Gender Differences in Self-Assessments at the Application Interface

by

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ABSTRACT

Past studies have shown that supply side sorting processes at the job application interface contribute to both vertical and horizontal gender job segregation. A prominent set of theories focused on the supply side stress the role of biased self-assessments in inducing gendered career choices (Correll 2001, 2004). In essence, females are posited to be less likely to pursue positions in male-dominated fields because they have downwardly biased views of their competence in those fields due to male-favoring cultural associations of competence. I examine the presence of biased self-assessments in the case of labor market job applicants. Female applicants in my sample generally self-assess their career level lower than males with the same level of education and experience. Consistent with Correll (2001, 2004), there are also differences in the extent of this bias with respect to the gender type of the job pursued. Female applicants report significantly lower self-assessments than comparable males when pursuing jobs in *male typed* departments but not when pursuing jobs in *gender neutral* departments. Across the organizational hierarchy, the extent of self-assessment bias favoring males increases as you move up levels of the hierarchy. However, I find no gender self-assessment bias among applicants to departments with female competence associations. This suggests the limits of Correll's "cultural beliefs" explanation of biased self-assessments beyond the case of stereotypically male fields.

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Researchers have traced the roots of the gender inequality in the labor market to gender job segregation (Petersen and Morgan 1995; Weeden, Charles, and Grusky 2004). Indeed, past research has shown that once you compare individuals within a particular job at a particular employer, most of the gender wage gap disappears. So, a key task for scholars interested in gender inequality in the labor market is to identify the processes through which men and women get sorted into different jobs. Although internal transfers and attrition can contribute to segregation (Cohen, Broschak, and Haveman 1998; Elvira and Cohen 2001), scholars have argued that the hiring interface is a particularly influential stage for generating gender job segregation (Petersen and Saporta 2004; Fernandez and Sosa 2005).

Job segregation processes in hiring include "demand side" processes through which employers screen individuals for different positions as well as "supply side" processes through which individuals come to pursue different positions. While several past studies have assessed the role of demand side job applicant screening in producing segregated outcomes (Petersen, Saporta, and Seidel 2000; Fernandez and Sosa 2005; Booth and Leigh 2010; Goldin and Rouse 1997; Neumark, Bank, and Van Nort 1996), a growing literature has argued that supply side sorting processes are a part of the story. With respect to vertical segregation, past work has shown that females are less prevalent in job queues for high status, high paying jobs (Fernandez and Mors 2008; Fernandez and Abraham 2010, 2011; Fernandez and Campero 2012). Also, horizontal segregation has been found in a number of stereotypically male fields such as finance (Barbulescu and Bidwell 2012), computer programming (Fernandez and Friedrich 2011), or engineering and science (Cech et al. 2011). These studies have found that females are less likely to pursue stereotypically male fields.

Why might females be less likely to pursue jobs at higher levels in the organization or in stereotypically male fields? One set of influential theories relate to biases in competence self-assessments (Vroom 1964; Eccles 1987; Barreto, Ryan, and Schmitt 2009). Eccles (1987)'s expectancy value model provides a succinct synthesis of the argument. In this model, an individual's propensity to pursue activities in a particular domain is determined both by *the value* they place on the domain and *the expectations* they have of doing well in the domain. Further, theories that emphasize the role of feedback (Kanter 1977; Falk, Huffman, and Sunde 2006) posit that expectations of success are formed through prior experience and feedback in the domain. However, a key insight of status characteristic theory (Berger et al. 1977; Correll 2001, 2004; Correll and Ridgeway 2006) is that expectations of success or competence self-assessments do not take place in a cultural vacuum, and that individuals are biased by cultural associations when interpreting feedback. In particular, scholars have argued that gender is associated with competence in different fields (Cejka and Eagly 1999; Foschi 1996, 2000; Ridgeway and Correll 2000; Ridgeway and Correll 2004) as well as with managerial competence (Biernat et al. 1998; Eagly and Carli 2003; Rosen and Jerdee 1974).

Correll (2001, 2004) addresses the extent to which cultural associations of competence and gender may explain gendered patterns in early career choices. Her theory posits that, given the same feedback about competence in a particular field, males and females will make different inferences about their competence based on broad cultural associations between gender and competence in that field. Further, she argues that these biases in self-assessments influence the career choices of young people in a way that steers females away from stereotypically male fields. Correll (2001) tests this theory using information on the grades, self-assessments, and courses of study of high school and college students. She finds that females self-assess their math ability lower than males who've received the same math grades. Further, she finds that this difference in math self-assessments is related to females' lower propensity to pursue a quantitative career. Correll (2004) tests this theory in a laboratory setting where a group of college students are given a test in an unknown field (contrast sensitivity) and each receives the same score. However, prior to performing the test, a random sub-group of students are told that males have superior ability in contrast sensitivity while the rest of the students are told that there are no gender differences in task ability. She then measures students' self-assessment of their ability in contrast sensitivity and their stated intention to pursue a career where contrast sensitivity is an important skill. Consistent with her predictions, she finds that being exposed to the belief that males are more competent in a field induces a male-favoring gap in subjects' self-assessment of task competence, while no gap appears when gender is specifically dissociated from the task.[1] Further, the manipulation also induces a bias in subjects' future aspirations for activities thought to require this ability. When males are presented as having superior ability at the task, they state higher aspirations than females for careers requiring this ability. When gender is explicitly dissociated from the task, females state higher aspirations for careers requiring this ability. It is noteworthy that Correll (2004) did not test a "female advantaged" condition. To the extent that gender biases in self-assessments can be accounted for by cultural beliefs about gender and competence, a gender gap in self-assessments favoring females should emerge among subjects exposed to the belief that females have superior ability at these tasks.

Beyond early career choices, a few notable studies have investigated the impact of gender differences in expectations of success on labor market choices. Barbulescu and Bidwell (2012) use information on the job searches of MBA students who have comparable prior experience and face a similar choice set of jobs to compare the career choices of men and women. In this study, they infer competence self-assessments by surveying incoming students and asking them to rate the likelihood of receiving offers from various fields. They find that females have lower expectations of getting an offer in finance than males and that this difference in expectations of success mediates gender differences in propensity to apply to finance jobs. Also, Fernandez and Friedrich (2011) exploit a job application setting where applicants apply to jobs by phone and therefore make application choices that are unlikely to be influenced by employer steering. They infer expectations of success from application choices and a

[1] With respect to the source of the bias, she finds that both males and females are influenced by the exposure to the belief that males are advantaged at the task. However, the results relating to the influence of the gender-type manipulation on self-assessments are more reliable for males than for females (Correll 2004, p. 108).

survey of applicant preferences over different fields. They argue that females were unlikely to be deterred from applying to a gender atypical job in their setting by lower expectations of success because female candidates who rated the gender atypical job most highly, tended to rate the gender typical job even more highly. In essence, their preferences seemed to line up with gender stereotypes, rather than gender atypical preferences being suppressed by lower expectations of success in a gender atypical field.

In this study, I take a more direct approach to investigating the association between gender biases in self-assessments and the cultural associations of different jobs. In particular, I attempt to replicate Correll's strategy of matching on a competence standard and measuring gender self-assessment biases among groups pursuing fields with different gender types. Correll argues that the theory of biased self-assessments applies to labor market gender sorting: "Since many occupations and specialties within occupations do have stable, widely available cultural beliefs associated to them, the argument presented here is relevant to understanding the continued gender gap in a wide array of occupations" (Correll 2001, p. 1725). However, there have been few attempts to research the extent to which cultural beliefs about occupations and specialties can account for gender self-assessment biases in a field setting. The absence of field evidence to date seems to at least partly be due to the difficulty of replicating the conditions Correll exploited in a school or laboratory setting in the labor market. The most obvious difficulty is that in a labor market setting we can't control the feedback job applicants receive or manipulate the gender association of various fields as in Correll (2004)'s experiments. In fact, simply having information on job applications is rare (Fernandez and Weinberg 1997; Gorman 2005). Having information that would allow researchers to construct a competence standard relative to which self-assessment biases can be inferred is even rarer.

