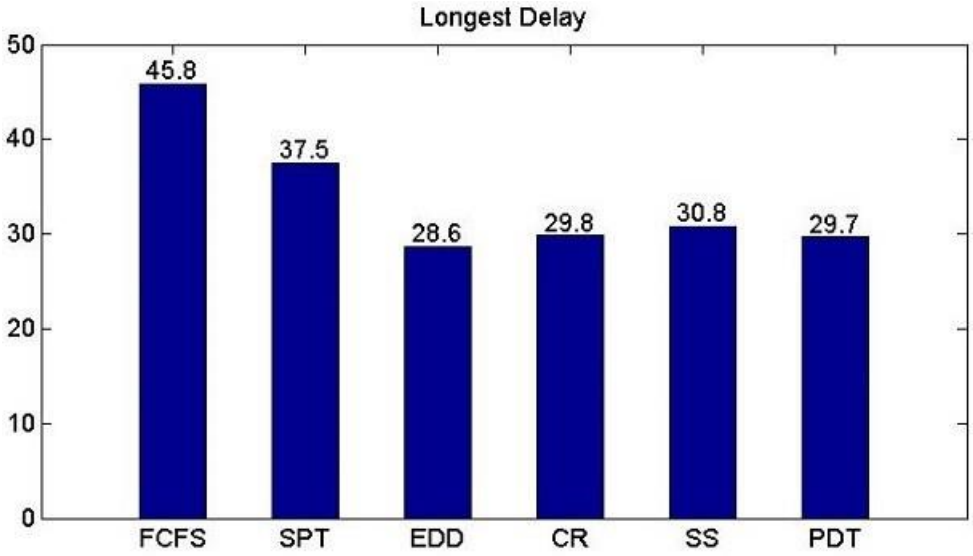
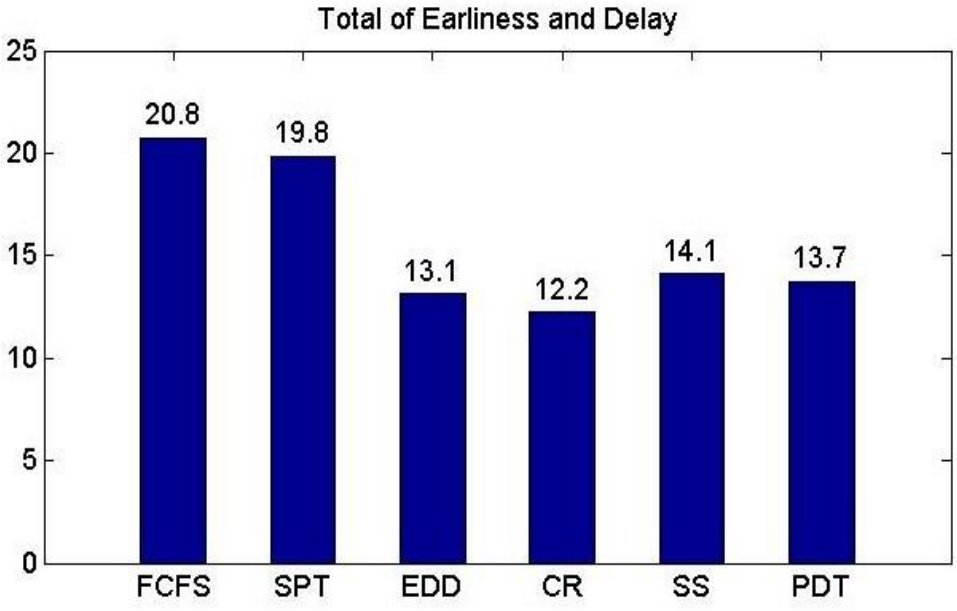


Figure 5: Average Total of Earliness and Delay



As seen in Table 3, Figure 1, Figure 2, Figure 3, Figure 4, and Figure 5, PDT has outperformed FCFS and SS with respect to all five criteria. PDT has performed better than CR with regard to the four criteria of average delay, average flow time, number of delayed jobs, and longest delay. PDT has provided better results than SPT with regard to the three performance measures of average delay, longest delay, and average total of earliness and delay. Also, PDT has performed better than EDD in terms of the three criteria of average delay, average flow time, and number of delayed jobs.

