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Perceptions of Job Displacement by Humanoid Robots in Thailand: An Empirical Inquiry

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Abstract

The phenomenon of job displacement by robots, in general, and potentially by humanoid robots has generated a growing body of academic literature as well as studies from business-funded think tanks. Because of the infancy of its development as a technology, much of the literature on humanoid robotics is speculative, focusing mostly on psychometric factors regarding receptivity and not on workers' perception of job displacement or human-robot interaction in future workplaces. This economics study regarding future employment trends is an original, pioneering effort in examining the perceptions of job displacement and future human-robot work interaction in Thailand. It surveyed students in an English-medium MBA program at an international university in Bangkok, Thailand. Perceptions of job displacement were examined using the demographic variables of gender, age, employment status, and ethnic background. The study found partial support regarding all fourof the demographic variables studied, with more significant differences regarding gender and ethnicity.

Keywords: employment, humanoid robots, job displacement, labor force, Thailand

1. Introduction

This empirical study used data obtained from an original survey of students in Thailand in order to assess their perceptions of the possible impact of humanoid robotics (HRs) on the Thai economy. The principal research questions in this study focused on concerns regarding fear of loss of jobs, which types of jobs will more likely be affected first, the anticipated timeframe of displacements, and the degree of receptivity to HRs in the workplace. Capturing these perceptions, as the development of HRs continues to move forward, serves to provide a valuable empirical basis for both management and workers to prepare for the inclusion of HRs in the labor force and the challenges that this inclusion will present.

Labor-displacing automation technologies, involving computerization, robotics, and other aspects of artificial intelligence, are believed to be the major drivers for future economic growth in a developing "Second Machine Age" (Brynjolfsson & McAfee, 2011, 2014) or "Fourth Industrial Revolution" (Schwab, 2016). The International Federation of Robotics (2021) estimated that there are now over 3.5 million industrial robots being utilized around the world. The global industrial robotics market was estimated to be worth about USD 4.17 billion in 2021 and is calculated to grow to about USD 81.4 billion by the year 2028, factoring in a compound annual growth rate of approximately 11.8% over that forecasted timeframe (Zion Market Research, 2022). However, these calculations do not factor in the burgeoning HR market which awaits further technological developments.

The top companies developing HRs are located in China (ExRobotics, Qihan Technology, Ubtech, and Hanson Robotics, located in Hong Kong), France (Intuitive Robots), Japan (Honda), South Korea (Samsung Electronics), Spain

(Macco Robotics, Pal Robotics), United Kingdom (Canonical Group, Engineered Arts Limited, Shadow Robot Company), and the United States (Agility Robotics, Boston Dynamics, Google/Alphabet Inc., Kindred Systems, Promobot, Tesla) (Bhapkar, 2021; Contreras, 2022; Market Trends, 2022). However, no HRs are currently in a fully operational mode in any work environment (Biba, 2022).

2. Literature Review

The great preponderance of academic literature about HRs in social science journals has consisted of psychometric measurements involving anxiety or fear regarding human-robot interaction as well as the perception of likeability regarding the physical appearance of HRs (Castelo & Sarvary, 2022; Krageloh et al., 2019; Morikawa, 2017). Because of the infancy of the technology, most testing involved testing of perceptions in non-work environments with very few questions that focused on human-robot interaction within the work environment, fear of job displacement, or speculation as the timetable of potential displacement as well as the most vulnerable jobs.

There is no consensus as to the extent of potential job displacement by technological automation including robots, and the literature has not specifically focused on HRs. Some studies have suggested that the impact of robots on human employment will be significant (Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017; Ford, 2015), while other studies have argued that jobs will not be threatened and that robotics may actually increase employment of humans (Acemoglu & Restrepo, 2019; Autor & Salomons, 2017; Dahlin, 2019).

Some of the social science literature that has focused on the psychometric measurement of receptivity of HRS addressed age, gender, and ethnicity as

independent variables (e.g., Alemi & Abdollahi, 2021; Kamide & Arai, 2017). However, unlike this study, the demographic variable of employment status was not explored. In addition, no studies on HRs have been conducted that primarily focused on the workplace environment and possible job displacement. Finally, no previous work has focused on Thailand regarding perceptions and receptivity of HRs. Therefore, the original dimensions of this study contribute to a growing body of literature that has focused, in general, on factors involving the incorporation of HRs into the human workplace (Carbonero et al., 2018; Choi et al., 2008; Ford, 2015; Kaplan, 2004; Lim et al., 2021; Morikawa, 2017; Oxford Economics, 2017, 2019).

Besides the pioneering effort of analyzing Thailand, this study is important in providing utilitarian insight to businesses as to the impact of demographic factors on the receptivity of HRs. Studying demographic factors is vital because they impact perceptions, attitudes, and preferences regarding HRs. By accounting for demographic factors, researchers and employers can better understand the potential challenges and opportunities of integrating HRs into the workplace. This knowledge can assist in developing effective strategies for robot deployment and training programs that account for the concerns and preferences of diverse workers and their different attributes.

This study examined the following hypotheses:

H_1 *There will be a difference in perception of job displacement by humanoid robots based on gender.*

H_2 *There will be a difference in perception of job displacement by humanoid robots based on age.*

H_3 *There will be a difference in perception of job displacement by humanoid robots based on employment status.*

H_4 *There will be a difference in perception of job displacement by humanoid robots based on ethnicity.*

H_5 *There will be a difference in the rankings of job displacement by occupation as a result of humanoid robots (based on gender, age, employment status, and ethnicity).*

3. Data and Research Method

An inferential sample of 214 was determined from a population of 482 MBA students, as per Krejcie and Morgan (1970). The sample population very closely resembled that of the actual population percentage breakdown regarding the tested variables of gender, age, and ethnicity. In the sample, males came to 91 of the total (42.5% of the sample), and females totaled 123 (57.5%). The age ranges were the following: ages 21–25 (68 in total and 32% of the sample), ages 26–30 (69 in total and 32%), and ages 31–52 (77 in total and 36%). There was no university administration data as to the employment status of students. As for the sample, 149 (70% of the sample) were full/partially employment, and 65 (30%) were unemployed. Regarding the variable of ethnicity/nationality, Thais came to 160 in total (75% of the sample), and non-Thai international students came to 54 of the total (25%). Within the Thai sample population, 124 in total (77.5% of all Thais) were of non-Chinese ancestry, and 36 (22% of all Thais) were Chinese Thai. This division within the Thai population is based on prior research, which found significant behavioral differences between these two groups (Franco & Roach, 2017, 2022). Distinctions regarding the degree of "Confucian work dynamism"

(e.g., values of work ethic, persistence, thrift, and reciprocity) were found when Thailand was compared to Hong Kong, Taiwan, Japan, and South Korea (Chinese Culture Connection, 1987). The overall breakdown by ethnicity allowed for an in-group comparison (Chinese Thai students v. non-Chinese Thai students) and between-group comparison (all Thai students v. foreign students) in order to explore the potential impact of cultural differences on the receptivity of HRs.

