Norwegian School of Economics

Bergen, 2015

Rexamining the Gender Wage Gap

Evidence from an Online Labour Market Experiment

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Abstract

Gender wage gap have declined over the past decades with the progression of society and legal enforcement of equal wages. However, there is still existence of quite a significant gender wage gap even in developed countries. There are number of theories that have emerged regarding the psychological orientation of women that are likely to be responsible for the prevalence of gender wage. But most of these studies either focuses on the demand side in isolation that is the gender discrimination in the hiring decision of employer or supply side in isolation that is the employee productivity in terms of competitiveness and effort exertion of employees. In this paper I have investigated both the supply and demand side of the labour market through two experiments on the online labour market. The results of these two experiment shows that both male and female are responsive to wages but depending on the intrinsic motivational factor of the task they respond to wages differently. The effort exertion of women are slightly more responsive to wages again depending on the nature of the task. However on the supply side, the employer are agnostic about gender in a setting where gender discrimination would clearly hurt profitability of the employers. The two most important conclusion that can be drawn from this paper is that understanding intrinsic motivation of employees can align performance with incentives allowing both employer and employees to optimize utility. Second, the lower math score of female can be translated into higher gender wage gap because different literature have found that math related job have better pay structure. Hence, the self-selection of women into low paying jobs are at the heart of gender wage gap according to the results in this paper.

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1. Background

In most labour markets women are less paid than men, this is the case even for most developed countries of OECD. Even though the gender wage gap has narrowed over the last decade, it is still, on average, 15.5% in the OECD countries (see figure 1 of Appendix A). For example, in United States women earn on average 82.1% of what men earn (see figure 2 in Appendix A). Such a wide gap in wages is incongruous with the structure of the US policies, which promises such high degree of equality. Albrecht, Bjorklund, and Vroman (2003) have found that the wage gap is increasing throughout the wage distribution and peaks at the top and they interpreted this as evidence of a glass ceiling in Sweden. In a similar study, De la Rica, Dolado and Llorens (2005) found that in Spain the gender wage gap was wider at the bottom than the top of income distribution for less educated female. The authors pointed out that less educated female in the Spanish labour market faces frequent interruptions due to family duties and religious belief, employers might have factored ex-ante the interruptions in career of women resulting in widening of gender wage gap at the bottom of income distribution.

There are three major explanations for the existence of gender wage gap. The first theory relates to the choice of occupation by women. It has been suggested that women have more of a process orientation which means that women are motivated to achieve out of the concern for the process of achievement itself (Spence and Helmreich, 1978). The importance of winning the game or other extrinsic factors such as money are not primary concerns (Kidd and Woodman, 1975; Veroff, 1977; Zander, Fuller and Armstrong, 1972). On the other hand men have been characterized as having an "impact orientation" which mean that men are less concerned how the game is played but whether they win or lose, essentially suggesting that men are extrinsically motivated (Leary, Unger and Wallston, 2013). The gender wage gap emerges from the value driven occupations that seem to appeal to women, such as teaching and nursing, which are overrepresented in the public sector, which pay less than the private sector. Groshen (1991) and Peterson and Morgan (1995) have found that the segregation of women into lower-paying occupations, industries, and establishments essentially explains the entire gender wage gap in the US labour market. Similarly, Meyersson Milogram et al (2001) finds for Sweden and Peterson et al (1997) for Norway that the entire gender wage gap is attributable to the segregation of women into lower-paying occupations and establishments

The second theory relates to the risk and competitive preferences of women. There is a wide literature which suggests that competitiveness and economic risk preferences of women, characterize the choice of career taken by women. Different studies have documented that women are less competitive than men and have higher risk aversion (Niederle and Vesterlund, 2011; Rachel and Gneezy, 2009). Cotton, McIntyre & Price (2010) have given two explanations behind the superior performance of male in

competitive environment. First male have higher ability to convert their effort into performance, possibly because of the effect of testosterone or adrenaline. Second, male may care more about winning or enjoy competition more than female. Considering this evidence it is not very surprising that females are overrepresented in occupations with less volatile payment schemes, resulting in lower expected earnings.

Lastly, labour market discrimination can explain part of the gender wage gap. Though the equal pay act (EPA) of 1963 made it illegal to pay men and women differently for similar work in the United States. Despite the law being instituted more than 50 years ago, the gap in gender wages have remained extraordinarily high even within occupations. For example, Stewart (2014) found that the overall gender wage gap in the public sector of Britain is 9.8%. Altonji and Blank (1999) define labour market discrimination as a "situation in which person who provide labour market services and who are equally productive in a physical and material sense are treated unequally in a way that is related to an observed characteristics such as race, ethnicity or gender". The economic theories of discrimination are broadly classified into two categories. First is the statistical discrimination explained by Altonji and Blank (1999) as the strategy of employers using group-level characteristics such as gender or race which are easy to observe to evaluate productivity of employees. The second theory suggested by Becker (1971) is the taste based discrimination where an employer are prejudiced over a particular minority group, for instance an employer with a taste for discrimination against women will employ a less productive man over a more productive women and hence generate lower profit.

In this paper I test to what extent intrinsic motivation can explain the gender wage gap. To investigate this question I have recruited workers from an online labour market to solve math and verbal task. The workers were randomly assigned to one of the two tasks and to work for different piece rates (0, 0.01, 0.05), in addition to a fixed show-up fee. I hypothesize that a larger piece rate will translate to more time spent on the task as well as better performance, and importantly, more so for men than for women. It might, however, be the case that men and women respond identical to wage increases, but that employers think that men respond more strongly. An employer with such a belief would therefore have an incentive to give a higher wage to males relative to females. We test this alternative explanation in a follow up experiment where we recruit employers and asked to select the profit maximizing piece rate for workers of different gender.

The first objective of this paper is thus to explore the difference in wage-effort elasticity across gender. The wage-effort elasticity is a measure of the labour supply choices depending on the behavioural preferences of workers. I look at the performance and effort exertion for two distinct types of task, a male oriented task which is the math task and a female oriented task which is the verbal task.

The second objective of the paper is to explore the demand side of the labour market. The employer has the discretion to choose either piece rate or fixed payment option for the workers in order to maximize his/her profit. With the help of this incentivized experiment I can also capture whether male employers are giving more to male and female employers are giving more to females, or vice versa.

2. Literature Review

Dohmen & Falk (2011) have argued that field data often lack information on worker's preferences and motives and there are several omitted variables which impedes causal inference. Falk and Fehr (1999) have argued that in a controlled laboratory experiment it's possible to control workers 'outside options' in such a way that the isolated effect of the variable of interest can be answered precisely. I have conducted a field experiment on a real online labour market to study the effects of incentive on performance and effort provision of workers and the wage setting of employers. There are two advantages of this choice. First as the setting is a real labour market, responses are from real workers implying there is less possibility of contamination of data through scrutiny bias. Second, the real online labour market also has the feature of a controlled laboratory experiment as the task are solved in an online platform much of the 'outside options' are eliminated through the controlled environment similar to setting of laboratory experiment. .

The general hypothesis regarding the effects of monetary incentives on effort and performance is that incentives lead to greater effort. The effort dimension is measured in terms of effort *duration* which refers to the length of time an individual spends to complete a task, its measured in studies in which subjects work at their own pace and control the time taken to complete a task (Bonner & Sprinkle, 2002). The expectation theory proposed that people act to maximize expected satisfaction with outcomes (Vroom, 1964). According to Vroom's expectation theory individual's motivation in a particular situation is a function of two factors: (1) the expectancy about the relationship between effort and particular outcome, which means effort in proportion with outcome (2) the attractiveness of the outcome. The motivation created by these two factors leads people to adjust level of effort that matches with the expected outcome. However, monetary incentives have two kinds of effects, first is the price effect which is in line with the expectancy theory and makes the incentivized behaviour more attractive and second is the indirect psychological effect, which in some cases works in opposite direction to the price effect and crowd out incentivized behaviour (Gneezy, Meier, & Rey-Biel, 2011). Benndorf, Rau & Sölch (2015) have provided evidence on gender difference on incentive effects. They have used a within-subjects experiment with a real effort task with different compensation schemes. In the main treatment the subjects work under a piece rate and the subsequent stage the incentives are removed and workers got a flat fee. When the incentive was removed men's performance declined by 12% whereas women performance remained the same. They also found that the gender difference in performance vanishes in a setting where subjects work first with a fixed fee and then with piece rates.