The setting employed in this study is uniquely suited for this purpose. I study people applying via the Internet to job openings at different departments and at different levels of five high tech firms located throughout the US. I exploit the fact that applicants to these firms were given a common survey that asked them to self-assess their career level at the time of application along with other demographic and background information. I use the applicant's credentials (i.e., years of education, work experience, and management experience) as a competence standard akin to the school grades used in Correll (2001). I match males and females on these credentials and compare their self-assessed career level within applicant pools to jobs with different gender associations.

I also test Correll's (2001, 2004) "cultural beliefs" explanation more generally by investigating the extent to which biased self-assessments arise in the case of applicants to stereotypically female fields. Correll argues that biased self-assessments arise when individuals are exposed to negative stereotypes about their competence in a particular field. Regardless of whether individuals personally believe the negative stereotype, the knowledge that the stereotype is widely held induces an unconscious expectation of inferior performance by the disfavored group. This unconscious expectation leads individuals in the disfavored group to be judged less favorably (by both others and themselves) for the same level of objective performance as the favored group (Foschi 1996; Correll 2001). Although Correll (2001, 2004) finds evidence consistent with this "cultural beliefs" explanation in the case of females considering male typed careers, some of her findings relating to the self-assessments of other groups are less conclusive.

In Correll (2001), African Americans show higher academic self-assessments than comparable whites in spite of "dominant cultural beliefs that undoubtedly disadvantage them" (p. 1715). Although this result is at odds with a "cultural beliefs" explanation of biased self-assessments, she argues that individuals tend to be more insulated from negative stereotypes about their race than about their gender which may explain why biased self-assessments emerge in the case of gender but not race.[2] In the case of self-assessment biases in stereotypically female fields, Correll (2001) finds that males self-assess their *verbal* ability less favorably than females who received the same grade in verbal ability. However, it is unclear to what extent these female-favoring biases support the more general view that individuals of both genders bias their self-assessments when pursuing gender atypical fields as the evidence relating to the gender stereotypes of verbal ability is scant. By assessing the extent to which biased self-assessments arise among job applicants to stereotypically female fields, this study provides a further opportunity to test the generalizability of the "cultural beliefs" explanation of gender biases in self-assessments beyond stereotypically male fields.

Overall, I find that female applicants in this setting self-assess lower than males with the same education and experience. Furthermore, consistent with Correll, this male-advantaging self-assessment bias emerges among applicants to male-typed departments, but not among applicants to gender neutral departments. Looking across organizational levels, the degree of self-assessment bias favoring males increases as you move up levels of the hierarchy. To the extent that upper organizational levels are associated with masculinity, this is also consistent with male advantages in self-assessments being associated with cultural beliefs about competence and gender. However, no female advantaging self-assessment bias occurs among applicants to female typed departments. This suggests the limits of Correll's cultural beliefs explanation of biased self-assessments beyond the case of stereotypically male fields.

[2] In particular, she argues that individuals mostly grow up in racially homogeneous families and often attend racially segregated schools. This can insulate them from hegemonic beliefs about their race. On the other hand, individuals usually have greater contact with both genders at home and in school which makes exposure to hegemonic gender beliefs more prevalent (Correll 2001, p. 1715).

Hypotheses

Prior research has argued that certain organizational departments have gendered competence associations. In the case of Sales, Morgan and Martin (2006) argue that competence stereotypes may favor males because a lot of the work takes place in social contexts that disadvantage females (p. 111). In the case of departments directly related with Engineering and Technology, Cech et al. (2011) argue that females have lower confidence in their ability to "successfully fulfill the roles, competencies, and identity features" of these professions. Given the presence of these male-favoring competence beliefs, I would expect a male-favoring gap in self-assessments among applicants pursuing jobs in these departments. In line with this reasoning, I propose the following hypothesis:

Hypothesis 1: When applying to jobs in male typed departments, males will self-assess their career level higher than females *ceteris paribus*.

Further, in order to establish the extent to which cultural beliefs about the department pursued account for the male advantage in self-assessments, it is useful to also evaluate gender biases in self-assessments among applicants to departments not culturally associated with masculinity. Marketing and Client Service departments are used for this purpose. Unlike Sales or Engineering, previous research does not document clear gender stereotypes for jobs in Marketing and Client Service. Further, as I show below, applicant pools to jobs in these departments are gender balanced, suggesting the absence of a clear gender association. As such, a "cultural beliefs" account of biased self-assessments would suggest that gender differences in self-assessments among applicants to these departments should be small relative to gender differences in self-assessments among applicants to gender typed jobs.

In addition to gender associations of the department, scholars have also argued that the organizational level of the job is associated with gender competence stereotypes. In particular, studies have argued that leadership positions such as manager and executive may be associated with male-favoring competence stereotypes (Biernat et al. 1998; Eagly and Carli 2003; Rosen and Jerdee 1974). These studies argue that management ability is often associated with being male or possessing male characteristics. As such, I propose that:

Hypothesis 2: When pursuing managerial or executive jobs, males will self-assess their career level higher than females *ceteris paribus*.

If what induces the bias is the gender association of managerial positions then, *ceteris paribus*, no gender bias should emerge in the self-assessments of applicants to non-managerial positions. Across organizational hierarchies, there is rarely a clear delineation between job levels with and without managerial responsibilities. Above a certain level, it is often clear that the primary responsibilities are managerial, and entry level jobs clearly lack managerial responsibilities. However, there are often organizational levels immediately above the entry level which may entail some managerial responsibilities, but where these do not comprise the majority of the job's responsibilities. As such, if the source of the self-assessment biases is the gender association of managerial competence, there should be no self-assessment bias among applicants to entry level positions, and the extent of self-assessment bias favoring males should increase as you move up levels of the hierarchy.

As argued above, the "cultural beliefs" explanation used in Correll (2001, 2004) to account for biased self-assessments suggests that individuals of both genders should downwardly bias their self-assessments when pursuing jobs culturally associated with the opposite gender. Jobs in departments such as HR and Administration are gender atypical for males to the extent that most of the tasks performed in these departments are associated with feminine qualities. Although prior literature does not provide direct evidence of the gender association of these departments, it has been well documented that jobs in HR and Administrative departments are predominantly held by females (Gabriel and Schmitz 2007; Kochan 2004). Further, Cejka and Eagly (1999) argue that "qualities thought to be required for occupational success correspond to the gender stereotype of the male or female group that is numerically dominant in the occupation" (p. 414). To the extent that these departments are associated with femininity, a "cultural beliefs" account of biased self-assessments would predict a male-disadvantaging self-assessment bias among applicants to these departments. As such, I propose that:

Hypothesis 3: When pursuing jobs in female typed departments, males will self-assess their career level lower than females *ceteris paribus*.

Data and Setting

The data for this study comes from five medium sized high tech firms located throughout the US. Companies 1, 2, and 3 are in software developers and companies 4 and 5 are online retailers. These companies use a "cloud" applicant tracking service to post job openings on the Internet providing short job descriptions and information about the company, but no salary information. I analyze applicants to these firms over a period of up to 40 month from December 2008 to April 2012.[3],[4] Jobs posted during the period were coded by these firms for both organizational level and department. Organizational level was based on companies' own classification of their jobs into a six level full-time[5] job classification required by the "cloud" service: 1 = Entry-level, 2 = Mid-level, 3 = Experienced non-manager, 4 = Manager, 5 = Executive, and 6 = Sr. Executive. Examples of job titles at each level are: "Sales Associate" for entry-level, "Account Executive" for mid-level, "Social Media Strategist" for experienced non-

[3] Applications to Company 1 were observed from 01/2011 to 04/2012, Company 2 from 12/2008 to 04/2012, Company 3 from 05/2011 to 04/2012, Company 4 from 04/2009 to 04/2012, Company 5 from 09/2011 to 04/2012.