A voluntary, self-administered questionnaire was utilized to test four demographic variables (gender, age, employment status, and ethnicity) in relation to fifteen attitudinal questions. The survey consisted of a 4-point, forced-Likert scale, which ranged from "Strongly Disagree" (weighted as 1) to "Strongly Agree" (weighted at 4). The Likert scale eliminated a neutral option (e.g., "Not Sure") because Thai culture discourages the practice of asserting opinion (*kreng jai*) when offered such an option in surveys (Holmes & Tangtongtavy, 1997; Komin, 1990; Suntaree, 1990). The non-attitudinal portion of the survey, which looked at possible displacement by occupation, utilized a Likert scale of 1 to 5. Since most of the respondents were students who used English as a second language, the questionnaire was translated from English to Thai and subsequently translated back to Thai by a Thai native speaker in order to assure accuracy and prevent the loss of understanding as a consequence of the translation process (Behling & Law, 2000; Domyei & Taguchi, 2009). The foreign MBA students (i.e., those from outside Thailand) were given a questionnaire in English because they were either native speakers of English or because they possessed a high proficiency in English. The data obtained from the surveys were subjected to statistical analysis and are presented in Results and Discussion.

4. Results and Discussion

Respondents were initially asked a number of general questions: Would the introduction of HRs into our society be good for the economy or would it cause harm? Would HRs in the workforce make businesses more efficient, reducing the costs of doing business, and would their introduction allow businesses to make products in a more effective way, surpassing current manufacturing techniques? Will HRs take my job in the future? Can we maintain control over HRs or will HRs try to take control over humans? Based on these attitudes, how soon do you believe that HRs will enter the workforce? The results of these questions are provided in Table 1.

Table 1. Mean attitude ratings and significant distance from near-mid rating.

Variable	M	SD	t	df	p	Mean Difference
Good for the Economy	2.88	.727	17.932	216	<.001	.885
Harm the Economy	2.82	.786	15.465	216	<.001	.825
Make Business More Efficient	2.96	.761	18.687	217	<.001	.963
Make Business More Effective	2.83	.761	16.347	216	<.001	.834
Take My Job	2.27	.961	4.086	217	<.001	.266
Humans Lose Control of HRs	2.65	.895	10.769	216	<.001	.654
HRs Take Control of Humans	2.42	.908	6.762	214	<.001	.419
Years Until Introduction of HRs into the Workforce	One Year		Five Years	Ten Years	Twenty Years	> Twenty Years
Number of Respondents	3		67	83	42	19
Percentage of Respondents	1.4%		31.0%	39.0%	19.6%	9.0%

Note: Distance from 2.0 mid-point on 4-point scale.

Source: Authors' calculations from survey.

The mean scores for four of the attitude ratings were significantly different and higher than the mid-point on the four-point scale used to capture the ratings, as indicated by a one-sample t-test. The largest distances above the mid-point were associated with Making Business More Efficient, $M = 2.96$, $SD = .761$; Improve the Economy, $M = 2.88$, $SD = .727$; Make Business More Effective, $M = 2.83$, $SD = .761$; followed by Harm the Economy, $M = 2.82$, $SD = .786$. Closer to the mid-range, but still significantly above the mid-point, was Humans Lose Control of HRs, $M = 2.65$, $SD = .895$. The means of two attitudinal variables were below the mid-range of the scale, one of which was significantly so. Take My Job was a statically significant distance below the mid-point, $M = 2.27$, $SD = .961$. The attitudinal variable Take Over Control of Humans, $M = 2.42$, $SD = .908$ was below the mid-point but not so much as to be statistically significant.

The three positive attitudinal statements were rated higher than the mid-point of the scale, indicating relatively positive expectations that the introduction of HRs will improve the economy and make business more efficient and effective. Negative attitudinal statements had mixed reviews, with agreement significantly above the mid-range of the scale, indicating attitudes that HRs may Harm the Economy and that humans may Lose Control to HRs. Yet, respondents significantly disagreed that HRs would Take My Job. The statement that HRs may try to Take Over Control was not significantly different from the mid-point of the scale, indicating there was neither agreement nor disagreement that this may happen. Further, data in Table 1 indicated that, while respondents did not believe that HRs would be introduced into society anytime soon, 153 (71.5%) of the respondents reported that they expected the introduction of HRs in ten years or less.

The study examined whether the respondents shared general attitudes or whether attitudes varied due to demographic classifications such as gender, age, employment status, or ethnic background. In order to test this, an ANOVA was required to examine group differences. The data found that group sizes varied across these variables, and, for certain variables, the assumption of homogeneity of variance was violated. Therefore, in order to minimize any effects that these might have on a Type-1 error, the Welch test was selected to test for mean group differences (Mendes & Akkartal, 2010).

The first two groupings tested for differences in their attitudes due to Gender or Age. The continuous age variable was broken into three relatively equal groupings. The descriptive statistics for these first two groupings are shown in Table 2.

Table 2. Mean response to humanoid robot effects on business by gender and age category.*

Dependent Variable	Gender				Age Category					
	Male (91)		Female (123)		21-25 (68)		26-30 (69)		31-52 (77)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Improve the Economy	2.94	.778	2.84	.690	2.88	.673	2.85	.685	2.93	.808
Harm the Economy	2.67	.784	2.93	.772	2.94	.768	2.81	.866	2.75	.720
Make More Efficient	3.09	.768	2.88	.747	2.94	.782	3.01	.682	2.94	.817
Make More Effective	3.05	.787	2.69	.694	2.71	.843	2.90	.653	2.88	.753
Take My Job	2.53	.982	2.08	.907	2.47	.843	2.26	.979	2.10	1.014
Lose Control of HRs	2.69	.951	2.63	.858	2.42	.860	2.78	.826	2.73	.957
HRs Control Humans	2.46	.986	2.39	.853	2.09	.830	2.56	.937	2.55	.884

* Where 1 = Strongly Disagree and 4 = Strongly Agree.