Similar to Benndorf, Rau & Sölch (2015) I have used an effort task to find the effect of incentives on the performance and effort duration of the subjects. But in my paper I have used a between subjects design, which in comparison to within-subject designs is more robust against experimenter demand

effects. In addition, I have used two different types of task; that is a verbal and math task to find the difference in effort provision and productivity for a given task and incentive scheme on a one shot game. Cvencek, Meltzoff & Greenwald (2010) found strong identity association of male with maths and female with reading in elementary school children and this self-concept of math influence actual math achievements. Females are therefore hypothesized to provide relatively more effort and score better on the verbal task, the question is whether they respond more or less to incentives on verbal tasks as well.. According to Beede et al. (2011) the lower math achievement is at the heart of the underrepresentation of women in the Science, Technology, Engineering and Mathematics (STEM) jobs; its estimated that less than 25% of women holds a STEM job in United States and women comprise 48% of the US workforce. The underrepresentation has remained fairly constant over the last decade even as women share of the college educated has increased (Census Bureau, 2009). This is a puzzle given that the premium for working in a STEM job for a female is 33% more than a female in non-STEM job but only 25% for males.

Studies that measure explicit gender attitudes found that females are believed to be worse at math tasks and better at verbal tasks than male (Chartard et al, 2006 & Nosek et al., 2002). It is also to be noted that across all domains women participation in math related jobs are much lower, in fact when education increases the ratio of male and female participants in math and related science declines (Nosek et al., 2002). However the evidence on actual performance between genders is mixed and varies by country and population (Bohnet et al., 2012).

In addition I have studied the demand side behaviour using a monopsonistic employer in a real online market to test our hypothesis regarding monopsonistic discrimination.
Joan Robinson (1933) developed the idea of monopsonistic discrimination in the labour market. The idea behind monopsonistic discrimination is that a single buyer, a monopsonist sets wages below marginal revenue product. The more inelastic the labour supply, the lower wages relative to productivity. The monopsonist can attain higher profit by differentiating wages between groups with different elasticities of labour supply. Robinson suggests that gender can be one of the dimensions along which the employer may discriminate. Barth and Dale-Olsen (2009) depicted the condition required for monosonistic discrimination to work, first the employers should be able to distinguish between men and women in the wage setting process. Secondly the supply curve of women has to be less elastic than the labour supply curve of men. However, Barth and Dale-Olsen (2009) have found evidence that females are more or equally wage sensitive than men's labour supply.
The discrimination in gender wage has been a contentious issue in the public domain, in that it's not entirely clear whether the moral argument of gender wage discrimination truly holds in the labour market. The critics of EPA argues that employing women are more expensive and there is also a significant historical anchorage to the role responsibilities of women that can be linked to unchanging

cultural, social and religious beliefs that assign appropriate roles and responsibilities to women. Becker (1981) has argued that wage rates are correlated with human capital and wage rates of women are lower because women invest less time than men in human capital while the productivity of household time is presumably greater because usually they invest more time in household capital. However with the increase in college enrolment of female in the past two decades, the gap in human capital have narrowed.

However, even with the enforcement of EPA, the gender wage gap has not closed down because of changes in mechanism of gender bias. First, the process of hiring, promotion and job assignments have shown gender bias, recent evidence suggest that gender bias are automatically activated when evaluators of a certain job has knowledge of sex of a person (Bohnet, Geen & Bazerman, 2012). Such gender biases lead to unintentional and implicit discrimination which does not make a rational assessment of future performance and discriminates arbitrarily based on gender. The gender differences in business-critical assignments and promotion have been identified as the driving force behind the gender wage gap because the career advancement depends on assignment of critical assignments and timely promotions.

Second, different studies have shown that women are less likely than men to use negotiations for promotions and salary increments (Lauterbach & Weiner 1996) and Bowles et al. (2005) have shown that the gender difference in the propensity to initiate negotiation may be explained by the difference treatment they receive while they try to negotiate. It is found that women candidates are penalized more than male for initiating negotiation for higher compensation. They also found that the male evaluators (employers, managers) penalized the female candidate more than male candidate for initiating negotiation. On the other hand the female evaluator equally penalized male and female candidate for initiating negotiation. There is also presence of gender discrimination based on stereotypes on women characteristics.

Heinz, Normann & Rau (2014) have shown that choice in competitive behaviour may entail gender wage gap. They looked at the demand side behaviour that is from the employer's perspective and at the interaction between supply and demand sides. In the first part of their experiment the subject choose a remuneration scheme either tournament or piece rate and they conduct real effort task. This part of the experiment is similar to my experiment except the fact the remuneration scheme was randomly assigned in my experiment and instead of tournament scheme I had fixed payment (zero piece rate treatment) and there were two different tasks. In the next stage they added a dictator game stage, where the pie is generated by the employees (recipients) and where employers (dictators) decide the proportion to take from that pie. In this design the employer have 100% discretion, so the employer don't face any reprisal in terms of loss in profit for making the wrong choice, their results have shown that when the employees have decided to work under piece rate, the employer took substantially and

significantly more from female workers. In contrast, the employers didn't discriminate based on gender when tournament is chosen. The real effort task in this experiment was similar to the math task of Niederle and Vesterlund, 2011, so the employers believed that the male are significantly better at math task, so the assessment of the employee's performance was based on the stereotypical view of women relative weakness in maths. Hence, when piece rate is chosen the employers tends to took substantially from the female but in the tournament design the employer are more inclined to incentivize better performance and provide less or zero incentives to the low performers, so gender does not come into play.

3. Methodology

3.1 Experimental Design

In this study I have conducted two experiments in a real online labour market to test for gender discrimination.

In the first experiment I have focused on the supply side dynamics of labour market in terms of gender differences in effort provision and performance with different incentive scheme. In particular the focus was on the difference in productivity between men and women under different wages and tasks, and the hypothesis is that men's productivity is more responsive to wages, whereas women provide maximum effort independent of wage and task. Moreover men have higher mathematical reasoning capacity than women. To test the hypothesis I recruited 457 subjects from Amazon Mturk and randomly assigned them to one of 6 treatments in a 3 (zero, low or high piece rate)*2(math or word task) design. In the high treatment the subjects received $0.05 for each correct answer, in the low treatment the subjects received $0.01 for each correct answer and in the zero treatment the subjects did not receive anything for each correct answers. In addition, all participants received a fixed payment of $0.5. Each subject were assigned to either a math task or word task. In the math task, the participant were given a series of numbers with particular pattern, the participant were asked to fill in the missing number from the sequence of numbers (See Appendix B). The math task was a math puzzle of varying difficulty which are adapted from Majewska (1964) test of mathematical deductive reasoning. In the word task, the participants were asked to recognize the exact word from a single horizontal matrix of scrambled letters that make up the particular word (See Appendix B). This task is a modified version of Bohnet & Saidi (2012) search word problem, where in their study the words were randomly ordered in a large matrix and word could be formed vertically, horizontally and diagonally. I have modified the task to moderate the difficulty level for the participants of M-Turk who are much more heterogeneous in ability than the group of high ability participants at Harvard Decision Science Labourtary in Bohnet & Saidi (2012). The tasks were not timed, so the participant could choose to take as much time as possible to finish the task, I have used the time taken by the participant to complete the task as an outcome variable in terms of effort duration.

In the second experiment I have focused on the demand side dynamics of the labour market. The demand side dynamic is captured through the employer's allocation of wages. The second experiment was intended to capture the presence of any discretionary discrimination attitude through the choice made by the participants.

In the second experiment I have recruited 150 subjects, which we refer to as employers, from Amazon M-turk and randomly assigned each of them to either two male or two female workers from the first experiment. One of the two workers had worked for a zero piece rate, whereas the other worker worked

for a $0.01 piece rate. The employers were familiarized with the original tasks that the workers in the first experiment had worked on. Based on the incentive schemes of the two workers the employer was then asked to hire one of the two workers to "work" for them. Further, the employers were informed that they are going to receive a revenue of $0.06 for each correct answer of their chosen worker. The profit function of the employer was therefore $0.06*X_1 - 0.01*X_1$ if they chose the worker with the 0.01 piece rate (where X_1 is the number of problems correctly by this worker) and $0.06*X_2$ if they chose the worker with the zero piece rate (where X_2 is the number of problems correctly by this worker). It was made quite clear that choosing the 0.01 piece rate would only be profitable if they believe it would increase worker performance on average by 20%. To make sure the employers understood these incentives they also solved two control questions. The gender of the workers were made salient to the subjects, as it was repeatedly referred in the instructions and control questions that they were either assigned to a set of two male workers or a set of two female workers. In the actual task the subjects had to choose either the $0.01 piece rate or the zero payment that can maximize their earning without knowing the number of puzzles actually solved by a given male or female worker. In a scenario, where there employers think men but not women respond strongly to monetary incentives, the employers will consistently choose the zero piece rate for the female workers and $0.01 for the male workers. There was also a possibility of a reciprocal effect of giving out more to the female worker out of compassion. But we can rule out any reciprocal effect because I have mentioned in our survey that the task has been already completed by the workers and their choice of wage won't have any impact on the earnings or performance of the workers. To estimate our results I have used bar charts and difference in difference regression using STATA 12.0.

