

# Gender discrimination in hiring processes in Bogota: A correspondence Study

## *Pre-Analysis Plan*

Ana María Tribín\*  
Natalia Ramírez Bustamante†  
Luz Magdalena Salas‡  
Andrés Ham§  
Juanita Ruiz\*\*  
Santiago Rojas††

### **Abstract**

This intervention aims to determine whether employers that post online vacancies discriminate against men and women applicants based on their potential and effective parental situation. We conduct a correspondence study in one of Colombia's largest online platforms for job seekers, where we apply with six different profiles that vary by sex, effective parental status, and potential parental status. We will apply to different types of sectors and occupations to try and capture differences across economic activities that are male or female dominated. We expect this evidence to help disentangle the effect of discrimination due to potential and effective parenthood in online job applications, for which there is scarce evidence, especially in a developing country setting.

Keywords: discrimination, gender, parenthood, online job applications.

JEL Classification: C93, D9, I12, I2

---

\* The World Bank

† Universidad de Los Andes

‡ Universidad Javeriana

§ Universidad de Los Andes

\*\* Inter-American Development Bank

†† Universidad de Los Andes

## **1. Motivation**

The Colombian labor market faces multiple challenges, one of which is the persistence of high unemployment and labor informality rates. This means that there is a part of the population that cannot enter the productive system and therefore has a limited capacity to generate income. Moreover, high informality rates suggest that almost 58% of the people who manage to get a job end up in low quality employment, which usually lacks social protection coverage, is very unstable, and results in even lower earnings (DANE, 2022).

Some individuals face greater challenges when trying to participate in the labor market, such as women. It is estimated that for every 100 employed men in Colombia, there are approximately 67 employed women (DANE, CPEM y UN, 2020). This translates into a higher proportion of inactive or unemployed women with longer unemployment periods (Arango and Ríos, 2015). Both barriers potentially exacerbate gender gaps, since low participation rates hamper the reduction of gender inequalities in the labor market and prior work experiences as well as unemployment spells tend to affect future labor outcomes, at least when they occur in the early stages of working life (Cruces, Ham, Viollaz, 2012).

Gender gaps in the labor market go beyond female and male participation and employment. Inequality is also manifested in the quality of employment and income. The raw wage gap between men and women in Colombia is about 6%. What is concerning about these inequalities is that they negatively affect women's opportunities for career advancement, their likelihood of being unemployed or laid off, and are strongly associated with the incidence of poverty among adult women (DANE, CPEM y ONU MUJERES, 2020). Moreover, they can potentially influence the expectations and aspirations of young

girls and adolescents in the labor market (Molina and Usui, 2022). Hence, it is key to study whether some of this inequality is due to discrimination.

This research aims to study differences in callback rates for job applicants across several attributes. First, we concentrate on gender, comparing male and female applicants to jobs. We also aim to approximate the extent of discrimination in callback rates for applicants that signal i) being a potential parent and ii) being an actively engaged parent. We will create applicant profiles that are identical, and only vary in the above attributes to try and measure differences in employer screening when they select applicants to interview through online platforms.

## **2. Intervention**

There is ample evidence of heterogeneity in labor market participation, sectors and occupations between men and women, as well as within gender in Latin America (ECLAC & ILO, 2019). The literature suggests that several factors or barriers may explain these gaps. On the one hand, women have less access to information channels and job search mechanisms. On the other hand, there is evidence of discrimination in hiring processes where firms tend to prefer male rather than female candidates (Correl, Bernard, & Paik, 2007; Cuddy, Glick & Fiske, 2001; Gonzáles, Cortina, y Rodríguez, 2019), and/or penalize mothers or potential mothers participating in these processes (Petit, 2007; Becker, Fernández & Weichselbaumer, 2019). Our study focuses on the latter barrier and seeks to provide evidence that contributes to Phelps's theory of statistical discrimination, which explains that employers infer a candidate's level of productivity based on noisy characteristics found in a candidate's resumé or profile, and their prior beliefs about the expected productivity from these signals.