Source: Authors' calculations from survey.

The first hypothesis suggests that mean attitude ratings toward HRs would vary by Gender of the respondents. The results of this test are provided in supplementary Table A (Appendix).

As Table A indicates, there were a total of four attitude ratings where men's and women's means were significantly different. These included Harm the Economy, *Welch's F* (1, 185.217) = 5.815, $p = .017$; Make More Efficient, *Welch's F* (1, 183.482) = 4.166, $p = .043$; Make More Effective *Welch's F* (1, 171.090) = 11.748, $p = .001$; and *Welch's F* (1, 176.710) = 11.689, $p = .001$. While women rated Harm the Economy higher than men ($M = 2.93$, $SD = .772$ vs. $M = 2.67$, $SD = .784$), men had higher mean ratings on Make More Efficient ($M = 3.09$, $SD = .768$ vs. $M = 2.88$, $SD = .747$), Make More Effective ($M = 3.05$, $SD = .787$ vs. $M = 2.69$, $SD = .694$), and Take My Job ($M = 2.53$, $SD = .982$ vs. $M = 2.08$, $SD = .907$). This means that significant differences identified for these groupings were due to high levels of variance across the demographic groupings relative to the variance in responses within these groupings. In other words, ratings within groups were similar, where ratings from group to group were significantly different. Therefore, Hypothesis 1 received partial support.

The data indicates that males were more receptive to the beliefs of the introduction of HRs in terms of the overall impact on the economy as well as providing greater efficiency and effectiveness to the workplace. However, they expressed greater anxiety in turns of job displacement by HRs and slightly more than females regarding the fear that HRs could control humans. The more positive attitudes of males were found in previous studies (Andtfolk et al., 2021; Nomura, 2016), while other research found no significant differences regarding gender (Alemi et al., 2021; Kamide et al., 2012; Riek et al., 2010).

Hypothesis 2 suggested that mean attitude ratings of respondents toward HRS would vary by the Age grouping of the respondents. The results of this test are provided in supplementary Table B (Appendix). Since there are three age groupings, a Games-Howell post hoc test was conducted to determine the significant pairings. The results of that analysis are provided in supplementary Table C (Appendix).

Note that for post hoc tests, only the key results indicating significant differences across groupings are presented. As indicated in the table, only two attitudinal variables were found to be significantly different in mean ratings across the age groups. The youngest group (21–25) significantly differed from the middle age group (26–30) on Lose Control of HRs and HRs Control Humans, with the middle group having higher mean ratings in both cases. The youngest group also exhibited a significant difference in mean ratings from the oldest group (31–52) on the variable HRs Control Humans, with the younger group once again having lower mean ratings. Therefore, partial support is found for Hypothesis 2.

The data contradicts prior studies (Andtfolk et al., 2021; Kamide & Arai, 2017; Nomura et al., 2015), which found that younger respondents (those in their 20s and 30s) expressed greater apprehension and anxiety toward HRs than respondents in their 50s and 60s. The data here only finds that to be the case regarding fear of job displacement. Otherwise, increasing age was an indicator of greater fear of losing control of HRs and of being controlled by them. It should be noted that two prior studies had found no significant differences as to receptivity based on age (Mavridis et al., 2012; Riek et al., 2010).

Hypotheses 3 and 4 examined attitudes toward HRs by Employment Status and Ethnic Grouping, respectively. The descriptive statistics on these variables for these groupings is presented in Table 3.

Table 3. Mean response to human replacement ratings by employment status and ethnic grouping.

Dependent Variable	Employment Status				Ethnic Grouping					
	Employed (149)		Unemployed (65)		Chinese Thai (36)		Thai (124)		International (54)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Improve the Economy	2.85	.755	2.98	.645	2.97	.637	2.84	.712	2.93	.813
Harm the Economy	2.83	.738	2.82	.904	2.85	.870	2.78	.763	2.91	.793
Make More Efficient	2.93	.754	3.05	.777	3.03	.770	2.88	.750	3.13	.764
Make More Effective	2.87	.771	2.75	.699	2.97	.637	2.72	.739	3.02	.805
Take My Job	2.20	.980	2.44	.898	2.33	.990	2.30	.940	2.14	.999
Lose Control of HRs	2.70	.854	2.53	.987	2.59	.946	2.67	.840	2.64	.999
HRs Control Humans	2.51	.887	2.18	.922	2.51	.871	2.40	.890	2.37	.966

Note: Where 1 = Very Strongly Disagree and 4 = Strongly Agree.

Source: Authors' calculations from survey.

Hypothesis 3 proposed that there would be significant differences in the mean ratings of attitude statements related to Employment Status of the respondents. The findings of the Welch test/ANOVA testing are presented in supplementary Table D (Appendix).

As indicated in Table D, only one variable had statistically significant differences by group Employment Status. Attitudes that HRs Will Control Humans was significantly different for Employed *Welch's F* (1, 106.473) = 5.808, $p = .018$, with Employed ($M = 2.51$, $SD = .887$) having higher mean ratings relative to that of

the Unemployed group (M = 2.18, SD = .922). This provided partial support for Hypothesis 3.

Employment status was used as a demographic variable because this study was workplace-specific as to its focus, and this variable was utilized to determine if perceptions were different based on already having a job, including the fear of losing it. Regarding employment status, the data indicated little difference as to the introduction of HRs regarding efficiency and work effectiveness. There was a small differential as to fear of job displacement, with the unemployed showing more concern than those already employed. However, the respondents who were employed expressed greater anxiety as to losing control of HRs and of being controlled by them. Because of the uniqueness of this demographic variable, no prior studies exist to facilitate comparisons.

Hypothesis 4 suggested that attitude mean ratings will vary by Ethnic Group. The Welch test in ANOVA was again used to examine the data to determine if mean differences existed between these three groupings on the attitude variables. The results of this analysis are presented in supplementary Table E (Appendix).