[4] In the analysis below, I analyze 53,117 first time applications received from external applicants by the five firms during these periods. This sample excludes 5,863 repeat applications from applicants who had previously applied during the observation period and 1,585 applications from internal applicants. I exclude repeat applications and focus my main analyses only on first time applications in order to minimize the prospect that the self-assessments indicated are influenced by employer feedback on the initial application. However, I performed a robustness check of the subsequent analyses including repeat applications (Appendix Table A1).

[5] Analysis excludes 3,755 applications to part-time internship positions, and 439 applications from students.

manager, "Brand Manager" for manager, "VP of Marketing" for executive, and "CFO" for sr. executive. Job department was either explicitly specified as part of the job posting, or coded based on the job title.[6] As part of the online application process, applicants were asked to rate their own career level on the same scale as jobs were hierarchically classified: 1 = "Entry level," 2 = "Mid level," 3 = "Experienced non-manager," 4 = "Manager," 5 = "Executive," 6 = "Sr. Executive." Additional information provided by applicants to all companies at the time of application included educational degrees, years of work experience, years of management experience, and on a voluntary basis, their gender.[7] These data were collected into each company's applicant tracking system and anonymized before being provided to me for use in this study.

These firms' practices are in line with a growing number of medium sized firms that have turned to "cloud-based" solutions for their applicant interface and tracking (Autor 2001; Cappelli 2001; Kerka 2001). However, this sample of firms is unique in that it provides consistent applicant and job data across the firms, and - crucially for this study - consistent applicant career level self-assessments. This applicant self-assessment data, along with the information on the applicant's background, and the departments and level of jobs they are pursuing provides a unique opportunity to perform a direct field-based test of biased self-assessment theory and its applicability in labor market settings.

[6] There were 294 applications for which the department of the job could not be determined.
[7] Of the 53,117 applicants, a total of 13,093 (25 percent) choose not to provide information about gender. I was given access to candidates' first names and thus was able to code all but 8.9 percent (1,170) of the 13,093 cases who did not provide their gender. Between these and the cases who did identify their gender, I was able to identify gender for 51,947 cases, or 97.8 percent of the applicants. For these 51,947 cases, I used the information about the applicant's educational degrees to code years of education for all but 10,911 applicants (21 percent). Also, applicant years of experience were missing for 1,874 applicants, organizational level of the job pursued was missing for 587 applicants, and the applicant's career level self-assessment was missing for 122 applicants. The main analyses were performed on the sample of 38,601 cases where these variables were non-missing. However, given the high number of cases missing years of education, I performed a robustness check of the subsequent analysis on the larger sample including the 10,911 cases for which years of education were missing (Table 6 Panel b).

Analysis

Table 1 shows the distribution of the applications studied by the gender of the applicant and the department of the job to which s/he applied. Of the 38,601 applicants in the sample, 42.3 percent are female. I coded Sales, Engineering/Technology, and Production departments as male typed based on prior literature that posits male-advantaging competence stereotypes in these fields (Morgan and Martin 2006; Cech et al. 2011). I coded HR and Admin departments as female typed based on the gender distribution of these domains and its implications for gender stereotyping (Cejka and Eagly 1999; Gabriel and Schmitz 2007; Kochan 2004). Consistent with these studies, the gender distribution of applicants to male typed departments shows a decidedly male skew, and to female typed departments a female skew. I coded Client Service and Marketing as gender neutral given the lack of evidence relating to a strong gender association of these departments and the gender balanced applicant pools. Table 1 shows that while the gender composition of the applicant pool broadly aligns with the coded gender types of the departments, there are a sufficient number of gender atypical applicants for within department type gender comparisons: 27.7 percent of applicants to male typed departments are female, and 37.6 percent of applicants to female typed departments are male.

Table 2 shows the distribution of self-assessed career level by gender of the applicant and gender type of the department. This table shows that applicants' self-assessments are not disproportionately skewed towards a particular response category. Within the entire sample, each of the six response categories received responses from between 10 and 25 percent of the applicants. Further, although the modal response for both genders was "Manager," females on average self-assess lower than males: 3.3 versus 3.6 on a 1 to 6 scale (p<0.01). Among applicants to male typed departments, the modal response for males was "Manager" and for females it was "Mid-level," and on average females gave themselves a rating of 3.2 compared to 3.6 for males (p<0.01). Among applicants to gender neutral departments, for both genders the modal response was "Manager" but on average females gave themselves a rating of 3.4 compared to 3.8 for males (p<0.01). Finally, comparing applicants to female typed jobs, for both genders the modal response was "Manager" but on average females gave themselves a rating of 3.4 compared to 3.6 for males (p<0.01). These results don't suggest a strong association between the extent of self-assessment bias and the gender association of the job's department. Although females applying to male typed departments are the only group that modally self-assesses at a level below "Manager," the mean self-assessment level of male applicants is above that of females' among applicants to all three department types.

Table 3 shows the distribution of applicants by gender and level of application. Consistent with prior research (Fernandez and Abraham 2010, 2011; Fernandez and Campero 2012), this table shows that the applicant pool is balanced by gender at the entry level and that male applications become more prevalent in the applicant pool as you move up levels of the hierarchy, especially for executive and sr. executive levels where the share of females in the applicant pool drops off significantly. Table 3 also shows the mean self-assessment level (1 to 6 scale) by gender and level of application. I find that females' lower self-assessed career level persists once you look within level of application for all levels except the entry level and the sr. executive level (p<0.05).[8] Further, the gender difference in self-assessed career level increases from a -0.04 deficit for females at the entry level (p<0.1) to a -0.47 deficit at the executive level (p<0.01). This descriptive result is in line with the view that self-assessment biases are induced by male-favoring competence associations of higher organizational levels, especially the managerial and executive levels.

Table 4 shows the distribution of applicants by gender and level of application for each of the three types of departments: Panel a corresponds to male typed departments, Panel b to gender neutral

[8] There are only 15 female applicants at the sr. executive level.

departments, and Panel c to female typed departments. Starting with applicants to male typed departments, Panel a shows a pattern of fewer female applicants as you move up levels of the hierarchy. Further, the extent of female disadvantaging self-assessment deficit increases from -0.17 ($p<0.01$) at the entry level to -0.62 ($p<0.01$) at the executive level. In the case of gender neutral departments, Panel b shows that the percent of females in the applicant pool is somewhat stable at lower organizational levels, increases at the manager level, and then drops off significantly at the executive level. Among applicants to these jobs, the extent of females' self-assessment deficit does not vary much across the hierarchy: from -0.31 ($p<0.01$) at the entry level to -0.39 ($p<0.01$) at the executive level.

Finally, in the case of female typed departments, Panel c shows that there is a large change in the gender composition of the applicant pool across organizational levels: from 71 percent female at the entry level, to 38 percent female at the executive level, and only 10 percent female at the sr. executive level. With regards to self-assessments, Panel c shows that for entry level jobs in female typed departments, females on average rate themselves 0.14 *higher* than males ($p<0.01$). Consistent with the "cultural beliefs" account of biased self-assessments, this result suggests that –at least at the entry level – females self-assess more favorably than males among applicants to stereotypically female jobs. However, this advantage does not persist at higher organizational levels. Among applicants above the entry level, self-assessments are the same or higher for males than for females. These results suggest that stereotypes associated with different organizational dimensions (department, level) may reinforce each other in biasing self-assessments. The largest male self-assessment advantage is among applicants to *male typed executive level* positions (-0.62). The largest (only) female self-assessment advantage is among applicants to *female typed entry level* positions (0.14).