4. Results

In this section I present the main results. In the first part I have presented the descriptive statistics of the background characteristics for the first experiment, then I have checked whether the tasks were gender neutral in terms of the performance of the subjects in the word and math task across gender and then I have presented the subsequent regression results from the first experiment. In the second part, I have presented descriptive statistics of the background characteristics of the second experiment and presented the bar charts and regression results from the second experiment.

4.1.1 Descriptive Statistics

Table 1 Descriptive Statistics Experiment 1

	Male		Female	
	mean	sd	Mean	Sd
Age	34.54	10.52	37.56	12.08
Educ	4.04	1.32	4.06	1.28
N	247		210	

The descriptive statistics of the first experiment shows that the workers on average had high school education (2-year College) and it is balanced across gender but the age of the female is slightly higher than the male, so in our regression equations we have controlled for age. The number of male participants exceeds the number of female participants in both experiments. In table 3 of Appendix C I have provided the descriptive statistics of first experiment across all the treatments.

4.1.2 Gender Neutrality of Tasks

In this part I have checked for the neutrality of the tasks across gender.

Table 2 Regresion Results for Neutrality of Tasks

	Math Task	Word Task
Math Task	0.482	
	(0.503)	
Female	0.635	-0.590
	(0.518)	(0.530)
Female*Math Task	-1.225*	
	(0.742)	
Constant	12.26***	12.74***
	(0.345)	(0.367)
R^2	0.006	0.006
Observations	457	457

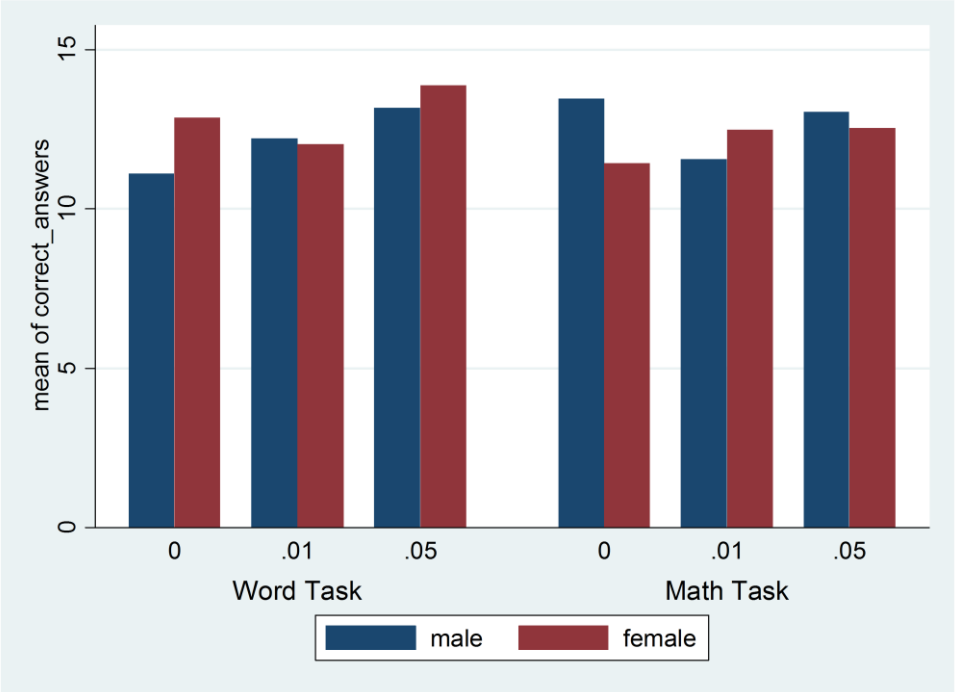
Standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

The regression table above shows that the male have clearly outperformed the female in the math tasks with high statistical significance at 95% confidence interval. The male workers have solved one additional math puzzle compared to female. But the female are only slightly better than male in the verbal tasks with low statistical significance. So our hypothesis regarding the domination of male in the math task has turn out to be correct. I therefore have reported all results separately for the math and word task

4.1.3 Data Analysis of Employees Productivity

In this section I have presented the data analysis of the first experiment, first by summarizing the results from the bar charts and then from the regression results.

Figure 1 Overall Gender Difference in Performanc

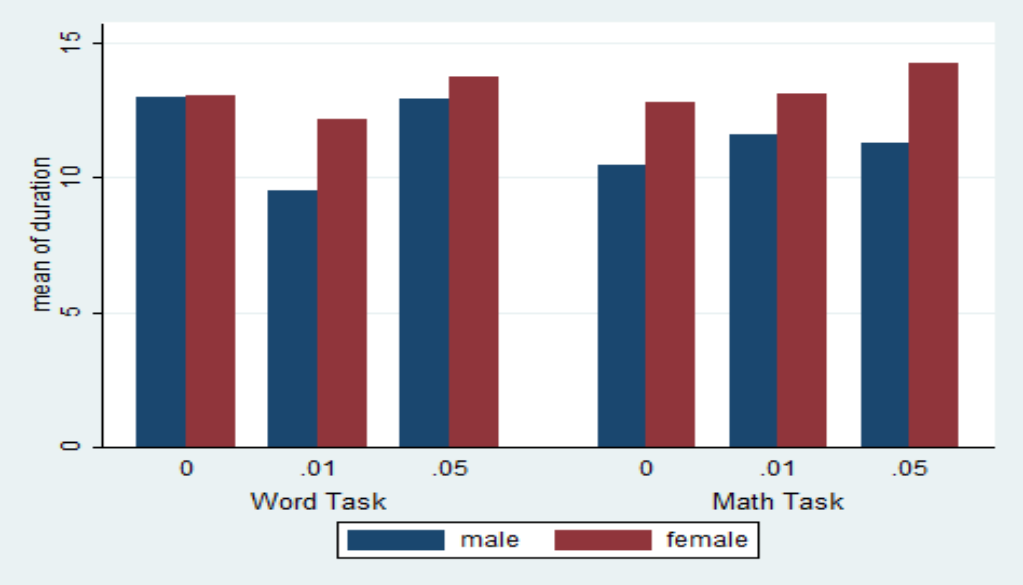


As shown in the bar chart above, the performance of the male subjects in the verbal task was responsive to wage rates. The number of correct answers were higher for the subject who were assigned to the high wage treatment compared to low and zero treatment groups. The number of correct answers of word task of male was slightly lower than that of female for subjects in the zero piece rate treatment group but the performance was almost identical for $0.01 piece rate and $0.05 piece rate treatment groups respectively. The performance of male in the math task has been discontinuous with wages; the male subjects in the zero piece rate treatment group has solved the highest number of math problems compared to male subjects in other treatment groups. However, the performance significantly dropped for the $0.01 treatment and the performance picked up slightly for the high treatment group. The performance of the male subjects for the math task was significantly higher in the zero treatment comparison to female in the same treatment group, but slightly lower than female in the $0.01 treatment group. In addition, the performance of male was slightly better than female in high treatment. The female on the other hand was responsive to wages for the math task, the performance of female were higher in line with higher wages. However, for the word task the female subjects have shown

discontinuous pattern, the performance declined for the female subjects in the $0.01 treatment group and then slightly increased for the $0.05 treatment group. The bar chart in figure 1 shows the variation in performance over gender and tasks.

The effort duration of the subjects varied slightly over tasks and gender. The effort duration of male subjects for the word task is in line with their performance. The male subjects have exerted more effort in the zero wage treatment for the word task but the effort duration dipped for the low wage treatment and the effort duration of the subjects of high wage treatment was similar to the subjects of the zero wage treatment. Overall the duration of the male subject were similar to the duration of the female subjects for the word tasks. In the math tasks the male had significantly lower effort duration compared to female and the effort duration actually was even lower for the high treatment subjects.