Our research will focus on Bogotá, Colombia. We intend to use a correspondence test to evaluate whether firms statistically discriminate against job candidates based on: i) their sex (male or female); ii) potential motherhood (by age); and iii) effective motherhood (by signals). Usually, a correspondence test is an experimental technique in which researchers send pairs of resumes that are very similar, except for one characteristic or trait, to job advertisements. If there is statistical discrimination, individuals with the characteristic of interest are less likely to be contacted for further screening. As we will explain later, our study involves a slightly more complex design. However, we will identify discrimination in a similar manner.

The first stage of the intervention required studying patterns and trends in labor supply and demand in Colombia. We used administrative records from the Public Employment Service (SPE) between 2016 and 2019, to obtain the number of vacancies, applicants, and placements by economic sector and sex. It is important to highlight, that the law requires that all job vacancies in Colombia be published in the SPE platform. Based on this assumption, we obtained the participation and placement gaps by sector and used them to divide them into three categories: i) *low competition sectors*, with low participation and placement of women; ii) *intermediate competition sectors*, where the participation and placement gaps between men and women are between 0% and 30%; iii) *highly competitive sectors*, with high participation and placement of women. We then selected one sector with the highest number of historical vacancies within each category for our study. This helped us to focus on dynamic economic sectors with high labor demand and heterogeneous levels of female participation to test for discrimination in different contexts.

The second stage of the intervention will last about 4 months and was designed based on the findings of the first stage. Initially, we will create online profiles and resumes for

fictitious job seekers, then we will collect weekly job postings on one of the main job advertising websites in Bogota. After this, we will select job postings within the sectors of interest using a webscraper and send groups of applications along with resumes to each job posting. We expect to compare callback rates for the applications sent to each job posting.

### **3. Data**

To assess the intervention, we intend to determine whether employers in Bogotá statistically discriminate against job seekers based on: i) their gender; ii) their reproductive stage; iii) parenthood status; and iv) the quality of their previous employment. To this end, we will create a database that records the characteristics of our constructed job seekers, vacancies, and the callbacks from potential employers for each job opening to which we send applications. These data will allow us to estimate changes in the candidates' probability of receiving a call back. We expect to collect this data for four months, from May 2023 until September 2023.

### **4. Experimental design**

Bogotá is the largest and most economically dynamic city in Colombia, but more importantly, it has the highest demand for labor. According to the SPE, there are currently about 90 thousand job vacancies in Bogotá, making it the most convenient city for our experiment. As mentioned above, we studied the labor demand and supply of each economic sector in Colombia and Bogotá and selected five economic sectors (health, education, professional activities, transport, housework/cleaning/care) with high labor demand and heterogeneous levels of participation and employment gender gaps. Hence, our sample will have job

applications to i) low competition sectors (transport); ii) intermediate competition sectors (professional activities); and iii) highly competitive sectors (health, education, and housework/cleaning/care). This heterogeneity will help us explore whether low participation and employment rates for women in certain sectors or activities are due to discrimination in the hiring process that prevents them from entering or even considering applying for jobs in these sectors. Or whether observed patterns of employment and participation are due to other barriers not related to the hiring stage.

#### *4.1. Gender discrimination and effective or potential parenting*

There is a strand of the experimental literature that has focused on exploring how gender stereotypes affect employers hiring decisions (Ramírez-Bustamante et al., 2022). This research has mainly focused on studying gender discrimination in the labor market in the context of developed countries, and has shown that: i) young female applicants are discriminated against in the hiring process because employers believe they are more likely to have career interruptions due to future motherhood (Petit, 2007; Becker, Fernández and Weichselbaumer, 2019); ii) female applicants who are already mothers are discriminated against as employers consider them to be less competent for the job than equally qualified male or female applicants (Correl, Bernard and Paik, 2007; Cuddy, Glick and Fiske, 2001; Becker, Fernández and Weichselbaumer, 2019); iii) These types of discrimination can be stronger for low skilled women or women applying for long term positions.