To the extent that there are systematic differences between the male and female applicants being compared, the above self-assessment comparisons cannot be directly interpreted as evidence of biased self-assessments. Correll (2001)'s theory is premised on comparing the self-assessments of males and females who received the *same grade* in the subject matter. In order to approximate this scenario, I construct a sample of applicants having the *same credentials* at the application interface. I use an exact matching procedure (Sekhon 2008; Imai, King, and Stuart 2008) to match male and female applicants on their years of education, years of work experience, and years of management experience as well as the characteristics of the job applied to. I then compare the self-assessments of males and females applying to departments of different gender type, and to different organizational levels. Exact matching allows me to identify the region of "common support," meaning those male and female applicants that share the same observed characteristics and focus the analysis on those cases (Morgan and Harding 2006). By utilizing this procedure, I enforce the highest possible comparability standard between male and female applicants and estimate gender biases in self-assessments that are not dependent on any parametric modeling assumptions.

Matching methods are based on the counterfactual model of causality (Holland 1986; Morgan and Harding 2006). Under this framework, causal inference is conceived as an assessment of the difference in potential outcomes under a treatment and a control condition only one of which is observed for each unit. Matching methods attempt to make progress on identifying causal effects in observational studies by assuming there is a set of observed covariates that determine selection into the treatment. As such, conditioning on these covariates, the treatment and control groups are interchangeable and causal effects can be estimated. When the primary causal variable of interest is an individual characteristic such as gender rather than a treatment, it is important to make a conceptual clarification. Gender cannot usually be manipulated within individual and so does not satisfy the maxim of "no causation without manipulation," Rubin (1978), inherent in the potential outcomes framework. Further, gender is not assigned at a particular point in time which impedes the analyst from differentiating pre-treatment from post-treatment covariates. As such, gender differences in outcomes of matched samples of males and females cannot be interpreted in causal terms within the potential outcomes framework. However, scholars have suggested that matching is still an appropriate methodology to improve the comparability of cases when making comparisons of outcomes across immutable characteristics such as gender (Boyd, Epstein, and Martin 2010; Greiner and Rubin 2011).

The most strict approach to ensure the comparability of males and females is to match exactly and identify those males and females who share the same values of all observed characteristics. Although in many settings exact matching is not feasible because the resulting matched sample would be too small, the large sample size available here allows me to adopt this approach. The sample thus created contains the sub-set of males for whom there is at least one female applicant that has the same years of education, years of work experience, and years of management experience, and who is applying to a job at the same company, in the same department, and at the same level (as well as the matched females). In this matched sample, gender is uncorrelated with any of the covariates. As such, no further parametric adjustment is necessary and gender biases can be assessed simply as the gender difference in mean self-assessments in the matched sample. The main limitation of this approach is that the resulting inference applies only to the sample of males and females for whom covariates match. In this case, this is less of a concern given that I manage to exactly match a large number of male and female applicants. Also, like any matching procedure, it is only as good as the set of covariates matched on. Self-assessment comparisons on the matched sample remain subject to bias because of differences between males and females on unobserved characteristics. However, to the extent that the applicant's level of education and experience provide an objective measure of his or her career level then this analysis matches applicants on the appropriate competence standard relative to which self-assessment biases may be assessed.

Table 5 shows the gender differences in observed characteristics in the unmatched dataset, as well as the means of these characteristics on the matched dataset. It also shows the relationship between observed candidate characteristics and self-assessed career level. For the applicant's credentials to be an appropriate competence standard relative to which we may measure self-assessment biases, they should be strongly predictive of career level self-assessments. Table 5 shows that this is indeed the case with respect to the applicant's years of work experience and years of management experience, although not for years of education. Years of work experience and years of management experience individually explain 45 and 48 percent of the variance in career level self-assessments, while years of education explain less than 1 percent.

Table 5 also shows that males and females have significant differences in levels of education and experience in the unmatched dataset. Male applicants have on average 16.5 years of education compared to 16.3 for female applicants (p<0.01). Male applicants also have on average 10.4 years of work experience compared to 8.8 for female applicants.(p<0.01). Further, males on average have 6.2 years of management experience compared to 4.6 for female applicants (p<0.01). Given how predictive of self-assessments the experience variables are, even small differences in experience by gender will induce bias in gender self-assessment comparisons. The key objective of the matching analysis is to identify a sub-sample of male and female applicants with the same values of these credentials. Further, given that I am interested in comparing self-assessments of males and females within particular departments and organizational levels, I also match on the department and level of application pursued. As previously described (Tables 1 to 3), Table 5 shows that male applications are more prevalent in applicant pools to male typed departments and higher organizational levels relative to female applications. Finally, given that the five firms in the sample did not contribute equally to the male and female applicant pools, I also match applicants on the company of application. Table 5 shows that males' applications are more likely to come from two of the software developers (Companies 1 and 3), and females' applications are more likely to come from the two online retail firms (Companies 4 and 5) and one of the software developers (Company 2).

Turning to the matched dataset, of the 38,601 applicants in the dataset, I was able to match 12,796 applicants through 1-to-1 exact matching without replacement (6,398 males matched exactly to 6,398 females).[9] This matched dataset is still large enough to estimate gender differences in self-assessments to a high degree of precision. Compared to the unmatched dataset, matched applicants are drawn from the lower part of the experience distribution: applicants in the matched dataset have on average 6.3 years of work experience and 3.0 years of management experience compared to 9.7 years of work experience and 5.6 years of management experience in the unmatched dataset. Applicants in the matched dataset are also drawn in sufficient numbers from within the three department gender types: N = 5,916 for male typed departments, 4,308 for gender neutral departments, and 2,512 for female typed departments. Across the organizational hierarchy, I group applications into three strata based on the prevalence of managerial responsibilities: entry level jobs that lack managerial responsibilities are a first strata, mid-level and experienced jobs where managerial responsibilities are a minor part of the job constitute a second strata, and managerial, executive, and sr. executive levels where managerial responsibilities are a major part of the job are a third strata. Matched applicants are skewed towards the bottom of the organizational hierarchy compared to the unmatched dataset: 27 percent of applicants in the matched dataset are to entry level jobs compared to 21 percent in the unmatched dataset, 63 percent are to experienced and mid-level jobs compared to 61 in the matched dataset, and only 6 percent are to managerial and executive jobs compared to 17 percent in the unmatched dataset. However, within each of these three strata, there are a sufficient number of matched applications for

[9] I used the Match package in R written by Sekhon (2008) to implement this procedure. The matching analysis was also conducted with replacement and yielded substantively similar results (available from the author).
The procedure included a random tie breaker to select the matched observation in the cases when there were multiple matches. However, an additional analysis that included and weighted all possible matches was also performed and yielded substantively similar results (available from the author).

within strata gender comparisons: N = 3,558 for entry level, 8,264 for experienced and mid-level, and 974 for managerial, executive, and sr. executive.

Having created this matched dataset, I now proceed to test the hypotheses by comparing the mean self-assessments of males and females within department type and organizational level strata. Table 6 Panel a shows the results. Starting with differences in the overall sample, males on average self-assess 0.03 higher on a 1 to 6 scale than females with the same education, experience, applying to the same companies, in the same departments, and at the same level ($p<0.05$). To put the magnitude of this bias in perspective, I compare it to the observed difference in mean self-assessed career level associated to additional years of work experience. In the matched sample, going from 8 (the median) to 9 years of work experience is associated with a mean increase in self-assessed career level of 0.18 (from 3.84 to 4.02). This suggests that the magnitude of the gender bias in self-assessment in the overall dataset is relatively small, equivalent to about 16 percent of the increase in self-assessed career level associated with an additional year of work experience at the median.

Comparing within type of department pursued, I find that females self-assess 0.07 lower on a 1 to 6 scale than males among applicants to male typed departments ($p<0.05$). This finding provides support for Hypothesis 1 which states that females will self-assess lower than comparable males among applicants to male typed departments. With respect to the magnitude of the bias, this level of bias is equivalent to about 38 percent of the increase in self-assessed career level associated with an additional year of work experience at the median. Further, the gender differences in self-assessments are much smaller and not statistically significant among applicants to gender neutral departments (gender difference in mean self-assessments = 0.01, $p= 0.59$). This result is consistent with the view that the gender association of male typed departments induces a gender bias in self-assessments.