As the table shows, only one variable, Make More Effective, indicated significantly different mean ratings by the three ethnic groupings *Welch's F* (2, 81.437) = 3.669, p = .030. In order to identify between which grouping pairs these significant differences existed, and because homogeneity of variance was non-significant, an LSD post hoc test was conducted on the data. The results of this analysis are presented in supplementary Table F (Appendix). The only pairing shown to be significantly different in mean ratings was between the Thai (M = 2.72,

SD = .739) and International (*M* = 3.02, *SD* = .805), thus providing only partial support for Hypothesis 4.

Though variation as to ethnicity was limited, it should be noted that there was a consistent demonstration of differentials between non-Chinese Thais and Thais of Chinese ancestry, with Chinese Thais often obtaining scores closer to those of the International students. The cosmopolitan setting of the testing (Bangkok) and the graduate level of education of the respondents (with significant exposure to Western culture) may account for the overall minimal differences in scores among the three groups. Overwhelmingly, prior studies indicated that ethnicity, therefore culture, would be a significant factor regarding the receptivity of HRs (Alemi & Abdollahi, 2021; Castelo & Sarvary, 2022; Conti, 2019; Lim et al., 2021; Trovato et al., 2013).

Hypothesis 5 suggested that there would be significant differences in ranking of how likely it was for HRs to replace humans in various occupations. In order to test this hypothesis, the mean for all ratings on the various occupations explored was calculated at 2.82 out of a possible five on the Likert scale used to capture the rankings. Then, a single sample t-test was used to examine significant differences for the various occupations from this mean ranking for all occupations. The results of this analysis are presented in Table 4.

Table 4. Mean expectancy of human replacement by HRs on selected occupations.

Occupation	Mean Expectation	SD	t	df	Mean Difference	p
Factory Workers	4.50	.733	33.947	217	1.685	<.001
Housekeepers	4.19	.894	22.604	217	1.368	<.001
Mechanics	3.77	1.165	12.048	217	.951	<.001
Construction Workers	3.76	1.065	12.989	217	.937	<.001
Soldiers	3.70	1.252	10.347	217	.877	<.001
Farmers	3.46	1.192	7.970	217	.643	<.001
Taxi Drivers	3.28	1.358	5.048	217	.464	<.001
Retail Salesperson	3.03	1.154	2.715	217	.212	.007
Sex Workers	2.96	1.372	1.482	215	.138	.140
Police/ Firefighters	2.85	1.330	.318	217	.029	.751
Mean: All Occupations	**2.82**	**.521**				
Airline Pilots	2.72	1.345	-1.146	217	-.104	.253
Childcare Provider	2.24	1.187	-7.235	217	-.581	<.001
Teachers	2.02	1.062	-11.078	217	-.797	<.001
General of the Army	1.73	.913	-17.630	217	-1.091	<.001
Actors/ Singers	1.73	1.014	-15.884	217	-1.091	<.001
Politicians	1.70	.825	-20.017	217	-1.118	<.001
Artists/ Authors	1.61	.975	-18.231	216	-1.207	<.001
CEO of Company	1.53	.738	-25.842	217	-1.292	<.001

Note: Where 1 = Very little chance of HRs replacing humans and 5 = Great chance of HRs replacing humans.

Source: Authors' calculations from survey.

As can be seen in Table 4, all mean rankings of how likely it is that HRs will replace humans vary significantly from the mean of all included occupational ratings except for the occupations of Sex Workers, Police/Firefighters, and Airline Pilots. These three occupations have mean rankings that are not significantly different from the mean for all occupations, but, as can be seen in the mean differences, they did vary from the other occupations. Since Hypothesis 5 stated that the occupations would vary significantly in mean rankings of how likely it is that humans would be replaced in these selected occupations, this hypothesis is supported.

Hypothesis 5 suggested that rankings as to how likely it is that HRs would replace humans in selected occupations would vary by demographic groupings of the respondents. The first two demographic groupings were Gender and Age Category, and their descriptive statistics are shown in Table 5.

Table 5. Mean response to human replacement rankings by gender and age category.

Dependent Variable	Gender				Age Category					
	Male (88)		Female (130)		21–25 (65)		26–30 (72)		31–52 (80)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Factory Workers	4.44	.725	4.55	.738	4.38	.760	4.56	.690	4.56	.744
Housekeepers	3.90	.947	4.38	.801	4.00	.964	4.28	.843	4.26	.868
Mechanics	3.89	1.119	3.69	1.193	3.77	1.213	3.76	1.055	3.78	1.232
Construction Workers	3.83	1.074	3.71	1.060	3.61	1.094	3.71	.971	3.93	1.111
Soldiers	4.02	.947	3.48	1.382	3.36	1.285	3.63	1.272	4.04	1.130
Farmers	3.49	1.124	3.45	1.239	3.21	1.117	3.67	1.048	3.49	1.341
Taxi Drivers	3.67	1.172	3.02	1.417	3.02	1.330	3.18	1.417	3.60	1.279
Retail Salesperson	3.17	1.106	2.94	1.180	3.08	1.168	2.96	1.215	3.06	1.095
Sex Workers	2.83	1.472	3.05	1.298	2.68	1.416	3.04	1.325	3.11	1.359
Police/Firefighters	3.16	1.294	2.64	1.318	2.50	1.280	2.86	1.335	3.13	1.316

Airline Pilots	3.07	1.258	2.48	1.354	2.68	1.338	2.71	1.419	2.75	1.298
Childcare Provider	2.36	1.166	2.15	1.197	2.27	1.075	2.32	1.372	2.14	1.099
Teachers	2.28	1.093	1.85	1.007	2.09	1.077	2.03	1.034	1.96	1.084
General of the Army	1.76	.922	1.71	.913	1.91	1.003	1.69	.833	1.61	.893
Actors/ Singers	1.76	1.083	1.71	.968	1.82	1.136	1.71	.956	1.68	.965
Politicians	1.70	.805	1.70	.841	1.83	.852	1.67	.839	1.63	.786
Artists/Authors	1.77	1.097	1.51	.874	1.73	1.046	1.66	.985	1.48	.900
CEO of Company	1.64	.776	1.45	.706	1.74	.829	1.49	.750	1.39	.606

Note: Where 1 = Very little chance of HRs replacing humans and 5 = Great chance of HRs replacing humans.