Figure 2 Gender Difference in Overall Effort Duration



The effort duration of the male subjects in high treatment was not in line with the performance for the math task, as the performance of the male subjects in the high wage treatment group were better than the low and zero treatment but with a lower effort duration. The effort duration of the female subjects were much responsive to wage for the math tasks, the effort duration was highest for the high treatment subjects. The effort duration of female subjects for the math task were slightly higher than male subjects, but the performance of the female subject were significantly lower compared to male. On the other hand, for the word task the effort duration followed parallel trend with performance, the effort duration was lower for the low treatment subjects compared to the zero treatment subjects but was higher for the high treatment subjects. The bar chart in figure 2 summarizes the effort duration of the

subjects over gender and tasks. In appendix C I have provided the separate bar charts of effort duration and performance across treatment over gender and tasks.

Difference in Difference Regression Results for Experiment 1

Table 3 Summary of Perfrmance of Math Task

Correct Answers	Math	Math	Math
High Wage	0.368	-0.415	-0.459
	(0.580)	(0.782)	(0.773)
Low Wage	-0.423	-1.901**	-2.016**
	(0.593)	(0.837)	(0.828)
High Wage Female		1.516	1.474
		(1.154)	(1.141)
Low Wage Female		2.943**	3.066***
		(1.175)	(1.162)
Female		-2.015**	-2.206***
		(0.825)	(0.819)
age			0.0510**
			(0.0207)
Constant	12.47***	13.46***	11.74***
	(0.417)	(0.579)	(0.902)
R^2	0.008	0.042	0.068
Observations	222	222	222

In the first regression shown in table 5, I have regressed performance of math task against wages, sex and interaction term of sex and wages. The regression table illustrates that male does not respond to high wages for math tasks, but the responsiveness is pronounced in the low wage group. The female were highly responsive to wages for the math task as the performance of increased significantly in the low wage group and the performance was also positive for the high wage group. However, the regression result shows that female participants have solved at least had 2 *fewer* correct answers when they are paid low wage compared to no wage, and the difference is statistically significant.

Table 4 Summary of Performance of Verbal Task

Correct Answers	Verbal	Verbal	Verbal
High Wage	1.424**	2.055**	1.891**
	(0.682)	(0.926)	(0.910)
Low Wage	0.126	1.114	1.039
	(0.684)	(0.943)	(0.926)
High Female Wage		-1.056	-0.921
		(1.379)	(1.354)
Low Female Wage		-1.956	-1.664
		(1.373)	(1.350)
Female		1.764*	1.400
		(0.975)	(0.964)
Age			0.0769***
			(0.0245)
Constant	12.01***	11.11***	8.548***
	(0.488)	(0.699)	(1.066)
R^2	0.023	0.039	0.079
Observations	235	235	235

In the second regression as shown in table 6, I have regressed performance of verbal task on wages, sex, the interaction of wage and background statistics. The male were highly responsive to wage for the verbal task and the result is highly statistically significant. The male solved more verbal problems correctly in the low treatment group than the zero treatment group. The female on the other hand were very less responsiveness to wage and on the contrary the female solved fewer problems in the lower wage group compared to zero piece rate but even with high wage treatment the female performance was not responsive to wage. However, female have solved more verbal problems than male even though the relationship is not significant but female clearly have done better in verbal tasks than math tasks.

Table 5 Summary of Duration of Math Tasks

	Duration	Duration	Duration
High Wage	0.896	0.780	0.597
	(1.357)	(1.843)	(1.765)
Low Wage	0.764	1.102	0.615
	(1.389)	(1.973)	(1.892)
High Wage*Female		0.657	0.480
		(2.721)	(2.605)
Low Wage*Female		-0.772	-0.253
		(2.770)	(2.655)
Female		2.319	1.515
		(1.944)	(1.870)
Age			0.215***
			(0.0473)
Constant	11.63***	10.49***	3.248
	(0.975)	(1.365)	(2.061)
R^2	0.002	0.023	0.108
Observations	222	222	222

In this third regression as shown in table 7, the duration spent on math task against wages, sex and interaction wage and sex and background stats. The regression table illustrates that both male and female have spent approximate the same duration in the math task. However, the female were slightly more responsive to wages, as the female with low wages had exerted lower effort but the estimate is not statistically significant. However, given approximately same effort exerted by both male and female, the male participants have solved more math tasks, which suggest that the male have higher productivity for math tasks.

Table 6 Summary of Duration of Verbal Tasks

	Duration	Duration	Duration
High Wage	0.211	-0.0750	-0.817
	(1.413)	(1.926)	(1.736)
Low Wage	-2.393*	-3.484*	-3.822**
	(1.418)	(1.963)	(1.766)
High Wage*Female		0.772	1.380
		(2.870)	(2.583)
Low Wage*Female		2.554	3.872
		(2.856)	(2.575)
Female		0.104	-1.538
		(2.030)	(1.839)
Age			0.347***
			(0.0468)
Constant	13.03***	12.97***	1.425
	(1.012)	(1.454)	(2.033)
R^2	0.018	0.026	0.215
Observations	235	235	235

In this fourth regression shown in table 5, the duration spent on verbal tasks against wages, sex, interaction of wages and sex and background stats. The estimates from the regression shows that both male and female were responsive to wages for effort exertion. The female were more responsive to wages for exerting effort but overall the duration spent by female on verbal task was lower than male and we have seen from earlier regression result that female workers have slightly better performance than male in the verbal tasks, this implies that the female were more productive than male in verbal tasks.

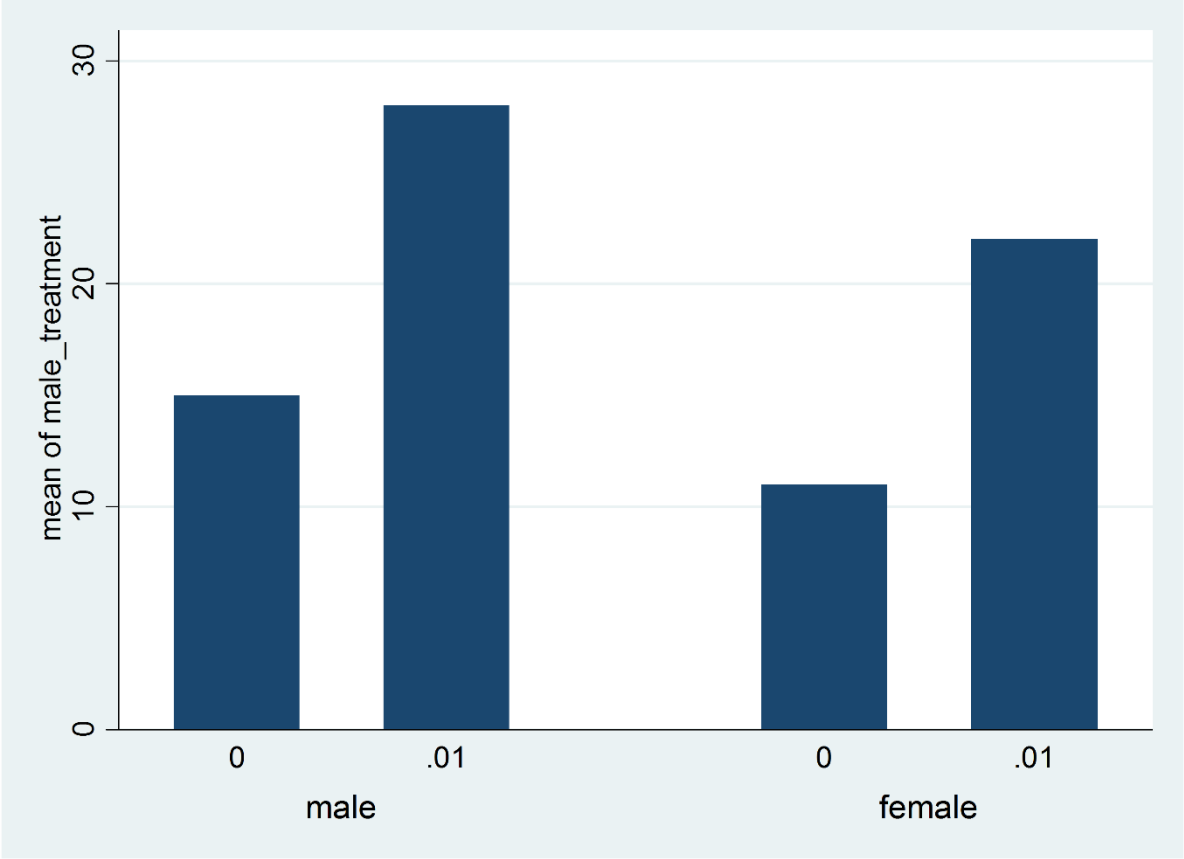
The overall summary of regression result on duration reveals that the female are more responsive to wages in terms of exertion of effort. The interaction of wage and female is significant at 90% confidence level and coefficient implies that the female have spent 2.3 additional minutes for higher wages. The coefficient of wage explains much of the change in effort duration, but the coefficient is not significant at 90% confidence level. The coefficient of age is again significant but does not have strong explanatory power. The coefficient of math task is negative, which means that overall less time was spent on math task compared to word task. But female subjects have spent more time on math task compared to word task as indicated in the coefficient of interaction female worker and task.