With respect to female-typed departments, Table 6 Panel a shows that there are no discernible gender differences in self-assessments among applicants to female typed departments (gender difference in mean self-assessments = 0.02, p=0.59). This finding suggests no support for Hypothesis 3 which states that females will self-assess higher than comparable males among applicants to female typed departments. Given that the descriptive analysis (Table 4, Panel c) suggested that a female favoring bias may emerge only among applicants to jobs that are stereotypically female both with regards to the department and level, I also compare self-assessments by gender among applicants to entry-level female typed jobs. I find no gender differences in self-assessments even within this sub-sample.[10] These findings provide no support for the broader argument that biased self-assessments emerge whenever cultural beliefs about competence favor one gender over another.

Turning to gender self-assessment differences across levels of the organizational hierarchy, Table 6 Panel a shows that the extent of bias increases as you move up levels of the hierarchy. Among applicants to entry level jobs, males self-assess 0.01 higher than matched females (p=0.64). Among applicants to experienced and mid-level jobs, this difference grows to 0.03 (p=0.05), and 0.05 (p=0.22) among applicants to managerial and executive positions. Although the pattern is directionally in line with Hypothesis 2 which states that self-assessment biases should emerge among applicants to jobs with managerial responsibilities, there is no evidence to support the hypothesis.

Robustness checks

The dataset analyzed above excludes a significant number of applicants because information on their educational degrees was missing. However, given that years of education is not predictive of career level self-assessments, it is appropriate to replicate the matching analysis excluding this variable and gain 10,911 more unmatched cases. Table 6 Panel b shows the mean self-assessments for a matched

[10] Among matched applicants to entry level jobs in female typed departments, males on average self-assess 0.02 higher than females, although this difference is not reliably different from zero (p>0.1).

sample based on the larger dataset including cases that were missing information on educational degrees. The results on this expanded dataset largely correspond to the results of the main analysis. Across organizational departments, females self-assess at a lower level than males among applicants to male typed departments but not among applicants to gender neutral or female typed departments ($p<0.05$). Across organizational levels, there are no gender differences in self-assessment at the entry level ($p>0.05$). There is also a pattern of male-advantaging self-assessment biases growing as you move up levels of the hierarchy: from 0.02 at the entry level to 0.06 at the managerial and executive levels. However, in contrast to the main analysis, in this expanded dataset, the gender differences in self-assessments are now statistically significant among applicants to strata above the entry level ($p<0.05$). This finding provides support for Hypotheses 2 which states that there will be a self-assessment bias favoring males among applicants to jobs with managerial responsibilities.[11]

Finally, the mean gender differences in self-assessments on the matched sample provide an easily interpretable and fully non-parametric measure of self-assessment bias. However, these comparisons make the assumption of equal distance between career level self-assessment response categories. In order to provide an additional measure of gender self-assessment bias foregoing this assumption, I model self-assessments as a function of gender using ordered probit models on the matched dataset including cases missing years of education. I model the applicant's self-assessed career level as a function of gender and all other observed characteristics of the applicant and job. I estimate these models within each department type and organizational level strata.[12] Based on these estimates, I

[11] I also excluded from the main analysis repeat applications from applicants who applied more than once during the observation period. This allows me to minimize the prospect that career level self-assessments are influenced by prior employer contact which may differ by gender. However, Appendix Table A1 shows the mean self-assessments for a matched sample based on the larger dataset including repeat applications. The results are substantively equivalent to those for the sample including cases missing years of education.

[12] Tables A2 and A3 in the Appendix show the full coefficient estimates for these models.

simulate the predicted gender differences in probability of self-assessing at each career level.[13] Figures 1 and 2 show these results for different department types and organizational levels respectively.

Figure 1 Panel a shows 95 percent confidence intervals of the predicted gender differences in probability of self-assessing at different levels among matched applicants to male typed departments. Panel a shows that, among applicants to male typed departments, females display a 1.9 percent *higher* probability compared to males of self-assessing as "Entry level" (p<0.05), a 1.3 percent *higher* probability of self-assessing as "Mid level" (p<0.05), a 1.4 percent *lower* probability of self-assessing as "Experienced", and a 1.6 *lower* probability of self-assessing as "Managers" (p<0.05). These results confirm the support for Hypothesis 1 as females are more likely to choose responses towards the bottom of the scale, and less likely to choose responses towards the top of the scale. Further, Figure 1 Panels b and c show no gender differences in the probability of self-assessing at each level (p>0.05) for applicants to gender neutral jobs (Panel b) or female typed jobs (Panel c). These findings confirm the lack of support for Hypothesis 3 relating to gender biases in self-assessments among applicants to female typed departments.

Comparing across levels of the hierarchy, Figure 2 shows the gender differences in probability of self-assessing at each level for applicants to the three different organizational level strata. Panel a in Figure 2 shows that, among applicants to entry level jobs, there is less than a 0.5 percent probability difference between males and females of selecting any one of the six response categories (p>0.05). Panel b shows that among applicants to experienced and mid-level jobs, females display a 1.2 percent *higher* probability compared to males of self-assessing as "Mid level" (p<0.05). On the other hand, they show a 1.1 percent *lower* probability compared to males of self-assessing as "Managers" (p<0.05). In the case of applicants to managerial and executive levels , Panel c shows that females display a *higher*

[13] I used the Clarify package in Stata written by Tomz, Wittenberg, and King (2003) to perform this analysis.

probability compared to males of self-assessing at all levels below "Executive" ($p<0.05$). Females are particularly likely to rate themselves as "Manager" (2.4 percent higher probability compared to males). Conversely, females show a 3.8 percent *lower* probability of self-assessing as "Sr. Executive" ($p<0.05$). These results confirm the support for Hypothesis 2 as the largest self-assessment biases emerge among applicants to manager and executive level positions. Further, these findings suggest that gender biases in self-assessments at the application interface are associated to the organizational level pursued as no self-assessment bias emerges among applicants to entry level positions. A smaller self-assessment bias emerges among applicants to experienced and mid-level positions where some managerial responsibilities are present but not predominant.

Discussion

The motivation for this study was to examine the extent to which gender biases in self-assessments induced by cultural competence associations may account for gendered job application patterns. Past research has found that females are less prevalent in applicant pools for positions at upper organizational levels and less likely to pursue stereotypically male fields. Correll's (2001, 2004) theory of biased self-assessments suggests that females contend with negative stereotypes about their competence as managers or workers in male-typed fields, and that these stereotypes cause them to downwardly bias their assessment of their own competence.

Comparing the self-assessments of job applicants, I find that females in this sample self-assess lower at the application interface than males with the same level of education and experience. Further, I find evidence associating the male-advantaging self-assessment bias to male associations of the department pursued. Male-favoring self-assessment biases are confined to departments with male competence associations like Sales or Engineering. This finding is consistent with Correll's findings with respect to the presence of self-assessment biases favoring males when individuals are exposed to the belief that males have superior competence at a task. The broader premise of the "cultural beliefs" explanation of biased self-assessments is, however, that biases are induced by cultural competence associations in general. This broader theory would thus suggest a female-advantaging self-assessment bias among individuals pursuing jobs with female competence associations. I find no evidence to support this broader argument. Females and males with the same credentials pursuing jobs in female typed departments like HR, and Admin self-assess at the same levels.

Looking across organizational levels, the extent of self-assessment bias favoring males increases as you move up levels of the hierarchy. Among entry level applicants, males and females self-assess at the same level. However, a self-assessment bias favoring males emerges among applicants to jobs above the entry level, and is largest among applicants to managerial or executive jobs which have been argued to be stereotypically male (Rosen and Jerdee 1974; Biernat et al. 1998; Eagly and Carli 2003). These findings are also consistent with Correll's findings relating to the presence of a male self-assessment advantage under the condition that individuals are exposed to the belief that males are more competent at the task than females.