Table 4 shows the rank of each sequencing rule with regard to each performance measure. As seen, PDT and EDD are the only sequencing rules that do not rank worse than third. Overall, PDT has the best average rank, followed by EDD and SPT.

Table 4: Ranks of Sequencing Rules

Criterion	FCFS	SPT	EDD	CR	SS	PDT
Average delay	6^{th}	3^{rd}	2^{nd}	4^{th}	5^{th}	1^{st}
Average flow time	6^{th}	1^{st}	3^{rd}	4^{th}	5^{th}	2^{nd}
Number of delayed jobs	5^{th}	1^{st}	3^{rd}	6^{th}	4^{th}	2^{nd}
Longest delay	6^{th}	5^{th}	1^{st}	3^{rd}	4^{th}	2^{nd}
Average total of earliness and delay	6^{th}	5^{th}	2^{nd}	1^{st}	4^{th}	3^{rd}
Average Rank	**5.8**	**3**	**2.2**	**3.6**	**4.4**	**2**

Table 5 shows the deviation (in percent) of the result of each sequencing rule from the result of the best sequencing rule with respect to each criterion. As seen, results of PDT are very close to the best results and have small deviations. PDT is the only sequencing rule that does not deviate from the best sequencing rule more than 12%. Overall, PDT has the lowest average deviation, followed by EDD and SPT. As observed, the average deviation for PDT is in the single digits and significantly less than the third-lowest average deviation. All in all, the simulation results presented in this section show that PDT is a very effective and promising sequencing rule.

Table 5: Deviation from the Best Result

Criterion	FCFS	SPT	EDD	CR	SS	PDT
Average delay	91%	15%	13%	24%	39%	0%
Average flow time	27%	0%	16%	22%	24%	9%
Number of delayed jobs	41%	0%	18%	61%	34%	5%
Longest delay	60%	31%	0%	4%	8%	4%
Average total of earliness and delay	70%	62%	7%	0%	16%	12%
Average Deviation	**58.0%**	**21.7%**	**10.8%**	**22.4%**	**24.0%**	**6.0%**

III. Second Proposed Sequencing Rule

Another way to combine SPT and EDD is to sequence jobs based on the weighted total of process time and due date. This new proposed rule is called Process time and Due date Weighted Total (PDWT) in this paper. The weighted total is calculated based on the following formula:

$$PDWT = w * PT + (1-w)* DD$$

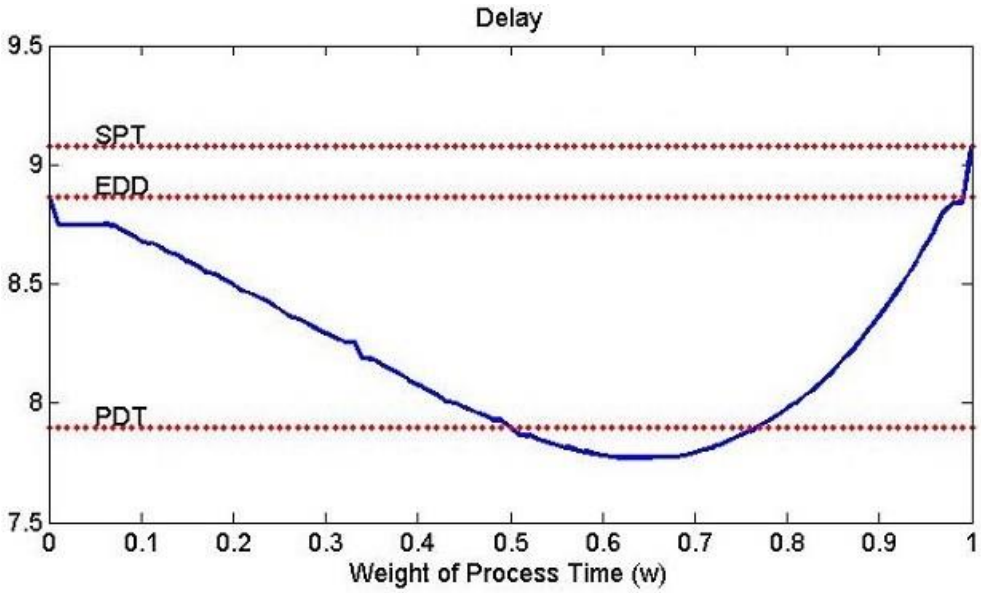
where PT is process time, DD is due date (days from now), and *w* is a real number between 0 and 1. In the above equation, *w* is the weight of process time and *1-w* is the weight of due date.