4.1.4 Data Analysis of Employers Hiring Decision

In this section I present the results from the second experiment, and I have use separate bar charts for the 2 different treatment group's one in which piece rate is assigned and another where no piece rate is offered.

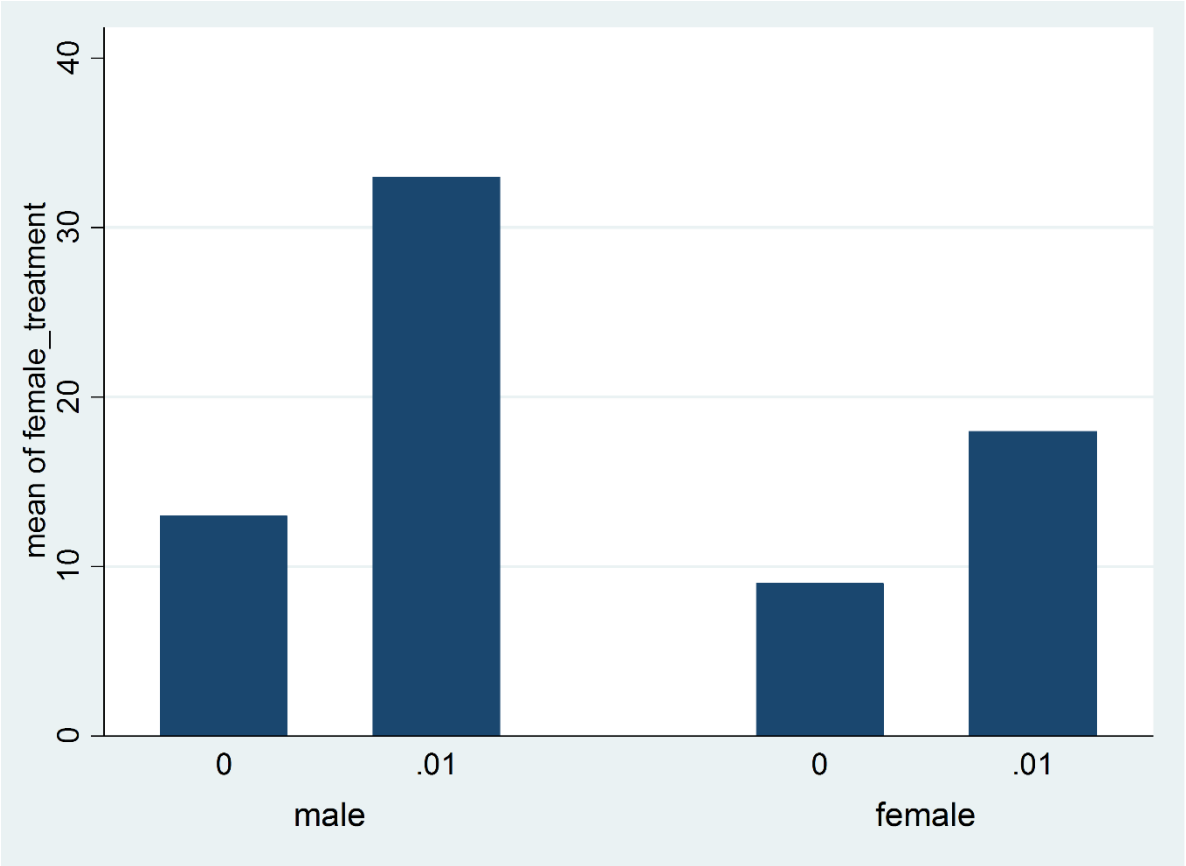
I have illustrated the results using bar charts and then used the regression specification. The vertical axis of the bar chart in figure 3 shows the proportion of observation of either zero or $0.01 allocation of wage to a male worker from the first experiment. The horizontal axis of the bar chart shows gender of the employers and the piece rates. It is clear from the bar chart that both the male and female employers have allocated the $0.01 piece rate to the male worker rather than the fixed payment (zero piece rate) option.

Figure 3 Wage Allocation to Male Worker



The bar chart in figure 4 below shows the wage allocation of the employers to the female workers. The specification of the vertical and horizontal axis is same as that of bar chart in figure 3. The employers are more interested to provide a piece rate to both male and female workers and there is no sign of discriminatory attitude of the employers, however, a higher proportion of the male employer have allocated piece rate to female workers which indicates higher degree of trust on female workers.

Figure 4 Wage Allocation to Female Workers



The bar chart above clearly shows that both the male and female employers have allocated the $0.01 piece rate wage to the female workers. It is evident from the two bar charts that both the male and female employers are indifferent between male and female workers in assigning the wage.

Regression Results for Experiment 2

Table 7 Regression of Employer Choice on Female Worker

	Employer Allocation
Female Worker	0.0407
	(0.0770)
Constant	0.658***
	(0.0539)
R^2	0.002
Observations	149

The regression table 9 above is the regression of employer allocation on female workers. Similar to the bar charts, the employer allocation is a dummy for piece rate and fixed rate. The regression estimates signifies that the employers are relative indifferent in allocating piece rate or fixed rate to female

workers. The positive estimate suggests that slightly higher proportion for female workers are allocated piece rates.

Table 8 Regression of Employer Allocation on Female Worker, Female Employer and the interaction term of Female Worker and Female Employer

	Employer allocation
Female Worker	0.0662
	(0.100)
Female employer	0.0155
	(0.109)
Female Worker*Female Employer	-0.0662
	(0.158)
Constant	0.651***
	(0.0721)
R^2	0.003
Observations	149

The regression table above shows the allocation employer against female workers, female employers and the interaction female workers and female employers. The table shows that the female workers are overall allocated to the piece rate and the female employer in general offered piece rate. However, the interaction term shows that the female employers have allocated less wages to female workers compared to male workers.

5. Discussion

The idea of gender discrimination emanating from the wage inelasticity of women workers, doesnt seem to hold in our experimental setting. The result from our first experiment shows that the women are equally responsive to wages as male. However, that responsivness depends on the task or degree of instrinsic motivational drive for that particular task. So for example male are better at math tasks so does not respond that much to wages on math task but responds to wages for the verbal task. On the contrary the effort duration of women are more responsive to wages than male. We find this from various literature and our experiment that there is existence in difference in performance of math and verbal task across genders.

The implicit gender stereotype of male domination of math task is clearly visible in our results. The performance of male on math task is clearly higher than female and with strong statistical significance. On the other hand, the performance of the female were slightly better than male on aggregate and slightly better in the word task with small statistical significance. The lower estimated score of female in math task, itself is likely to be a determinant of gender wage gap as science, technology, engineering and math (STEM) jobs tend to have higher pay than non-STEM jobs and also the gender wage gap in the STEM jobs are lower (Beede et al., 2011). So in a way a likely explanation for women self-selecting into low paying jobs is because of the internalization of gender stereotype of math skills on women leading to lower achievement in math tests. The impact orientation of women was also evident from the result of first experiment, the women had exerted more effort for the math task irrespective of the score achieved on the math tasks. But contrary to early literature on intrinsic motivation of women, the women did respond to the extrinsic incentive as the performance of the math task in the high wage treatment was higher. On the other hand the process orientation of men was also evident from the result in first experiment. The men had relatively lower score in the verbal task but the effort exerted was also relatively lower compared to female. Unlike the female the male did not increase the effort duration on the word task to compensate for the perceived relative weakness of male on verbal tasks.

In the first experiment, I have found evidence of overcrowding of intrinsic motivation with incentive as suggested by Gneezy et al. (2011). The intrinsic motivation for the male got overcrowded when the low piece rate was offered, because the performance of the math task significantly deteriorated for subjects in the low treatment group, while the performance of the male subjects in the zero treatment were much higher than the low treatment group and slightly higher than male workers in the high treatment group. On the other hand, the same phenomenon is evident for the female for the word task. So the idea that intrinsic motivation is only domain of female in competitive environment does not hold in my experimental result.