By testing for biased self-assessments in a field setting, the evidence presented in this study improves on the external validity of prior experimental or school-based studies in terms of assessing the extent to which biased self-assessments may account for gendered career choices in the labor market. Whereas the self-assessments elicited by Correll (2001, 2004) did not involve real stakes for the subjects, job applicants have at stake the prospect of obtaining the job to which they applied. The firms in this sample elicit applicants' career level for the purpose of determining the applicant's fit with the position they are pursuing, and may use this information as part of their applicant screening decisions. As such, applicants have an incentive to indicate the career level that they think will make the best impression on the employer conditional on their actual credentials. What this study shows is that there are biases in the ways males and females portray the same credentials even in a setting where individuals should be strongly motivated to portray themselves as favorably as possible. The presence of incentives is also important in light of debates in the stereotype threat literature about the extent to which gender biases identified in experimental studies may be due to experimenter demand effects or the lack of financial incentives (Fryer, Levitt, and List 2008).

Further, although Correll (2001, 2004) tests for self-assessment biases in abstract competence areas where performance is posited as derived from inherent skill, job seekers face the task of assessing their placement in concrete organizational settings. These self-placements are likely to evoke for the applicant numerous additional factors beyond the perception of their skills at the job's tasks. These placements may also encompass an assessment of their perceived fit within a particular type of profession. As such, the career level self-assessments measured here may encompass some measure of "professional role confidence" as discussed in Cech et al. (2011). Career level self-assessments may also encompass some measure of anticipated discrimination, as females downwardly adjust their career level in anticipation of being evaluated less favorably when pursuing stereotypically male positions. Although I am unable to discern the relative weight of these various factors in producing biased career level self-assessments, this paper shows that the aggregate result is that males portray their career level more favorably than females when pursuing jobs that are male typed in terms of the organizational department or level.

However, the gains in external validity derived from measuring self-assessments in a field setting come at the cost of greater potential threats to internal validity. Correll (2001) defines self-assessments as one's personal conception of competence at the skills and tasks necessary for a given career in order to commit oneself to pursuing that career (Correll 2001, p. 1700). In this study, the self-assessments measured correspond to the applicant's self- placement in an organizational hierarchy *as they are* *pursuing* a particular career path. The gender differences in self-assessments identified here correspond to the difference in confidence within the selected sample of job seekers who pursue jobs in different organizational departments and at different levels. Comparisons of self-assessments within job type pursued can be influenced both by the selection of individuals into applying to that type of job and by the effect of the cultural association of the job. If biased self-assessments are keeping individuals from applying to gender atypical jobs in the first place, then the selection effect should make this study a conservative test of the gender biases in self-assessments that may be induced by gender associations of different career domains and organizational levels. Biased self-assessments imply that it takes a greater level of confidence to apply to a job that is gender atypical than gender conforming (Correll 2004; Foschi 1996, 2000). So, if there is a higher threshold of confidence required to pursue a gender atypical application than a gender conforming application, applicants to gender atypical jobs are drawn from a higher range in the confidence distribution than applicants to gender conforming jobs. As such, when comparing the self-assessments of applicants to jobs within different gender types, the gender gap should be narrower than when comparing the self-assessments of males and females selected at random and asked to envision the hypothetical scenario that they are pursuing a gender typed job.

Future experimental work could examine this assumption and investigate the extent to which gender biases in self-assessments remain associated with the gender type of the job pursued under random assignment into a particular type of application. For instance, experimental subjects could be asked to envision they are searching for a job and then asked to select jobs they would be interested in applying to out of a list which includes jobs of different gender types (stemming from the job's department and/or organizational level). Subjects would then be told to suppose they were informed of an opening in one particular job from within the set they just selected. They would be given further information about this job: job description, company description, desired qualifications. For those subjects whose consideration set spans more than one gender type, the job opening offered would be randomly assigned to be either a gender neutral or a gender typed job. Subjects would then be asked to provide background information (self-assessment of career level, education, years of experience) as if they were applying to this job. Finally, they would be asked to rate their expectations that they would be called back on their application to this job, and would also be asked additional questions to check the effect of the gender type manipulation. Researchers could then compare the extent of self-assessment bias among applicants randomly assigned into applying to male typed, gender neutral, or female typed jobs. If selection into a gender atypical application is indeed positively correlated with the candidate's overall level of confidence, then – compared to the results of this study - this experiment is likely to yield larger male-favoring self-assessment biases among applicants to male typed jobs, and is also more likely to yield some female-favoring self-assessment bias among applicants to female typed jobs.

This paper shows that there are gender biases in self-assessments at the job application interface. Males on average rate their career level more highly than females with the same level of education and experience. Further, the extent of this male-favoring bias is associated to male cultural associations of certain organizational departments and levels. In addition to being informative as to the extent to which cultural images associated to job departments and levels may account for gender biases in self-assessments, these findings also highlight confidence as an additional dimension on which males and females differ at the application interface. Not only are females less prevalent in job queues for high status and male typed jobs, but those who are in these queues are also less confident about their credentials than equally qualified males. To what extent these differences in confidence impinge upon how males and females fare through the hiring process for positions in different fields and levels is a valuable question for future research.

Coda - July 2013

After having completed this paper and submitting it to my committee for approval as a Master's Thesis it came to my attention that the main dependent variable used could not be interpreted as career level self-assessments. The individuals who provided me the data informed me that the applicant career level variable, which I interpreted as the applicant's self-assessed career level, was actually not provided by the applicant. In fact, this variable was created by a resume parser which scanned applicant's resumes and guessed the applicant's career level based on the language in the resume. Therefore, the empirical analyses in the paper should be viewed as an exercise only, and the findings should not be relied upon.

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Appendix – Tables and Figures

Table 1. Distribution of applicants by organizational department

Department of application	Percent female	Total applications	Type of department	Percent female by type
Sales	30.0	7,338	Male typed	27.66
Engineering and technology	24.5	8,461		
Production	31.3	2,687		
Marketing	49.7	4,913	Gender neutral	50.83
Client service	51.7	6,595		
HR	64.7	2,924	Female typed	62.39
Administrative	61.2	5,683		
Total	**42.3**	**38,601**		

Table 2. Distribution of applicants by self-assessed career level (Percent)

	All applications			Applications to jobs in male typed departments		
Self-assessed career level	**Male**	**Female**	**N**	**Male**	**Female**	**N**
1 = Entry level	13.47	14.44	5,357	15.09	18.01	2,939
2 = Mid level	17.95	22.33	7,646	17.69	22.74	3,528
3 = Experienced non manager	12.82	14.36	5,201	13.7	14.69	2,583
4 = Manager	21.61	23.99	8,730	19.71	20.49	3,683
5 = Executive	14.73	13.27	5,448	14.18	12.5	2,535
6 = Sr. Executive	19.42	11.6	6,219	19.64	11.58	3,218
Mean self-assessed level	3.6	3.3		3.6	3.2	
Total applications	22,267	16,334	38,601	13,372	5,114	18,486
t-stat for gender diff	17.9***			13.5***		

	Applications to jobs in gender neutral departments			Applications to jobs in female typed departments		
Self-assessed career level	**Male**	**Female**	**N**	**Male**	**Female**	**N**
1 = Entry level	9.95	12.56	1,298	12.91	13.07	1,120
2 = Mid level	18.65	22.84	2,391	17.86	21.4	1,727
3 = Experienced non manager	10.87	13.18	1,386	12.6	15.34	1,232
4 = Manager	24.57	25.91	2,906	24.28	25.23	2,141
5 = Executive	16.68	14.67	1,802	13.59	12.5	1,111
6 = Sr. Executive	19.28	10.84	1,725	18.75	12.46	1,276
Mean self-assessed level	3.8	3.4		3.6	3.4	
Total applications	5,658	5,850	11,508	3,237	5,370	8,607
t-stat for gender diff	12.7***			6.7***		

* p<0.1, **p<0.05, ***p<0.01

Table 3. Gender distribution and mean self-assessed career level by level of application

Career level of application	Males		Females		N	Difference in means
	Percent male by level	Mean self-assessment (1-6)	Percent female by level	Mean self-assessment (1-6)		
Entry level	49.04	2.68	50.96	2.64	8,155	-0.04*
Mid-level	59.45	3.33	40.55	3.27	17,025	-0.06**
Experienced	56.84	3.94	43.16	3.68	6,900	-0.26***
Manager	59.6	4.64	40.4	4.03	3,223	-0.62***
Executive	69.07	5.31	30.93	4.85	3,168	-0.47***
Sr. Executive	89.23	5.83	10.77	5.64	130	-0.18
Total	57.69	3.64	42.31	3.34	38,601	-0.30***

* p<0.1, **p<0.05, ***p<0.01

Table 4. Gender distribution and mean self-assessed career level by level of application and gender type of department

Panel a. Male typed departments.