In a simulation study, PDWT is compared with SPT, EDD, PDT, and other sequencing rules ranking third or better with respect to each performance measure. In this analysis, *w* varies from 0 to 1 with an increment of 0.01 (i.e. 0.00, 0.01, 0.02, … , 0.98, 0.99, 1.00). Obviously, *w* of 0 represents EDD rule, *w* of 1 represents SPT rule, and *w* of 0.5 represents PDT rule as in PDT rule the weights of process time and due date are equal. For each value of *w*, the 10,000 randomly generated problems have been solved, and the average results are shown in Figure 6, Figure 7, Figure 8, Figure 9, and Figure 10. In these figures, the solid curve is the result of PDWT for various *w's*. Also, the results of PDT, SPT, and EDD along with the results of other sequencing rules ranking third or better with regard to each criterion are depicted in the figures.

The results of average delay are presented in Figure 6. As mentioned before, PDT has generated a lower average delay than EDD and SPT. As seen in Figure 6, PDWT generates lower average delays than PDT for certain weights, *w's*. Through numerous simulation runs, PDWT was observed to always perform better than PDT for weights of 0.51 to 0.76. Generally, weights of 0.61 to 0.67 generated the lowest average delays. Specifically, weights of 0.63, 0.64, and 0.65

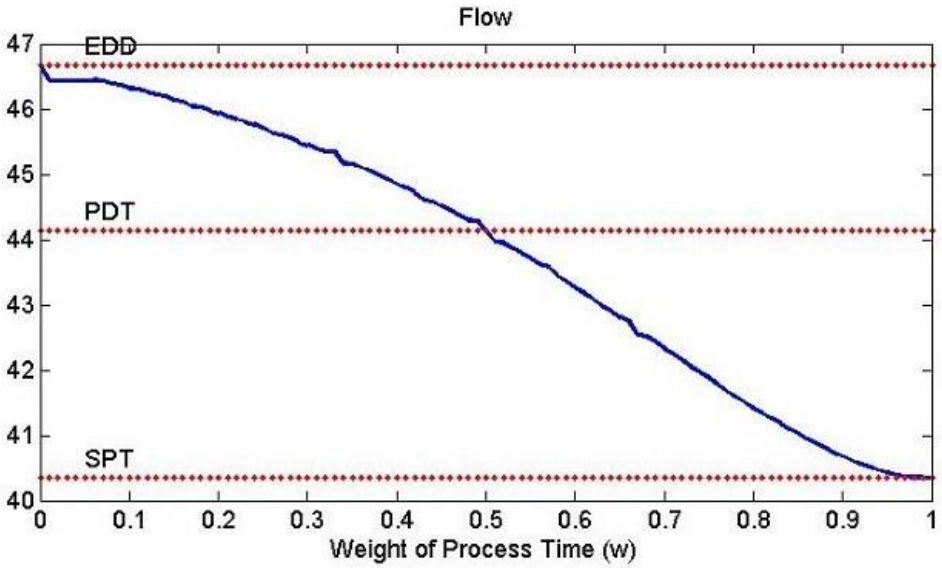
resulted in the three lowest average delays. Weight of 0.64 generated the lowest average delay in most runs, and 0.63 resulted in the lowest average delay occasionally.