From the first experiment we can reject our hypothesis that women have different wage elasticity in terms performance and effort duration compared to male. The implication of this result is that an employer can be indifferent between a male and female in terms of offering higher incentive to reciprocate better performance. Hence, the prevalent gender discrimination based on perceived lower wage-effort elasticity of female is not prevalent in our experimental evidence. Thus it seems that an employer is going to lose profit if equally competent female employees are not incentivized at par with incentive progression of male employees.

Taking stock of the first experiment, in the second experiment I have found consistent profit maximizing choice of treating male and female equally in terms allocating piece rate to the employees. On the contrary to the results of Heinz, Normann & Rau (2014) we have found that both male and female allocate piece rate to the workers. The fundamental difference between my experimental design and Heinz, Normann & Rau (2014) was that in my design the reprisal effect of gender discrimination was implicitly integrated in the design through the possibility of losing out on profit while in Heinz, Normann & Rau (2014) experimental design the employer could independently choose either piece rate or flat fee without any reprisal in terms of loss in profitability. So my results imply that if the employers have implicit knowledge of negative impact of profits due to discrimination they will act more rationally.

In the online experimental setting we have discounted institutional barriers and the difference in legal policies in different labour market. If we discount such external barriers it is apparent that gender discrimination is counterproductive to the firms. And the employers and manager making taste based or statistical discrimination are possibly leaving profit on the table.

6. Conclusion

The result from the first experiment makes it clear that the wage elasticity of effort and performance is similar across gender in our experimental setting. A very important result that came out from this paper is that the domain of task has significant implication in driving wage elasticity. From the results of first experiment we have seen that the male responds to wages for the verbal task but is less responsive for the math task and the opposite for women. The dominance of segregation of women to lower paying jobs is also implicit in the results from the first experiment. The lower score of math score of women in the math tasks implies that women have disadvantage in the math related jobs, which we have found to pay higher than non-math jobs. However, the female had higher wage effort elasticity compared to male. In essence, the employers are set to lose out in profit if the wages are not adjusted in a gender neutral manner, in the sense that the female are not given the same incentive as male for same level of competency. In many cases the ability of the employees are not observable, so if the employers consider effort duration as an objective measure for offering promotion or raise in salary, our experimental evidence suggests that women are likely to respond slightly more than the male counterpart.

The evidence from our second experiment also suggest that an utilitarian employer can avoid losing out on profit by allocating similar incentive scheme to both male and female. In the real labour market the male employer have a tendency to discriminate against female, such discrimination are commonly practised in many developed country due to various cultural and social practise. However, with the improvement of the educational attainment of women and resultant improvement in human capital. The employer have the possibility of losing out in profitability by not providing equal incentive structure across gender. In conclusion the experimental evidence suggest that the source of gender wage discrimination is not linked with the supply side dynamic rather the demand side dynamics. In the sense that the self-selection of women to lower paying occupation or choosing to work in the part time jobs has more to do with the institutional restriction and legal policies rather than intrinsic preference of women for low paid jobs. From the demand side, my experimental evidence suggests that the rational for paying lower wages to women has reprisal effect in terms of lower effort duration and performance of women which might augment cost to the firms.

7. References

Altonji, J., & Blank, R. (1999). Race and Gender in the labour market. Handbook of Labour Economics, 3.

Albrecht, J., Bjorklund, A., and Vroman, S. (2003). Is there a glass ceiling in Sweden? *Journal of Labour Economics*, vol. 21, no. 1, 145-177.

Barth, E., & Dale-Olsen, H. (2009). Monopsonistic discrimination, worker turnover, and the gender wage gap. Labour Economics, 589-597.

Becker, G. (1991). A treatise on the family (Enl. ed.). Cambridge, Mass.: Harvard University Press.

Becker, G. (1971). The economics of discrimination (2d ed.). Chicago: University of Chicago Press.

Beede, D., Julian, T., Langdon, D., Mckittrick, G., Khan, B., & Doms, M. (2011). Women in STEM: A Gender Gap to Innovation. SSRN Journal SSRN Electronic Journal.

Benndorf, V., Rau, H., & Sslch, C. (2015). Gender Differences in Incentive Effects after Compensation Scheme Changes. SSRN Journal SSRN Electronic Journal.

Bohnet, I., & Saidi, F. (2012). Informational Differences and Performance: Experimental Evidence.

Bohnet, I., Bazerman, M., & Geen, A. (2012). When Performance Trumps Gender Bias: Joint Versus Separate Evaluation. SSRN Journal SSRN Electronic Journal.

Bonner, S., & Sprinkle, G. (2002). The effects of monetary incentives on effort and task performance: Theories, evidence, and a framework for research. Accounting, Organizations and Society, 303-345.

Card, D., Cardoso, A., & Kline, P. (2014). Bargaining and the Gender Wage Gap: A Direct Assessment. *IZA Discussion Paper Series, 7592*.

Chatard, A., Guimond, S., & Selimbegovic, L. (2006). "How good are you in math?" The effect of gender stereotypes on students' recollection of their school marks. Journal of Experimental Social Psychology, 1017-1024.

Christofides, L., Polycarpou, A., & Vrachimis, K. (2010). 'The Gender Wage Gaps, 'Sticky Floors' and 'Glass Ceilings' of the European Union'. *Discussion Paper Series, 5044*.

Croson, Rachel, and Uri Gneezy. (2009). "Gender Differences in Preferences." *Journal of Economic Literature*, 47(2): 448-74.

Cvencek, D., Meltzoff, A., & Greenwald, A. (2011). Math-Gender Stereotypes in Elementary School Children. Child Development, 766-779.

Datta Gupta, Nabanita and Donna S. Rothstein (2001) 'The impact of worker and establishment-level characteristics on male-female wage differentials evidence from Danish matched employee-employer data'. *Review of Labour Economics and Industrial Relations*, 19(1), 1-35

Dolado, J. J. and Llorens, V. (2004). 'Gender wage gaps by education in Spain: glass floors vs. glass ceilings', *CEPR Discussion Paper* No. 4203, London.

Dohmen, T., & Falk, A. (2011). Performance Pay and Multidimensional Sorting: Productivity, Preferences, and Gender. American Economic Review, 101(2), 556-590.

Eckartz, K., Kirchkam, O., & Schunk, D. (2011). How do Incentives Affect Creativity? CESIFO WORKING PAPER.

Fehr, E., & Goette, L. (2005). Do Workers Work More if Wages are High? Evidence from a Randomized Field Experiment. SSRN Journal SSRN Electronic Journal.

Groshen, E. (1991). "The Structure of the Female/Male Wage Differentials: Is It Who You Are, What You Do, or Where You Work?" *Journal of Human Resources* 26, 457–472.

Gneezy, U., Meier, S., & Rey-Biel, P. (2011). When and Why Incentives (Don't) Work to Modify Behavior. Journal of Economic Perspectives, 25(4), 191-210.

Heinz, M., Normann, H., & Rau, H. (2014). How Gender Differences in Competitiveness May Cause a Gender Wage Gap: Experimental Evidence. SSRN Journal SSRN Electronic Journal.

Kidd, T., & Woodman, W. Sex and orientations toward winning in sport. Research Quarterly. 1975,46,476-483.

Leary, V., Unger, R., & Wallston, B. (1985). 'Women, gender, and social psychology'. New York: Routledge.

Lummis, M., & Stevenson, H. (1990). Gender differences in beliefs and achievement: A cross-cultural study. Developmental Psychology, 254-263.

Maccoby, E., & Jacklin, C. (1976). 'The Psychology of Sex Differences'. *The School of Review*,*84*(4), 625-629.

Majewska, M. (1960). A study of mathematical ability as related to reasoning and use of symbols. Chicago: Loyola University.

Milgrom, E., Petersen, T., & Snartland, V. (2002). 'Equal Pay for Equal Work? Evidence from Sweden and a Comparison with Norway and the U.S'. *Scandinavian Journal of Economics*,559-583.

Nelson, D., & Brammer, C. (2010). NATIONAL ANALYSIS OF MINORITIES IN SCIENCE AND ENGINEERING FACULTIES AT RESEARCH UNIVERSITIES. Retrieved March 1, 2015, from http://faculty-staff.ou.edu/N/Donna.J.Nelson-1/diversity/Faculty_Tables_FY07/07Report.pdf

Niederle, M., & Vesterlund, L. (2011). Gender and Competition. *Annual Review of Economics*, 601-630.

Nosek, B., Banaji, M., & Greenwald, A. (2002). Math = male, me = female, therefore math ≠ me. Journal of Personality and Social Psychology, 83, 44-59.