Career level of application	Males		Females		N	Difference in means
	Percent male by level	Mean self-assessment (1-6)	Percent female by level	Mean self-assessment (1-6)		
Entry level	65.9	2.52	34.1	2.35	3,302	-0.17***
Mid-level	72.5	3.22	27.5	3.07	8,395	-0.15***
Experienced	75.0	4.00	25.0	3.64	3,508	-0.36***
Manager	74.0	4.75	26.0	4.16	1,971	-0.59***
Executive	77.9	5.38	22.1	4.76	1,310	-0.62***
Sr. Executive	-		-			
Total	72.3	3.59	27.7	3.21	18,486	-0.38***

* p<0.1, **p<0.05, ***p<0.01

Panel b. Gender neutral departments.

Career level of application	Males		Females		N	Difference in means
	Percent male by level	Mean self-assessment (1-6)	Percent female by level	Mean self-assessment (1-6)		
Entry level	46.5	3.02	53.5	2.71	2,431	-0.31***
Mid-level	49.3	3.44	50.7	3.28	4,979	-0.16***
Experienced	45.3	3.81	54.7	3.52	1,646	-0.29***
Manager	38.8	4.21	61.2	3.79	900	-0.42***
Executive	62.9	5.29	37.1	4.90	1,552	-0.39***
Sr. Executive	-		-			
Total	49.2	3.77	50.8	3.40	11,508	-0.37***

* p<0.1, **p<0.05, ***p<0.01

Panel c. Female typed departments.

	Males		Females		N	Difference in means
Career level of application	**Percent male by level**	**Mean self-assessment (1-6)**	**Percent female by level**	**Mean self-assessment (1-6)**		
Entry level	28.6	2.64	71.4	2.77	2,422	0.14**
Mid-level	43.2	3.62	56.8	3.48	3,651	-0.14***
Experienced	31.3	3.79	68.7	3.83	1,746	0.04
Manager	32.4	4.66	67.6	4.28	352	-0.38***
Executive	62.4	5.08	37.6	4.78	306	-0.30***
Sr. Executive	89.2	5.83	10.8	5.64	130	-0.18
Total	37.6	3.64	62.4	3.40	8,607	-0.24***

* p<0.1, **p<0.05, ***p<0.01

Table 5. Distribution of observable characteristics before and after exact matching

	Unmatched dataset				
	Mean for male applicants	Mean for female applicants	Overall mean	t-stat for gender difference	R^2[1]
Years of education	16.46	16.31	16.40	9.9 (p = 0.00)	0.0001
Years of experience	10.39	8.83	9.73	20.3 (p = 0.00)	0.4513
Years of mgnt experience	6.22	4.64	5.55	23.5 (p = 0.00)	0.4768
Distribution by level of application					
Entry level	0.18	0.25	.21		
Mid level	0.45	0.42	.44		
Experienced	0.18	0.18	.17		
Manager	0.09	0.08	.08		
Executive	0.10	0.06	.08		
Sr. Executive	0.01	0.00	.003		
Pearson chi2(4)				499.5 (p = 0.00)	
Distribution by department of application					
Sales	0.23	0.13	.19		
Engineering/IT	0.29	0.13	.21		
Production	0.08	0.05	.07		
Marketing	0.11	0.15	.13		
Client Service	0.14	0.21	.17		
Admin	0.10	0.21	.15		
HR	0.05	0.12	0.08		
Pearson chi2(4)				3,500 (p =0.00)	
Distribution across companies	1 = .36, 2 =.23, 3=.18, 4=.16, 5=.07	1 = .33, 2 =.24, 3=.10, 4=.21, 5=.12	1 = .34, 2 =.23, 3=.14, 4=.18, 5=.09		
Pearson chi2(4)				835.91 (p = 0.00)	
N	22,267	16,334	38,601		

[1] In univariate analysis

Table 5. Distribution of observable characteristics before and after exact matching (Continued)

	Matched dataset – Overall mean
Years of education	16.38
Years of experience	6.35
Years of management experience	2.98
Distribution by level of application	
Entry level	0.27
Mid level	0.50
Experienced	0.13
Manager	0.03
Executive	0.03
Sr. Executive	-
Distribution by department of application	
Sales	0.22
Engineering/IT	0.16
Production	0.06
Marketing	0.12
Client Service	0.2
Admin	0.12
HR	0.07
Distribution across companies	1 = .45, 2 =.22, 3=.14, 4=.11, 5=.06
N	12,796

Table 6. Gender differences in mean self-assessment in the matched dataset

Panel a. Main analysis (dataset excluding observations missing years of education as well as repeat applications)