Figure 6: Average Delay for PDWT



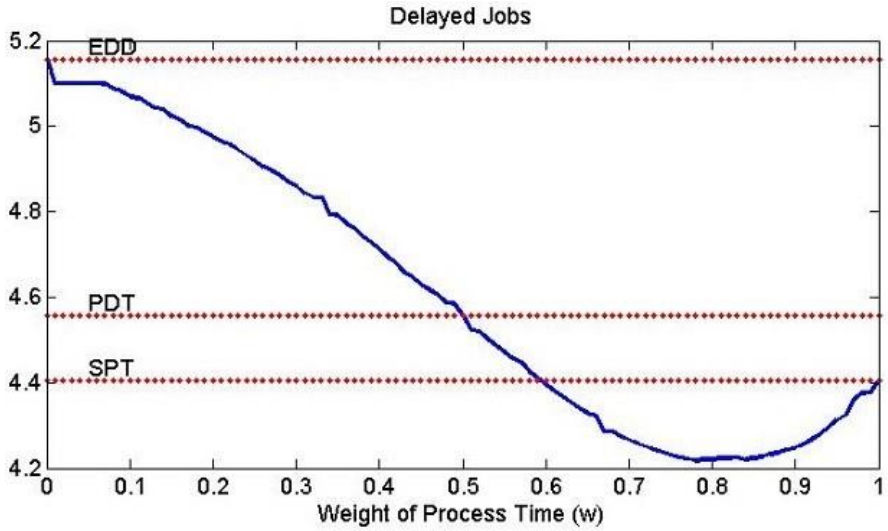
The results of average flow time are shown in Figure 7. As mentioned before, SPT minimizes the average flow time. As shown, PDWT performs better than PDT if *w* is more than 0.50.

Figure 7: Average Flow Time for PDWT



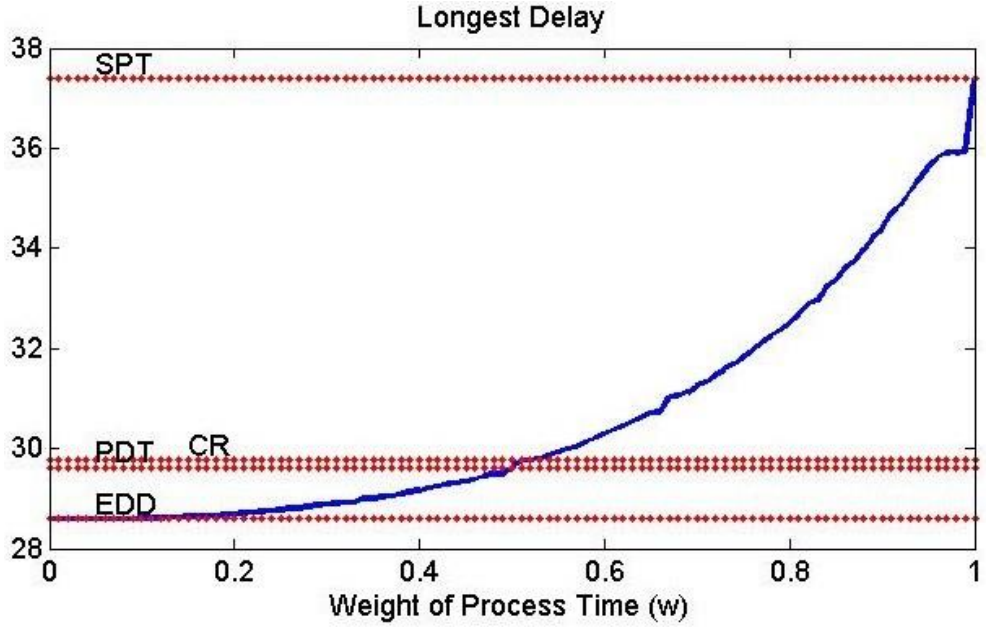
The results of the number of delayed jobs are presented in Figure 8. As mentioned before, while PDT performs better than EDD, SPT is slightly better than PDT. However, as seen in Figure 8, PDWT can perform better than both PDT and SPT. As shown, PDWT is better than PDT for weights more than 0.50. Through numerous simulation runs, PDWT was observed to always perform better than SPT for weights of 0.60 to 0.99. Generally, weights of 0.77 to 0.85 generated the lowest numbers of delayed jobs. Weights of 0.78 to 0.82 alternatively resulted in the lowest number of delayed jobs in different runs.