Based on these findings, we want to explore whether employers discriminate against workers based on potential/effective parenthood and sex. Hence, we will send 6 resumes and profiles to each vacancy combined as follows:

- i) female + potential mother + children sign
- ii) female + potential mother + no children sign
- iii) female + not potential mother + children sign
- iv) female + not potential mother + no children sign
- v) Male + children sign
- vi) Male + no children sign

This design will allow us to i) differentiate discrimination based on potential and effective parenthood, and ii) study discrimination patterns between and within sex groups. In the case of effective parenthood, we will signal the candidate's parental status by including or not including the father/mother's membership in a school's parent association in the resume. Furthermore, in the case of potential parenthood, we will signal the candidate's potential to have children in the future through the age. The age of potential mothers will randomly vary between 20 and 30 years old, and the age of non-potential mothers will randomly vary between 40 and 50 years old. For male applicants, the age will be the same of the female applicants.

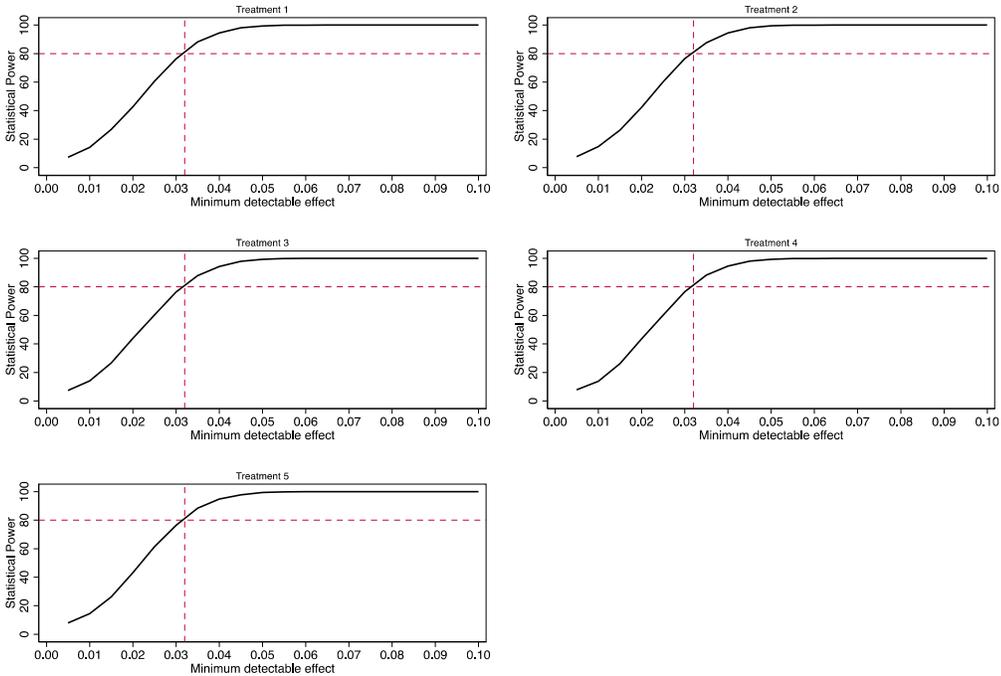
We conduct power calculations by simulation since we have no pre-intervention data on callback rates for individuals. We consider different number of vacancies where we will apply with the six profiles. We simulate a binary outcome with a normal distribution with mean 0.05 (5% callback rate) and standard deviation 0.25, calculating power for different effect sizes (from 1 to 10 percentage points). This process is repeated 10,000 times for each fixed number of vacancies and effect size. The resulting power calculations for 1,000 vacancies are shown in Figure 1.<sup>7</sup> Sending six applications to each vacancy would allow us to estimate a minimum detectable effect of 0.032 or 3.2 percentage points from the control

---

<sup>7</sup> We conducted power calculations assuming 200, 500, 1000, 1200, and 1500 vacancies. Given that the number of vacancies is the relevant unit, we can detect effects of 7, 4.5, 3.2, 2.9, and 2.6 percentage points from the control group, respectively. Given our analysis of job postings, we selected 1000 vacancies as our objective. See the Appendix for all these calculations.

group mean. While applying to more vacancies would give us more statistical power, the gains from applying to 1,200 and 1,500 job postings provide marginal gains (MDEs of 0.029 and 0.026, respectively). We note that since we are estimating six means, we need to adjust for multiple hypothesis testing in our final regressions. We will employ q-values as in Benjamini and Hochberg (1995).