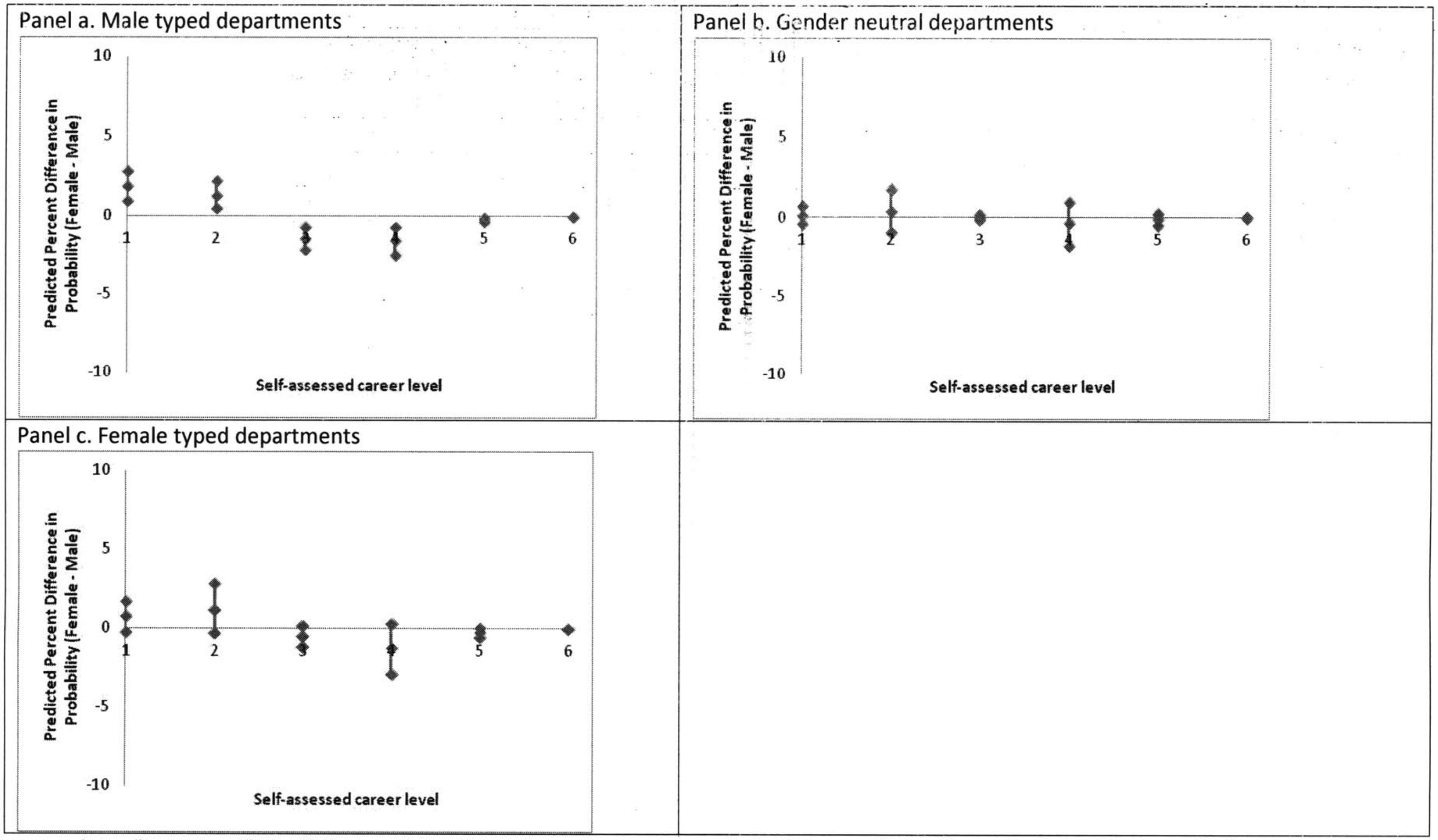
Matched sample	N	Mean self-assessment (1 to 6 scale)			SE[2]	t-stat	p-value
		Males	Females	Difference			
Overall	12,796	2.824	2.794	-0.029	0.013	-2.31	0.021
Male typed departments	5,916	2.757	2.688	-0.069	0.018	-3.91	-
Gender neutral departments	4,308	2.937	2.925	-0.012	0.023	-0.54	0.593
Female typed departments	2,572	2.788	2.773	-0.016	0.029	-0.53	0.593
Entry level jobs	3,558	2.090	2.079	-0.011	0.024	-0.46	0.644
Experienced and mid-level jobs	8,264	2.926	2.895	-0.031	0.016	-1.97	0.049
Manager, executive, and sr. executive jobs	974	4.632	4.581	-0.051	0.042	-1.21	0.226

Panel b. Dataset including observations missing years of education

Matched sample	N	Mean self-assessment (1 to 6 scale)			SE[2]	t-stat	p-value
		Males	Females	Difference			
Overall	21,768	3.084	3.054	-0.030	0.010	-3.091	0.002
Male typed departments	9,660	3.037	2.977	-0.061	0.014	-4.310	0.000
Gender neutral departments	7,668	3.143	3.138	-0.005	0.017	-0.276	0.783
Female typed departments	4,440	3.083	3.043	-0.040	0.022	-1.808	0.071
Entry level jobs	5,546	2.300	2.281	-0.019	0.020	-0.991	0.322
Experienced and mid-level jobs	13,954	3.154	3.121	-0.032	0.012	-2.653	0.008
Manager, executive, and sr. executive jobs	2,268	4.569	4.511	-0.058	0.028	-2.046	0.041

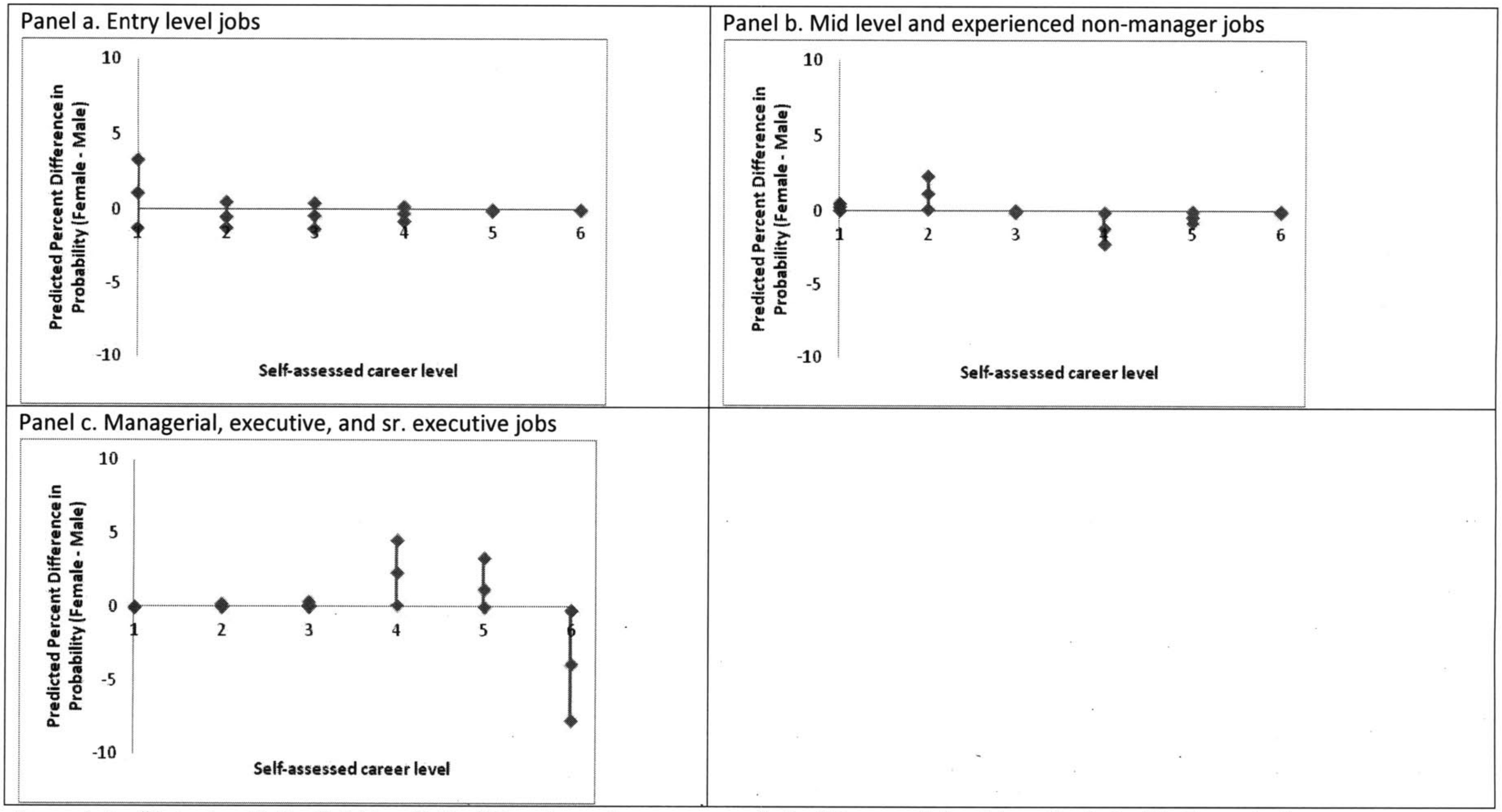
[2] Standard errors for matching estimator calculated according to the method described by Abadie and Imbens (2006)

Figure 1. Predicted gender differences in probability of self-assessing at different levels by type of department (95 percent confidence interval)



Legend: 1 = “Entry level”, 2 = “Mid level”, 3 = “ Experienced non-manager”, 4 = “Manager”, 5 = “Executive”, 6 = “Sr. Executive”

Figure 2. Predicted gender differences in probability of self-assessing at different levels by level of application (95 percent confidence interval)



Legend: 1 = "Entry level", 2 = "Mid level", 3 = " Experienced non-manager", 4 = "Manager", 5 = "Executive", 6 = "Sr. Executive"