Petersen, T., & Morgan, L. (1995). Separate And Unequal: Occupation-Establishment Sex Segregation And The Gender Wage Gap. *American Journal of Sociology, 101*(2), 329-365

Stewart, M. (2014). Why is the Gender Pay Gap Higher in the Private Sector.

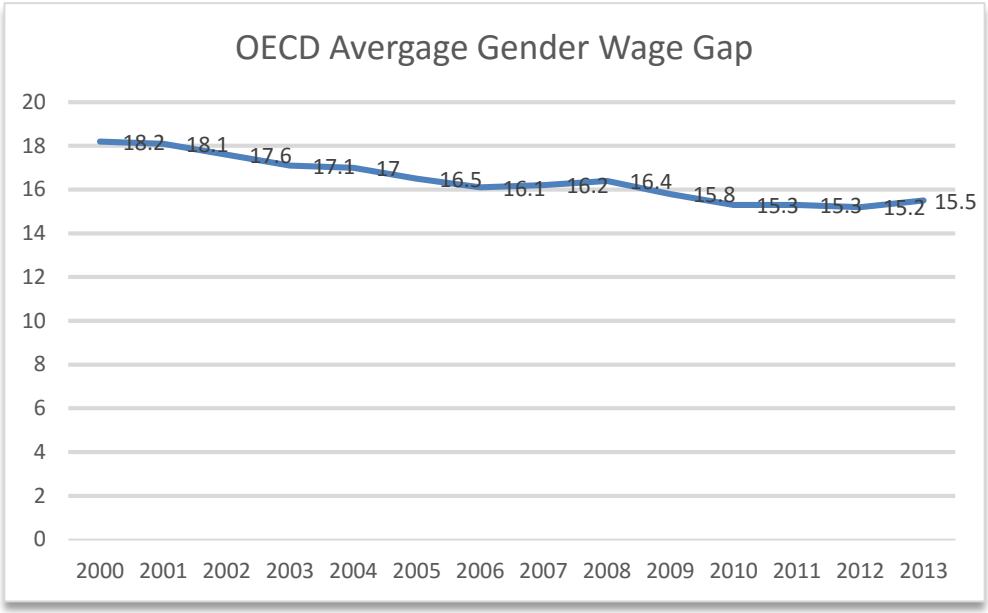
Robinson, J. (1933). The economics of imperfect competition,. London: Macmillan

Rudman, L., & Phelan, J. (2010). The Effect of Priming Gender Roles on Women's Implicit Gender Beliefs and Career Aspirations. Social Psychology, 41, 192-202. doi:10.1027/1864-9335/a000027

Spence J T & Helmreich R L.(1978). 'Masculinity & femininity: their psychological dimensions, correlates, & antecedents'. *Austin, TX: University of Texas Press*, 1978. 297 p.

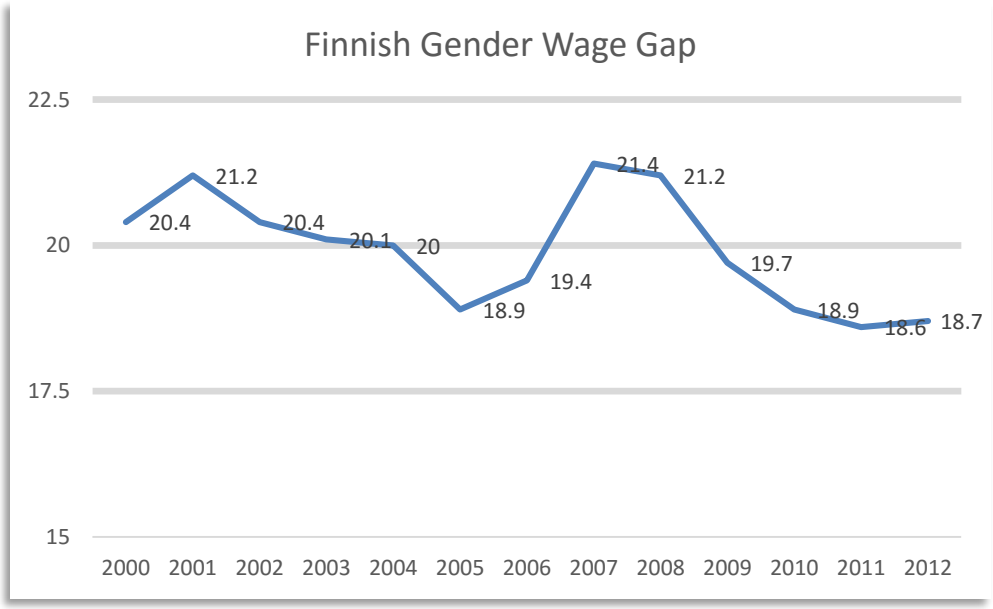
8. APPENDIX A

Figure 5 OECD AVERAGE GENDER WAGE GAP



Source: OECD Dataset

Figure 6 Finnish Gender Wage Gap



Source: OECD Dataset

9. APPENDIX B

In this study you are asked to solve math problems. For each problem you are supposed to find the missing number from a given sequence of numbers as shown below.

10	13	17	___

The correct answer is 22.

On the next screen you will find more instructions regarding the task.

Survey Powered By Qualtrics >>

In this study you are asked to solve word puzzles. For each word puzzles you you are supposed to recognize the correct word from the scrambled letters, as shown below.

A	S	E	M	E	N	T	B

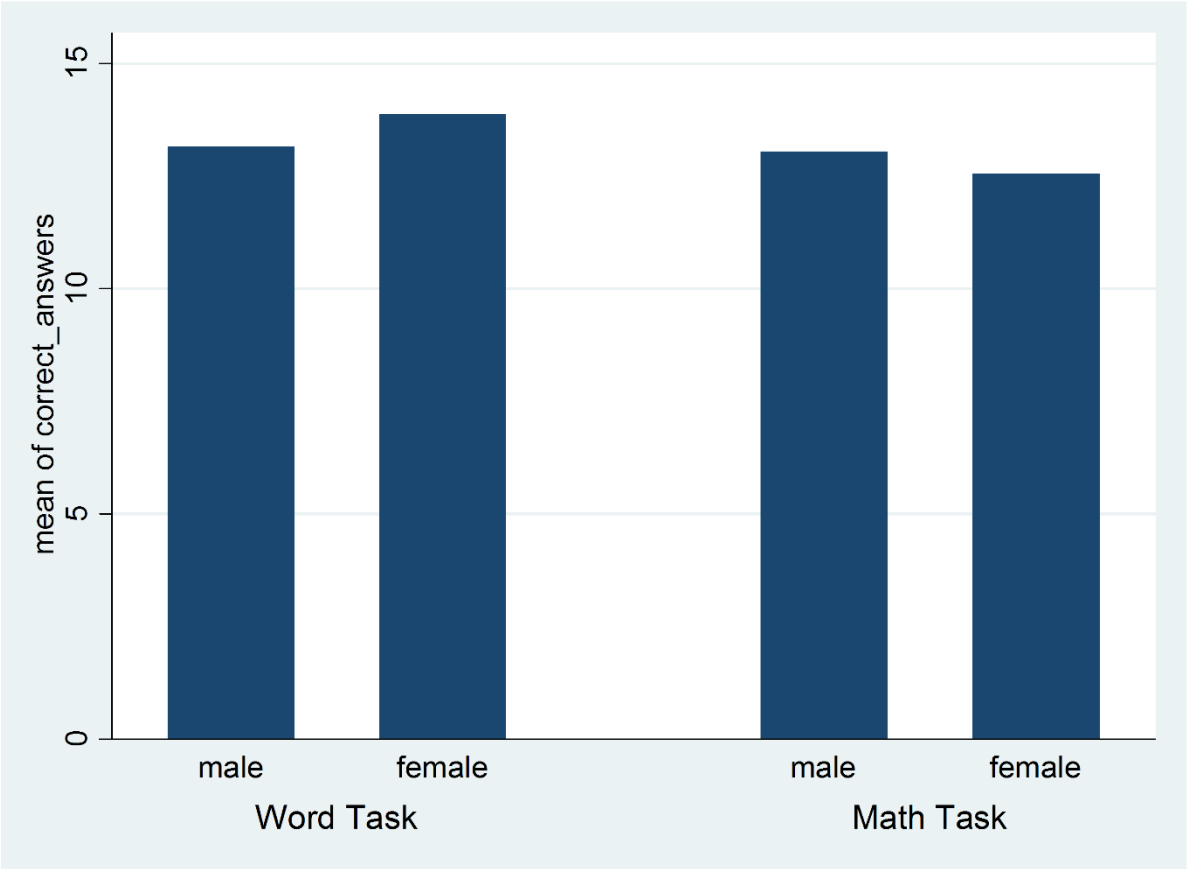
The correct answer is BASEMENT.