Figure 1. Power calculations for coefficients relative to control (6 group design)



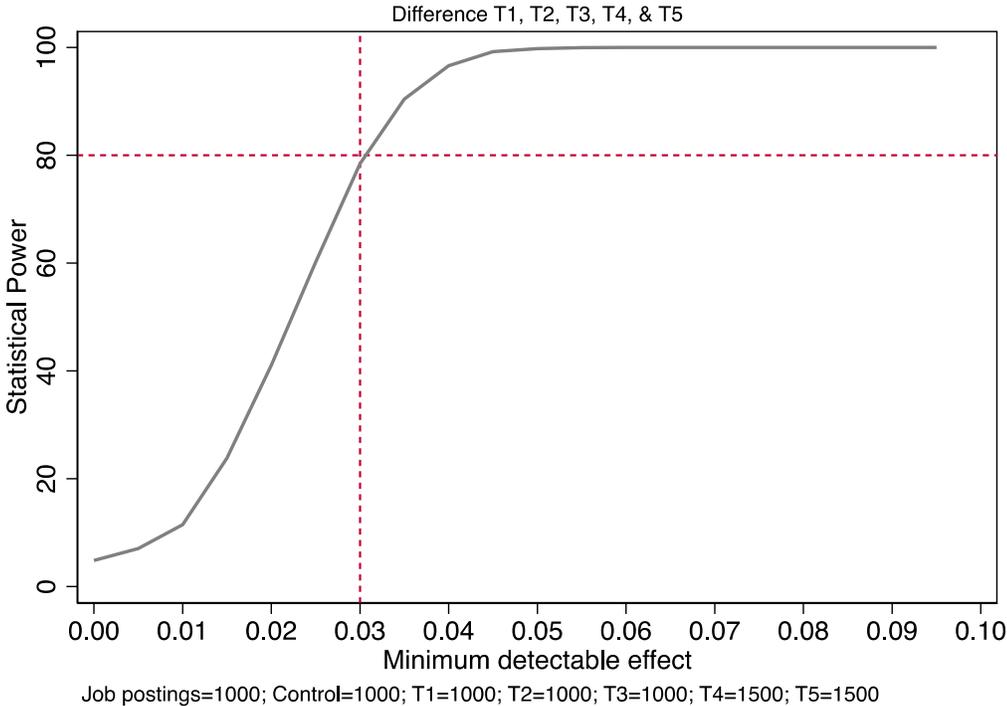
Job postings=1000; Control=1000; T1=1000; T2=1000; T3=1000; T4=1000; T5=1000

Source: Own elaboration from simulations.

We also calculate when we can detect differences between treatments. Figure 2 shows the minimum detectable effect when we vary one of the coefficients of the five treatment and test for equality of all coefficients,  $\Pr(T1=T2=T3=T4=T5)$ . We see that if one of the treatments has an effect 3 percentage points higher or lower than the rest, we can detect it. We also conduct several simulations, available upon request, assuming different error

distributions for the simulated outcome, showing that at greater variance, we would have less precise estimates. We note that these power calculations assume an R-squared coefficient of zero, so any gains in model fit would improve statistical power but we are unable to assume any specific fit before the data are collected.

Figure 2. Power calculations for differences between treatments (6 group design)



Source: Own elaboration from simulations.

**5. Hypotheses and empirical strategy**

Given the design of the experiment, we will analyze changes in observed callback rates to estimate discrimination by gender in three areas: expected parenthood, effective parenthood, and previous experience in formal or informal jobs. Since we are interested in different types of discrimination against workers, we need to test a different set of hypotheses depending on the discrimination dimension that we want to explore.