Figure 8: Number of Delayed Jobs for PDWT



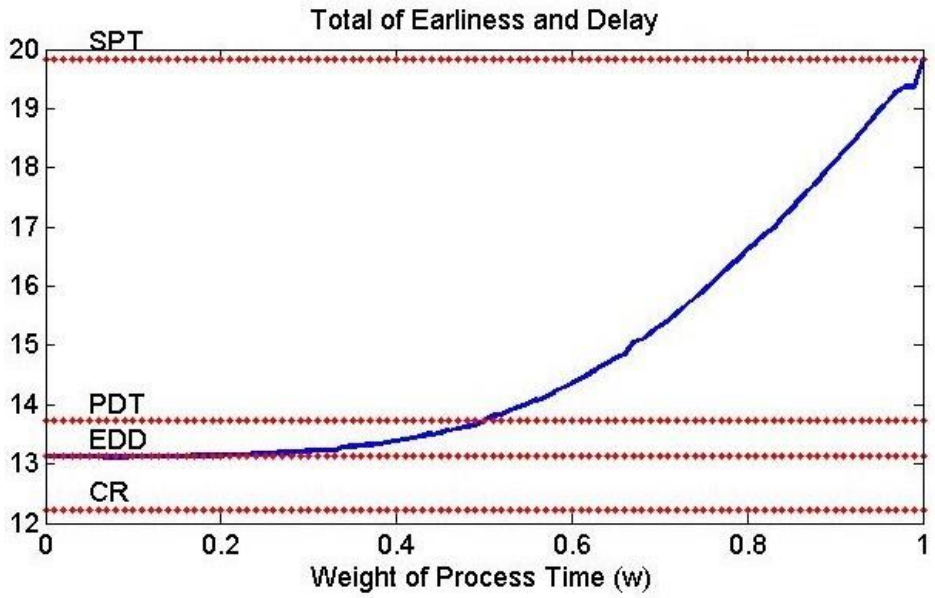
The results of longest delay are shown in Figure 9. As mentioned before, EDD minimizes the average flow time. As shown, PDWT performs better than PDT if the weight is less than 0.50.

Figure 9: Longest Delay for PDWT



The results of average total of earliness and delay are shown in Figure 10. As mentioned before, CR has generated the lowest average, and EDD performs better than PDT. As seen, PDWT performs better than PDT if the weight is less than 0.50. Through numerous simulation runs, PDWT and EDD results were observed to be very close for weights less than 0.20. Interestingly, PDWT performs slightly better than EDD and generates lower averages usually for weights of 0.01 to 0.11.

Figure 10: Average Total of Earliness and Delay for PDWT



IV. Conclusions

The non-preemptive single machine scheduling problem is complex for large-size instances. Two new job sequencing rules of PDT and PDWT are proposed in this paper. These rules are developed based on the combination of process time and due date. A simulation study has been performed to compare these new rules with five well-known sequencing rules. Simulation results show the effectiveness of PDT and PDWT. Based on comparison over five performance measures, PDT has the best average rank and the lowest average deviation from the best result. Specifically, PDT ranks first with regard to average delay, and PDWT generates lower average delays for certain weights. Additionally, PDWT performs better than all sequencing rules with regard to the number of delayed jobs for certain weights.

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