On the next screen you will find more instructions regarding the task.

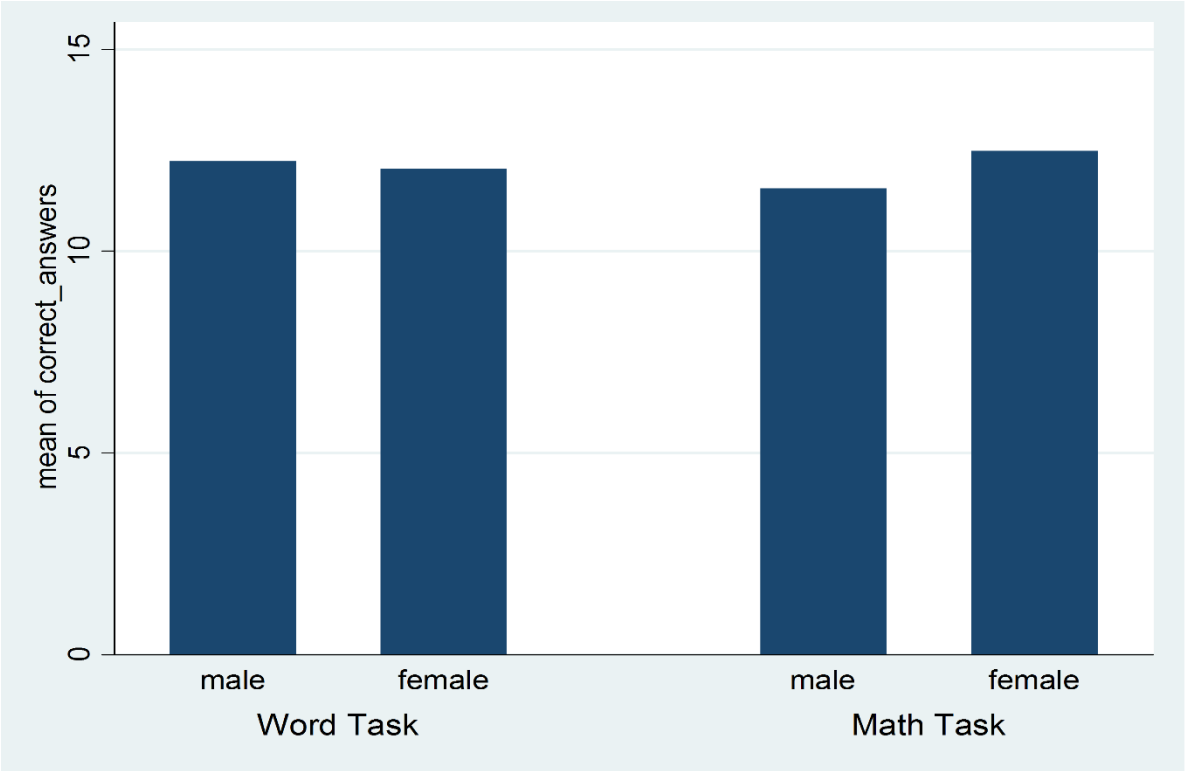
Survey Powered By Qualtrics >>

10. Appendix C

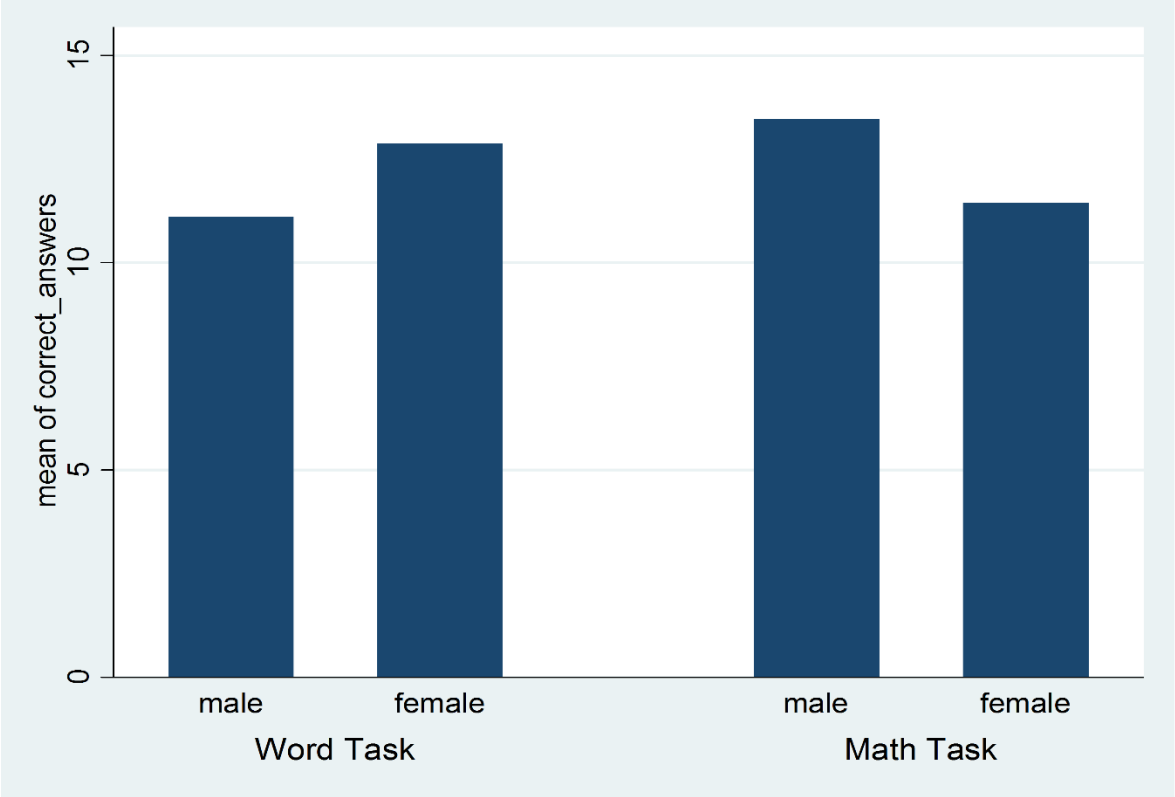
The bar chart of performance for treatment group in high wage of $0.05.



The bar chart of performance over task and gender for treatment group in low wage of $0.01



The bar chart of performance over task and gender for zero piece rate



Difference in Difference Estimation for High Wage Treatment for Performance

Correct Answers	Difference in Difference Estimation
Math Task*Female	-1.379
	(0.926)
gender	0.520
	(0.772)
age	0.0722***
	(0.0252)
Constant	10.58***
	(0.962)
R^2	0.062
Observations	158

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Difference in Difference Estimation for Zero Piece rate of Performance

Correct Answers	Difference in Difference Estimation
Female*Math Task	-1.413
	(0.919)
gender	0.474
	(0.798)
age	0.0252
	(0.0293)
Constant	11.44***
	(1.085)
R^2	0.021
Observations	149

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Difference in Difference Estimation for Low Wage Treatment for Performance

Correct Answers	Difference in Difference Estimation
Female*Math Task	0.256
	(0.933)
gender	0.0747
	(0.804)
age	0.0950***
	(0.0298)
Constant	8.612***
	(1.132)
R^2	0.068
Observations	150

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Difference in Difference Estimation for High Wage Treatment for Duratio

Duration	Difference in Difference Estimation
Math Task*Female	0.201
	(1.955)
gender	0.424
	(1.628)
age	0.364***
	(0.0532)
Constant	-0.623
	(2.029)
R^2	0.242
Observations	158

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Difference in Difference Estimation for Low Wage Treatment for Duration

Duration	Difference in Difference Estimation
Math Task*Female	0.367
	(1.763)
gender	1.699
	(1.519)
age	0.293***
	(0.0563)
Constant	0.143
	(2.139)
R^2	0.175
Observations	150

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Difference in Difference Estimation for Zero Piece rate Treatment for Duration

Duration	Difference in Difference Estimation
Math Task*Female	-0.173
	(1.990)
gender	0.545
	(1.727)
age	0.178***
	(0.0634)
Constant	5.775**
	(2.348)
R^2	0.056
Observations	149

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$