Source: Authors' calculations from survey.

In order to test Hypothesis 5, that there will be significant differences in human replacement by HRs in selected occupations by the Gender of those providing the rankings, a test of group differences was required. Upon checking the assumptions for using ANOVA, it was determined that different group sizes and the lack of homogeneity of variance for some of the occupation ratings would require the Welch test in ANOVA to minimize any possible Type-1 Error (Mendes & Akkartal, 2010). The results of this analysis are presented in supplementary Table G (Appendix).

As indicated in Table G, there were a total of six occupations in which rankings for the replacement of humans by HRs were significantly different by Gender. Significant differences by Gender were indicated for the occupation variables of: Housekeeper, *Welch's F* (1, 165.450) = 15.664, p <.001; Soldier, *Welch's F* (1, 215.862) = 11.975, p =.001; Taxi Driver, *Welch's F* (1, 207.409) = 13.501, p <.001; Police/ Firefighters, *Welch's F* (1, 189.115) = 8.366, p =.004; Airline Pilots, *Welch's F* (1, 195.782) = 10.901, p =.001; and Teachers, *Welch's F*

(1, 176.497) = 8.971, p =.003. Rankings indicating a greater chance of HRs replacing humans were higher for males for each of these occupation variables, except for Housekeeper, where women had a significantly higher ranking of the probability of HRs replacing humans. Descriptive statistics for these rankings by Gender are presented in Table 5. Since the hypothesis suggested differences in these rankings by Gender, and six of the eighteen occupational variables exhibited these differences, partial support is provided for Hypothesis 5.

This study is unique in terms of attempting to gauge perceptions of job displacement of occupation categories through the specified demographic variables. Therefore, there are no prior studies to facilitate comparisons. However, in general, gender appears to have been significant in job displacement determinations by occupation. With the importance of gender having been established regarding displacement considerations, future studies might incorporate focus groups of the respondents, after having completed and turned in the questionnaire, to determine the significant gaps in scores. Finally, there exists a growing body of literature exploring aspects of intimacy (including of a sexual nature) between anatomically correct HRs and humans (Cheok & Levy, 2018; Earp & Grunt-Mejer, 2020; Frank & Nyholm, 2017; Levy, 2007, 2020; Rigotti, 2020; Zhou & Fischer, 2019). Most of these studies have assumed that males would be more receptive to such encounters. However, this study found that the female respondents believed Sex Workers would be more susceptible to job displacement than the male respondents (M = 3.05 v. M = 2.83).

Hypothesis 5 also suggested that there would be statistically significant differences between mean rankings by Age grouping. In order to test this hypothesis, the Welch method was once again employed due to differences in group size and the

presence of some variables that did not meet the homogeneity of variance assumption. The results of that analysis are presented in supplementary Table H (Appendix).

While the ANOVA Welch test did indicate that four occupations had significantly different mean ratings, the test did not reveal between which of the three age groupings those differences existed. Therefore, a post hoc test was performed using the Games-Howell procedure since variances were assumed not to be equal. The results of this analysis are presented in supplementary Table I (Appendix).

As Table I indicates, significant differences were found to exist between the youngest group (21–25) and the oldest group (31–52) for all occupations where significant differences were found: Soldiers, Taxi Drivers, Police/ Firefighters, and CEO of Company. The younger group was also found to be significantly different in their rankings on CEO of Company than those of the middle age group (26–30). While the rankings of the other occupations did not reach the .05 level of significance in their mean difference ratings, the five pairings where significant differences were found to provide partial support for Hypothesis 5.

The data regarding Age parallels, to a degree, the findings regarding Gender where the occupations of Soldier, Taxi Driver, and Police/Firefighters stand out with substantially different scores. With this information as a backdrop, future studies might incorporate a focus group after the collection of administered surveys to determine the differentials and if the results show a correlation with the gender of the respondent.

The last two categories in Hypothesis 5 involved employed vs. unemployed respondents and the ethnic backgrounds of the respondents. Ethnic backgrounds were divided into three groupings, including Thai students of Chinese lineage, non-Chinese Thai students, and international students (i.e., not from Thailand). Their descriptive statistics are provided in Table 6.

Table 6: Mean response to human replacement ratings by employment and ethnic grouping.

Dependent Variable	Employment Status				Ethnic Grouping					
	Employed (149)		Unemployed (65)		Chinese Thai (36)		Thai (non-Chinese) (124)		International (54)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Factory Workers	4.49	.714	4.53	.783	4.70	.684	4.38	.783	4.68	.575
Housekeepers	4.18	.883	4.21	.926	4.36	.859	4.12	.898	4.25	.899
Mechanics	3.73	1.155	3.87	1.194	3.91	1.182	374	1.156	3.77	1.191
Construction Workers	3.76	1.066	3.74	1.070	4.06	.899	3.67	1.069	3.77	1.128
Soldiers	3.69	1.288	3.71	1.165	3.48	1.523	3.75	1.179	3.70	1.249
Farmers	3.47	1.144	3.44	1.313	3.52	1.326	3.47	1.097	3.41	1.332
Taxi Drivers	3.28	1.375	3.31	1.326	2.97	1.403	3.33	1.370	3.38	1.301
Retail Salesperson	3.10	1.135	2.87	1.194	2.88	1.053	3.02	1.114	3.14	1.299
Sex Workers	3.05	1.298	2.72	1.529	3.00	1.369	2.98	1.348	2.89	1.449
Police/ Firefighters	2.85	1.306	2.85	1.401	2.33	1.080	2.83	1.318	3.20	1.407
Airline Pilots	2.66	1.365	2.85	1.291	2.67	1.493	2.69	1.304	2.80	1.367
Childcare Provider	2.29	1.182	2.10	1.197	2.48	1.302	2.25	1.153	2.07	1.189
Teachers	2.05	1.112	1.95	.931	1.82	.846	2.09	1.173	2.00	.894
General of the Army	1.76	.883	1.66	.991	2.00	1.061	1.73	.882	1.57	.871
Actors/Singers	1.85	1.076	1.42	.759	1.45	.771	1.85	1.090	1.61	.947
Politicians	1.78	.816	1.52	.825	2.03	.918	1.80	.842	1.29	.530
Artists/Authors	1.64	.993	1.55	.935	1.42	.867	1.78	1.068	1.33	.695

CEO of Company	1.53	.722	1.52	.784	1.70	.847	1.56	.739	1.36	.645

Note: Where 1 = Very little chance of HRs replacing humans and 5 = Great chance of HRs replacing humans.