In the case of discrimination based on effective and potential parenthood status (6 groups), we will estimate the following regression:

$$y_{ij} = \alpha + \beta_1 T1 + \beta_2 T2 + \beta_3 T3 + \beta_4 T4 + \beta_5 T5 + \lambda_j + u_{ij}$$

where  $i$  indexes individual applications and  $j$  represents each vacancy. We will identify each of the six profiles defined in Section 4.1 with a binary indicator and set one of the groups as our control. This leaves five coefficients to estimate, from T1 to T5. We will include fixed effects by vacancy to control for any time-invariant unobserved attributes. Given that we will collect data over time, we may also control for some time-varying effects.

#### General hypothesis

- **H1:**  $\beta_1 \neq 0, \beta_2 \neq 0, \beta_3 \neq 0, \beta_4 \neq 0, \beta_5 \neq 0$
- **H2:**  $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5$

We will also test differences between pairs of coefficients to evaluate discrimination patterns related to sex and potential and effective motherhood/parenthood. Given that we will test multiple hypotheses using the same source of variation, we will adjust our p-values using false discovery rate adjusted q-values (Benjamini and Hochberg, 1995).

## **6. Threats to inference**

While resumes and job seeker profiles are sent to every job posting, receiving these items does not guarantee that employers will read them carefully and, more importantly, notice the specific differences between candidates. Other threats to inference depend mainly on the number of job openings available (overall and by sector) and the number of job openings to which we manage to apply. While our power calculations suggest that 1,000 vacancies would provide a reasonable objective, we are subject to job posting availability. For each treatment

(four or six groups) that we want to study, we need to apply to at least 1,000 job openings. If we do not reach this number, the experiment could lose statistical power and make it more difficult for us to estimate significant differences in callback rates and discrimination in the hiring process.

## **7. Ethics and IRB approval**

Because the experiment consists of fictitious applications to job openings, it does not require the collection of personal information or the involvement of human subjects in any treatment. However, since there are ethical implications derived from creating fictitious profiles and fictitiously applying to real job openings, this study requires approval from the university's Institutional Review Board. Our application was approved and deemed to pose minimal risk by the IRB of Universidad de los Andes on July 10, 2023, with case number 1767 of 2023.

## References

- ACNUR (2022). Global trends Forced Displacement in 2021. Fo <https://www.unhcr.org/62a9d1494/global-trends-report-2021>
- Ahmad, A. (2020). Ethnic discrimination against second-generation immigrants in hiring: empirical evidence from a correspondence test. *European Societies*, 22(5), 659-681.
- Arceo-Gomez, E. O., & Campos-Vazquez, R. M. (2014). Race and marriage in the labor market: A discrimination correspondence study in a developing country. *American Economic Review*, 104(5), 376-80.
- Baert, S. (2018). Hiring discrimination: An overview of (almost) all correspondence experiments since 2005. *Audit studies: Behind the scenes with theory, method, and nuance*, 63-77.
- Becker, S. O., Fernandes, A., & Weichselbaumer, D. (2019). Discrimination in hiring based on potential and realized fertility: Evidence from a large-scale field experiment. *Labour Economics*, 59, 139-152.
- Benard, S., Paik, I., & Correll, S. J. (2007). Cognitive bias and the motherhood penalty. *Hastings LJ*, 59, 1359.
- Berg, J. (2016), "Income security in the on-demand economy: Findings and policy lessons from a survey of crowdworkers", *Comparative Labor Law and Policy Journal*, Vol. 37/3, pp. 543-576.
- Benjamini, Y. and Hochberg, Y. (1995). Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society: Series B (Methodological)*, 57(1):289-300.
- Cuddy, A. J., Fiske, S. T., & Glick, P. (2004). When professionals become mothers, warmth doesn't cut the ice. *Journal of Social issues*, 60(4), 701-718.
- DANE, CPEM y ONU MUJERES 2020 <https://www.dane.gov.co/files/investigaciones/genero/publicaciones/mujeres-y-hombre-brechas-de-genero-colombia-informe.pdf>
- Departamento Administrativo Nacional de Estadística (2023) *Medición de Empleo informal y Seguridad Social - Dane, DANE*. Available at: [https://www.dane.gov.co/files/investigaciones/boletines/ech/ech\\_informalidad/bol\\_geih\\_informalidad\\_ene22\\_mar22.pdf](https://www.dane.gov.co/files/investigaciones/boletines/ech/ech_informalidad/bol_geih_informalidad_ene22_mar22.pdf)
- Economic Commission for Latin America and the Caribbean (ECLAC)/International Labour Organization (ILO), "Evolution of and prospects for women's labour