Source: Authors' calculations from survey.

Hypothesis 5 predicted there would be significant differences in rankings of human replacement in selected occupations by HRs for respondents reporting as employed (fully or partial) versus those reporting as being unemployed. In order to test this hypothesis, the Welch test was once again used to examine the data for differences. The results of this analysis are presented in supplementary Table J (Appendix).

As indicated in the table, respondents differed significantly in mean rankings of human replacement in only two occupations: Actors/Singers and Politicians. In both cases, those reporting being employed had higher mean ratings for these occupations (Actors/ Singers, $M = 1.85$ vs. $M = 1.42$; Politicians, $M = 1.78$ vs. $M = 1.52$). While respondents had similar mean ratings for sixteen occupations, they did rank two occupations significantly different, providing partial support for this hypothesis.

Hypothesis 5 also suggested that there would be differences in the ranking of humans being replaced by HRs in selected occupations as determined by different ethnic groupings. To test this hypothesis, an ANOVA employing the Welch test was used since the assumptions of equal group size and homogeneity of variance were violated by the data to be analyzed. The results of this analysis are presented in supplementary Table K (Appendix).

As indicated in the table, there were significantly different rankings across the different ethnic groupings for five occupational variables: Factory Workers, *Welch's F* (2, 84.580) = 5.153, *p* =.008; Police/ Firefighters, *Welch's F* (2, 83.774) = 5.294, *p* =.007; Actors/ Singers, *Welch's F* (2, 93.599) = 3.417, *p* =.037; Artists/ Authors, *Welch's F* (2, 86.532) = 6.154, *p* =.003; and Politicians *Welch's F* (2, 80.221) = 16.813, *p* <.001. However, since there were three ethnic groups, and ANOVA does not indicate between which groups these differences exist, a Games-Howell post hoc test was performed. The results of this analysis are presented in supplementary Table L (Appendix).

As indicated in Table L, a total of six pairings revealed significant differences in the ranking of occupations as being more or less likely to replace human workers with HRs. The international group differed from the other groups in five of these pairings. Chinese Thais' mean rankings differed from the other groups in three of the pairings, and Thais' mean rankings also differed from the other groups in three pairings. With these findings, partial support is provided for Hypothesis Five; there would be differences in rankings among the three ethnic groupings regarding human replacement by HRs across the occupations investigated in this study.

Regarding perceptions of job displacement by occupation, the data provides strong evidence of the impact of ethnicity (or culture), as determined in previous studies (Alemi & Abdollahi, 2021; Castelo & Sarvary, 2022; Conti, 2019; Joosse, 2014; Lim et al., 2021; Trovato et al., 2013), as well as additional findings of cultural distinctions between non-Chinese Thais and Thais of Chinese ancestry as determined in previous studies (Franco & Roach, 2017, 2022).

5. Conclusion and Suggestions for Future Research

Preparing for the introduction of HRs in the workplace is crucial for ensuring a smooth transition and maximizing the benefits that these machines can bring. It requires education, training, and a willingness to adapt to change. This study sought to examine demographic variables that impact these transitional factors, specifically regarding adaptability involving human-robot interaction and collaboration in the workplace, productivity, efficiency, employee motivation, employee morale (particularly regarding safety and possible job displacement), and the development of ethical guidelines and policies. Primary data, collected by using a self-administered questionnaire, was empirically analyzed and able to shed light on the impact of demographic variables on the receptivity of HRs. The main findings are that gender and ethnicity were the most significant demographic variables in affecting receptivity toward HRs in the workplace. The findings for these two variables confirm existing literature (specified in the review of the hypotheses below). Age proved to be a weaker variable in terms of impact on receptivity, supporting some existing literature but contrasting other studies (see below). Finally, employment status proved to be a weak variable. However, this independent variable was unique to the context of this study, and no prior studies exist as a means of comparison. As to the study's examination of the perception of possible job displacement by occupation, significant differences were found with all of the demographic variables, with the strongest to weakest presented in the following order: gender, ethnicity, age, and employment status. No prior research exists that examines the perception of job displacement by occupation category.

In review, five hypotheses focusing on demographic factors were tested in this study:

Hypothesis 1 (differences by gender). Of the four hypotheses tested that dealt with demographic independent variables, this one received partial support by indicating the greatest number of significant differences. Differences were found for Harm the Economy, Make More Efficient, Make More Effective, and Take My Job. This indicates that, at least for these variables, men and women do not share similar attitudes toward the introduction of HRs into society, with men indicating more fear of job displacement than women and more anxiety, in general, regarding HRs in the workplace. This confirms the findings in prior studies (Bartneck et al., 2006; Mavridis et al., 2012).

Hypothesis 2 (differences by age). While this hypothesis did receive some partial support, significant mean differences were found in only three group pairings and then only for the attitudinal variables of Lose Control of HRs and HRs Control Humans. Therefore, Age may be a weak grouping variable when it comes to explaining variance in attitudes toward HRs. This confirms the findings of Mavridis et al. (2012) and Riek et al. (2010), although other studies did find Age to be significant in determining attitudinal distinctions (Andtfolk et al., 2021; Kamide & Arai, 2017).

Hypothesis 3 (differences by employment). There was weak but partial support for group differences in attitudes toward HRs by Employment Status. Group differences were only found for one variable: HR Control Humans. Employment Status also appears to be a weak grouping variable for exploring attitudes toward HRs. No prior studies have used employment status as an independent variable.

Hypothesis 4 (differences by ethnicity). This hypothesis also only received partial support with one variable, Make More Effective, finding significant

differences between Thai respondents (consisting of both examined subgroups) and International respondents. This confirms the important impact of Ethnicity as found in prior studies (Alemi & Abdollahi, 2021; Castelo & Sarvary, 2022; Lim et al., 2012; Merkle, 2021).

Hypothesis 5 (differences in rankings of displacements by occupation based on gender, age, employment, and ethnicity). Regarding gender, this hypothesis was partially supported with six occupations out of the eighteen for which data was gathered, exhibiting significant differences in mean rankings. Men had higher likelihood rankings for all but one of the occupations (housekeepers). This indicates that men, in general, have a greater expectation that humans will be replaced by humanoid robots than do women.