participation in Latin America”, Employment Situation in Latin America and the Caribbean, No. 21 (LC/TS.2019/66), Santiago, 2019.

Eriksson, S., Rooth, D.-O., 2014. Do employers use unemployment as a sorting criterion when hiring? evidence from a field experiment. *Am. Econ. Rev.* 104 (3), 1014e1039

Glick, P., & Fiske, S. T. (2001). An ambivalent alliance: Hostile and benevolent sexism as complementary justifications for gender inequality. *American Psychologist*, 56(2), 109–118. <https://doi.org/10.1037/0003-066X.56.2.109>

Molina, T., & Usui, E. (2022). Female labor market opportunities and gender gaps in aspirations. *Available at SSRN 4207825*.

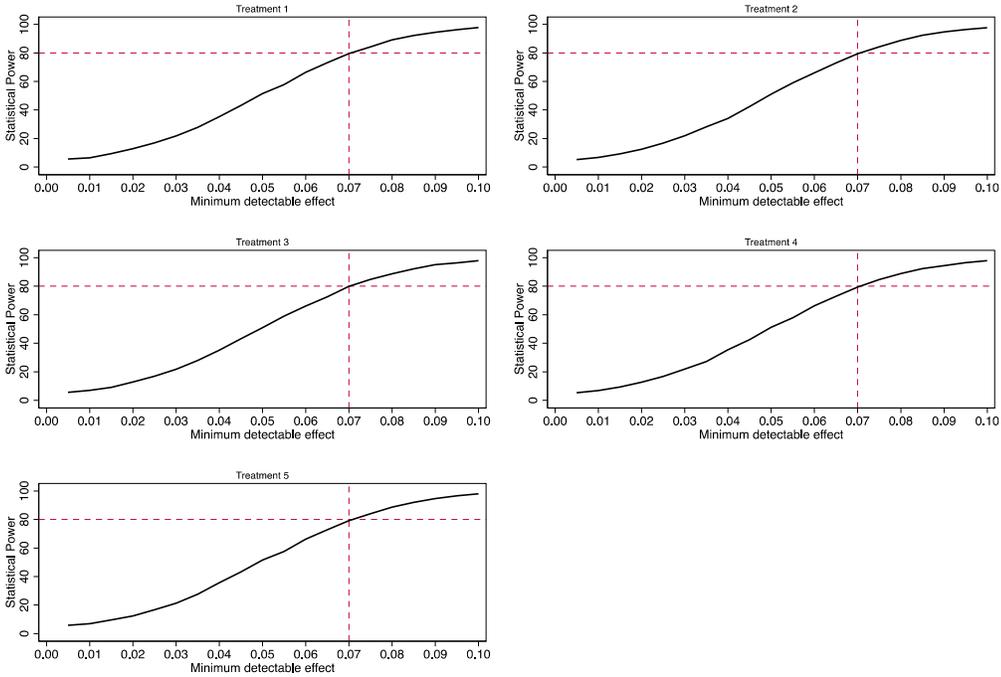
OECD/ILO (2019), *Tackling Vulnerability in the Informal Economy*, Development Centre Studies, OECD Publishing, Paris, <https://doi.org/10.1787/939b7bcd-en>.

Petit, P. (2007). The effects of age and family constraints on gender hiring discrimination: A field experiment in the French financial sector. *Labour Economics*, 14(3), 371-391.

Ramírez-Bustamante, N., Tribín-Uribe, A. M., & Romero-Prieto, J. E. (2021). Nadar contra la corriente: ser mujer, madre y empleada. *Mucho camello, poco empleo: por qué el trabajo de las mujeres en Colombia es escaso, desvalorado y mal remunerado*, 61.

# Appendix

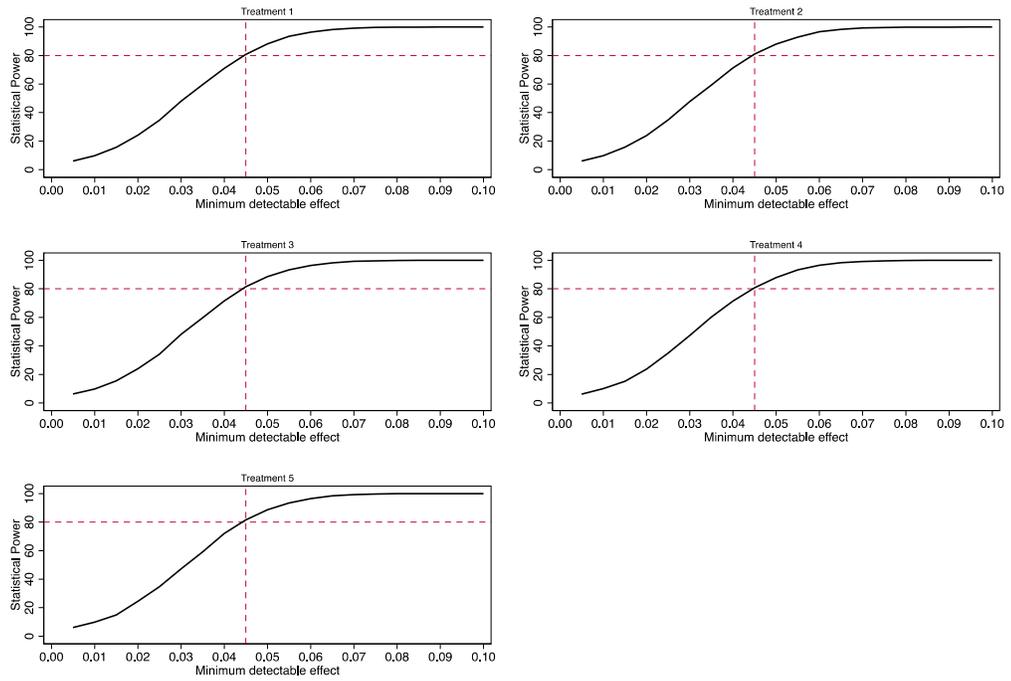
Figure A.1. Power calculations for coefficients relative to control (6 group design)  
200 job vacancies



Job postings=200; Control=200; T1=200; T2=200; T3=200; T4=200; T5=200

Source: Own elaboration from simulations.

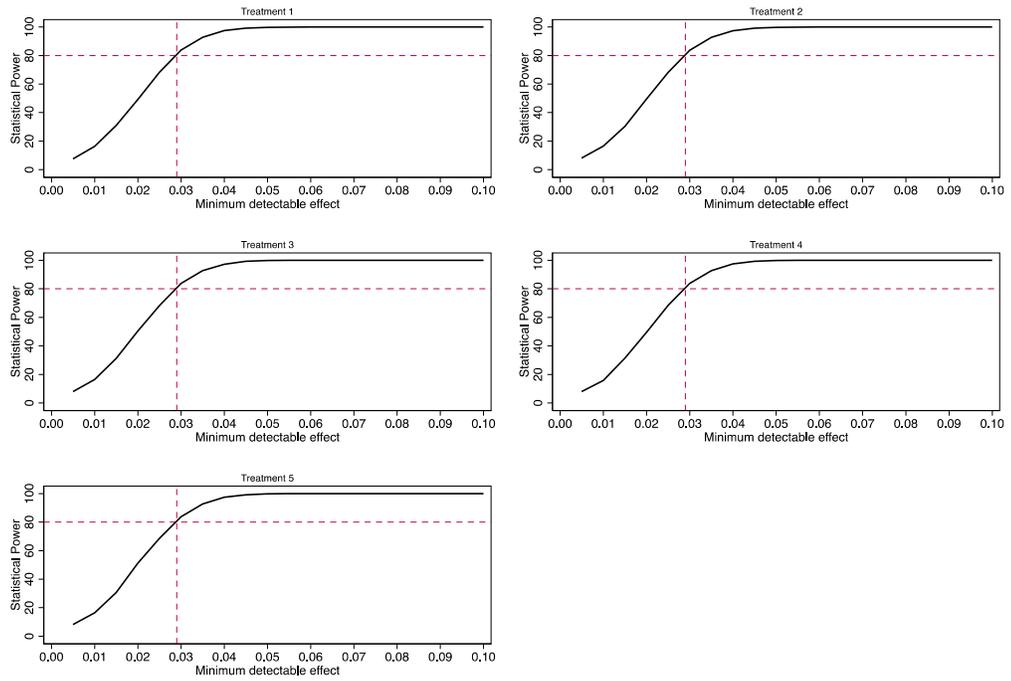
Figure A.2. Power calculations for coefficients relative to control (6 group design)  
500 job vacancies