With regard to age, significant differences were found for four of the occupations explored and for five of the pairings between groups, providing partial support for the hypothesis. The youngest group differed from the oldest group for all occupations where significant differences were found to exist. In only one case did the middle group differ from the older group. Mean rankings for the younger group tended to be lower than the older group. However, younger persons did have a greater fear of job replacement by HRs than older persons. Differentials in receptivity of HRs by Age is found in previous studies (Andtfolk et al., 2021; Kamide & Arai, 2017; Nomura et al., 2015) in reference to job displacement but not fear of losing control to HRS or being controlled by them, which this study found to increase with age.

Regarding employment status, only two occupations of eighteen occupations by group employment status received significantly different rankings from the

respondent groups. This provided weak partial support for Hypothesis 5 and indicates that employment status may not be a good indicator of persons possessing differing opinions regarding HRs.

Finally, regarding the ethnicity of the respondents, the results indicated that five occupations varied significantly in their mean rankings of these replacements. For all but one of the pairings in which significant mean differences were found, the International group differed from the Chinese Thais (two pairings) and the Thais (three pairings). Chinese Thais mean rankings differed significantly from non-Chinese Thais in only one pairing. This seems to indicate that Chinese Thais and non-Chinese Thais share some perceptions of HRs, while International respondents are more likely to perceive HRs differently than persons in the two Thai groups. Additionally, since the mean differences were not in any one direction for the International pairings, it would appear that any perception of increased likelihood for human replacement is not global for a particular ethnic group but rather varied based upon the occupation itself. In sum, an examination of all four demographic variables indicated that the respondents did vary in their rankings of how likely selected occupations will replace humans with HRs. This indicates that people believe that HRs will definitely enter the workplace and that some occupations will be quicker to be adversely impacted before others.

This study examined the critical role that culture plays as to how technology is perceived, with the understanding that technological innovation and evolution can also alter culture. The study's categorization of ethnic subgroups (in-group: Chinese Thais students v. non-Chinese Thais students and between-group: All Thai students v. foreign students) demonstrated cultural orientation differentials regarding receptivity of HRs in the workplace, and, therefore, this supports studies that

indicated ethnicity affects receptivity (Bartneck et al., 2005, 2006; Castelo & Sarvary, 2002; Joosse et al., 2014; Lim et al., 2021; Samani et al., 2013). HRs are designed to imitate human behavior and to interact with people in ways that are similar to human-to-human interaction. However, this requires levels of acceptance and trust that are influenced by cultural factors and which are directly reflective of accepted cultural norms. It is undeniable that HRs are created on the basis of the beliefs and biases of their designers. However, despite this reality, the design of such robots must be aligned with the cultural backgrounds of their potential human users in order to ensure strong receptivity.

An examination of the other demographic variables provided insight as to the impact of receptivity regarding age, gender, marital status, and employment status. A comprehensive and dialectical understanding of the impact of these different variables is vital for any business to transition to an effective integration of HR technology within its workplace. This real-world understanding of factors affecting HR receptivity can be used to create change management interventions in a proactive manner so as to mitigate any negative consequences in terms of such things as employee morale, workforce conflict, and unnecessary costs.

Jithitikulchai (2020) estimated that Thailand will experience an evolutionary substitution of human jobs through automation (including robots), with low-skilled workers involved in routine, repetitive tasks being the most vulnerable to job displacement. A combination of technological feasibility along with economic incentives based on a company's assessed profitability will, in the aggregate, dictate the country's future rate of job displacement. The results of this study assist in highlighting the following real-world business implications regarding workplace receptivity of humanoid robots in the future:

1. Resistance to change. Some workers may resist the introduction of HRs as they may fear that these robots will replace them or make their jobs obsolete. This resistance may lead to decreases in productivity, morale, and employee engagement.
2. Safety considerations. HRs may pose safety risks to human workers, particularly in industries involving heavy machinery. This risk can be exacerbated if HRs are not programmed to recognize and interact appropriately with human workers.
3. Training. The behavioral intention of human workers is determined by their attitudes toward HRs and, in turn, determines actual use. Human workers have to be trained to develop perceived usefulness of HRs in order to drive innovation in the workplace. When human workers become more receptive to this new technology, they are also more likely to enhance perceived ease of use and, consequently, work more effectively with HRs who have received specialized programming for human-to-robot workplace interactions.
4. Ethical considerations. As the level of artificial intelligence in HRs increases, businesses will be faced with issues of rights and protections that distinguish HRs from humans, as well as the challenge of placing HRs in positions of authority over human workers.

This work was limited to studying graduate students iat an international university in Bangkok. Future inquiries should be designed to examine a broader span of Thai society, encompassing an inferential representation as to the country's socioeconomic and educational attainment levels and its regional diversity.

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Appendix

Table A. Statistically significant mean ratings of attitudes toward HRs by gender of respondent.

Variable	Source	df	SS	MS	F	Welch's F	p
Harm the Economy	Between Groups*	1	3.530	3.530	5.847	5.815	.017
	Within Groups**	185.217	129.815	.604			
	Total***	186.217	133.346				
Make More Efficient	Between Groups	1	2.403	2.403	4.209	4.166	.043
	Within Groups	183.482	123.303	.571			
	Total	184.482	125.706				
Make More Effective	Between Groups	1	6.613	6.613	12.318	11.748	.001
	Within Groups	171.090	115.415	.537			
	Total	172.090	122.028				
Take My Job	Between Groups	1	10.602	10.602	12.055	11.689	.001
	Within Groups	176.710	189.967	.879			
	Total	177.710	200.569				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table B. Statistically significant mean ratings of attitudes toward HRs by age group of respondent.

Variable	Source	df	SS	MS	F	Welch's F	p
Lose Control of HRs	Between Groups*	2	5.095	2.547	3.245	3.422	.035
	Within Groups**	141.717	167.983	.785			
	Total***	143.717	173.078				
HRs Control Humans	Between Groups	2	9.623	4.812	6.119	6.551	.002
	Within Groups	139.287	166.702	.786			
	Total	141.287	176.326				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table C. Results of post hoc test for mean differences in attitudinal ratings of HRs by age group.

Attitude Variables	Age Groups	M	SD	p
Lose Control of HRs	21–25 vs 26–30	2.42 vs 2.78	.860 vs .826	.040
HRs Control Humans	21–25 vs 26–30	2.09 vs 2.56	.830 vs .937	.007
	21–25 vs 31–52	2.09 vs 2.55	.830 vs .884	.005

Source: Authors' calculations from survey.

Table D. Statistically significant mean rating of attitudes toward HRs by group employment status.

Variable	Source	df	SS	MS	F	Welch's F	p
HRs Control Humans	Between Groups*	1	4.835	4.835	6.006	5.808	.018
	Within Groups**	106.473	171.490	.805			
	Total***	107.473	176.326				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table E. Statistically significant mean rating of attitudes toward HRs by ethnic grouping.

Variable	Source	df	SS	MS	F	Welch's F	p
Make More Effective	Between Groups*	2	4.123	2.061	3.741	3.669	.030
	Within Groups**	81.437	117.905	.551			
	Total***	83.437	122.028				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table F. Results of post hoc test for mean differences in attitude ratings of HRs by ethnic group.

Attitude Variables	Ethnic Groups	M	SD	p
Make More Effective	Thai vs Intl	2.72 vs 3.02	.739 vs .805	.014

Source: Authors' calculations from survey

Table G. Statistically significant mean ratings of HR replacement of humans by gender of respondent.

Variable	Source	df	SS	MS	F	Welch's F	p
Housekeepers	Between Groups*	1	12.440	12.440	16.706	15.664	<.001
	Within Groups**	165.450	160.849	.745			
	Total***	166.450	173.289				
Soldiers	Between Groups	1	15.633	15.633	10.410	11.975	.001
	Within Groups	215.862	324.385	1.502			
	Total	216.862	340.018				
Taxi Drivers	Between Groups	1	21.993	21.993	12.555	13.501	<.001
	Within Groups	207.409	378.374	1.752			
	Total	208.409	400.367				
Police/ Firefighters	Between Groups	1	14.224	14.224	8.309	8.366	.004
	Within Groups	189.115	369.780	1.712			
	Total	190.115	384.005				
Airline Pilots	Between Groups	1	18.345	18.345	10.595	10.901	.001
	Within Groups	195.782	374.022	1.732			
	Total	196.782	392.367				
Teachers	Between Groups	1	10.065	10.065	9.258	8.971	.003
	Within Groups	176.497	234.821	1.087			
	Total	177.497	244.885				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table H: Statistically significant mean ratings of HR replacement of humans by age group.

Variable	Source	df	SS	MS	F	Welch's F	p
Soldiers	Between Groups*	2	16.983	8.492	5.652	5.863	.004
	Within Groups**	138.994	323.035	1.502			
	Total***	140.994	340.018				
Taxi Drivers	Between Groups	2	13.529	6.765	3.760	3.951	.021
	Within Groups	140.417	186.838	1.799			
	Total	142.417	400.367				
Police/ Firefighters	Between Groups	2	14.143	7.072	4.111	4.194	.017
	Within Groups	141.628	369.861	1.720			
	Total	143.628	384.005				
CEO of Company	Between Groups	2	4.740	2.370	4.486	4.186	.017
	Within Groups	134.778	113.595	.528			
	Total	136.778	118.335				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table I: Results of post hoc test for mean differences of human replacement variables by age group.

Occupation Variables	Age Groups	M	SD	p
Soldiers	21–25 vs 31–52	3.36 vs 4.04	1.285 vs 1.130	.003
Taxi Drivers	21–25 vs 31–52	3.02 vs 3.60	1.330 vs 1.279	.009
Police/ Fire Fighters	21–25 vs 31–52	2.50 vs 3.13	1.280 vs 1.316	.012

CEO of Company	21–25 vs 26–30	1.74 vs 1.49	.829 vs .750	.040
	21–25 vs 31–52	1.74 vs 1.39	.829 vs .606	.004

Source: Authors' calculations from survey.

Table J: Statistically significant mean ratings of HR replacement of humans by employment status.

Variable	Source	df	SS	MS	F	Welch's F	p
Actors/ Singers	Between Groups*	1	8.326	8.326	8.377	11.232	.001
	Within Groups**	157.917	214.706	.994			
	Total***	158.917	223.032				
Politicians	Between Groups	1	2.988	2.988	4.462	4.421	.038
	Within Groups	111.062	144.631	.670			
	Total	112.062	147.619				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table K: Statistically significant mean ratings of HR replacement of humans by ethnic group.

Variable	Source	df	SS	MS	F	Welch's F	p
Factory Workers	Between Groups*	2	4.924	2.462	4.744	5.153	.008
	Within Groups**	84.580	111.572	.519			
	Total***	86.580	116.495				
Police/ Firefighters	Between Groups	2	15.584	7.792	4.547	5.294	.007
	Within Groups	83.774	368.421	1.714			
	Total	85.774	384.005				
Actors/ Singers	Between Groups	2	5.292	2.646	2.612	3.417	.037
	Within Groups	93.599	217.741	1.013			
	Total	95.599	223.032				

Artists/ Authors	Between Groups	2	9.392	4.696	5.125	6.154	.003
	Within Groups	86.532	196.092	.916			
	Total	88.532	205.484				
Politicians	Between Groups	2	14.461	7.231	11.675	16.813	<.001
	Within Groups	80.221	133.158	.619			
	Total	85.221	147.619				

Source: Authors' calculations from survey.

*Variance in ratings across groupings

**Variance in ratings across members within each group

***Total variance across all responses

Table L: Results of post hoc test for mean differences of human replacement variables by ethnic group.

Occupation Variables	Ethnic Groups	M	SD	p-value
Factory Workers	Thai vs Intl	4.38 vs 4.68	.783 vs .575	.012
Police/ Firefighters	CT vs Intl	2.33 vs 3.20	1.080 vs 1.407	.005
Actors/ Singers	CT vs Thai	1.45 vs 1.85	.711 vs 1.090	.035
Artists/ Authors	Thai vs Intl	1.78 vs 1.33	1.068 vs .695	.002
Politicians	CT vs Intl	2.03 vs 1.29	.918 vs .530	<.001
	Thai vs. Intl	1.80 vs 1.29	.842 vs .530	<.001

Source: Authors' calculations from survey.