Job postings=500; Control=500; T1=500; T2=500; T3=500; T4=500; T5=500

Source: Own elaboration from simulations.

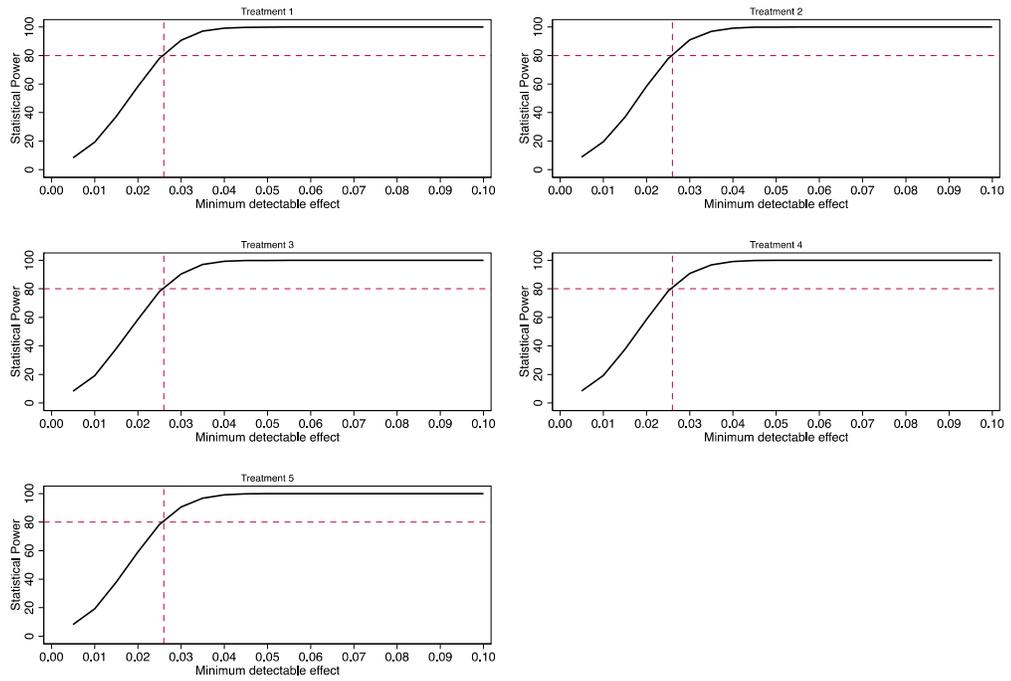
Figure A.3. Power calculations for coefficients relative to control (6 group design)  
1200 job vacancies



Job postings=1200; Control=1200; T1=1200; T2=1200; T3=1200; T4=1200; T5=1200

Source: Own elaboration from simulations.

Figure A.4. Power calculations for coefficients relative to control (6 group design)  
1500 job vacancies



Job postings=1500; Control=1500; T1=1500; T2=1500; T3=1500; T4=1500; T5=1500

Source: Own elaboration from simulations.