

The Role of Information in Deterring Discrimination:

A New Experimental Evidence of Statistical Discrimination†

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Abstract

This paper investigates experimentally gender and race discrimination in hiring decisions through a simple controlled setting where employers can observe workers' individual characteristics before recruiting them. In this paper, we explore whether discrimination, if any, is statistical or taste-based. For this purpose, we varied across our treatments the level of information available to the employer during the hiring stage regarding workers' potential ability. When no relevant information on ability is provided, we observe both significant gender and race discrimination. The introduction of information on ability or competitiveness reduces discrimination significantly, suggesting that discrimination is mainly due to a lack of information rather than preferences. Our findings indicate however that the reduction in discrimination strongly depends on the nature of the additional information available.

Keywords: real effort experiment; statistical discrimination; taste based discrimination; performance

JEL Codes: C90, C92, J15, J16

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1. Introduction

There are numerous examples of discrimination in labor markets ranging from wage discrimination to discrimination in hiring decisions. In the economic literature, traditional explanations for discrimination fall into two categories: taste-based and statistical discrimination models. Taste-based models originate with Gary Becker's seminal work (1957). In Becker's model, discrimination in hiring or wages is caused by a 'taste for discrimination' leading the employer to hire or pay higher wages to members of her/his own group. In this approach, discrimination is costly and leads to racially segregated workplaces. In a related approach, efficiency-based models also predict workplace segregation but consider that own-group biases are driven by efficiency considerations such as reduced costs of communication (Lang, 1986; Athey *et al.*, 2000). The second main explanation for discrimination is defined as statistical (Phelps, 1972; Arrow, 1973). According to this approach, employers have incomplete information about the worker's potential performance. Consequently they base their hiring or wage-setting decisions on (erroneous) stereotypes. In Arrow (1973)'s model and in a similar model developed by Phelps, employers have (erroneous) beliefs that individuals from some particular groups are less productive and would act accordingly. Imperfect information arises either because minority groups emit noisier signals (Phelps, 1972; Aigner and Cain, 1977; Cornell, and Welch, 1996; Pinkston, 2003) or because negative prior beliefs about members of a particular group may become self-fulfilling in equilibrium (Lundberg and Startz, 1983).¹

¹ Models of statistical discrimination differ according to whether stereotypes are erroneous or correspond to actual group averages in equilibrium. In the first case, imperfect information arises because minority groups emit noisier signals. Consequently, employers who observe ability with greater error rationally discriminate people belonging to minority groups (Phelps, 1972; Aigner and Cain, 1977; Cornell, and Welch, 1996; Pinkston, 2003). In the second category of statistical discrimination models, negative prior beliefs about members of a particular group may become self-fulfilling in equilibrium (Lundberg and Startz, 1983). This may be the case for instance if individuals of a specific group under invest in human capital because they anticipate a discriminatory treatment and therefore a lower return to education.

Several studies have attempted to measure empirically both the extent and the nature of discrimination. These empirical approaches range from surveys (Kahn, 1991; Knowles *et al.* 2001; Altonji and Pierret, 2001)² to field experiments (see Riach and Rich, 2002, for an exhaustive survey of field experiments discrimination). A common procedure of field experiments consists in matching two testers who attend job interviews or buy products, one from the majority group and the other from the minority group. These experiments have shown strong evidence of discrimination in different contexts, including housing market (Galster, 1990), automotive repair market (Gneezy and List, 2004), sports card market (Gneezy and List, 2004; List, 2004), car sales (Ayres and Siegelman, 1995) or television shows (Levitt, 2004; List, 2006).³ Another field approach consists in sending matched CVs that vary in only one variable (for example the name) to employers in response to job advertisements. This approach has been used to test gender discrimination (e.g. Levinson, 1975; Riach and Rich, 1987; Neumark *et al.*, 1996; Riach and Rich 2006), ethnic discrimination (Jowell and Prescott-Clarke, 1970; Hubback *et al.*, 1980; Brown and Gay, 1985 and Bertrand and Mullainathan, 2004) or other forms of discrimination based on age, sexual orientation or weight (Neumark *et al.*, 1996; Weichselbaumer, 2003; Kaas and Manger, 2012).⁴

² Survey approaches consist in making wage comparisons with marginal products of labor for different groups. These studies are most commonly performed for athletes, where “output” is relatively easy to quantify. This approach has provided mixed evidence of discrimination. While some studies found evidence of discrimination against blacks (Kahn, 1991), others observed no discrimination (e.g. Knowles *et al.* 2001; Altonji and Pierret, 2001).

³ Ayres and Siegelman (1995) investigated ethnic and gender discrimination in new car sales. The authors found that car dealerships attempt to charge higher prices to blacks and women. Gneezy and List (2004) used field experiments to measure the extent of discrimination against the disabled in two distinct markets—the automotive repair market and the sports card market. The authors found evidence of discrimination against the disabled on the automotive repair market and mixed evidence on the sports card market. List (2004) provided evidence of statistical discrimination in a sports card market. Using data from the “Weakest link” TV show, Levitt (2004) found evidence of statistical discrimination against Hispanics, while older participants suffer from taste-based discrimination. List (2006) found evidence of age discrimination by examining partner choice in the Friend and Foe television show.

⁴ Some studies have found that resumes with white names are more likely to lead to job interviews than similar resumes with black names (Jowell and Prescott-Clarke, 1970; Hubback and Carter, 1980; Brown and Gay, 1985; and Bertrand and Mullainathan, 2004).

Laboratory experimental studies have also been conducted to measure the extent of discrimination and its determinants (e.g. Ball and Eckel, 1996 and 1998; Holm, 2000; Anderson and Hauptert, 1999; Fershtman and Gneezy, 2001; Ball *et al.*, 2001; Fryer *et al.*, 2005; Falk and Zehnder, 2007; Dickinson and Oaxaca, 2009; Slonim and Guillen, 2010; Castillo and Petrie, 2010; Rödin and Özcan, 2011; see also Anderson *et al.* 2006 for a survey).

In this paper we aim at contributing to this existing literature by investigating experimentally discrimination in hiring decisions through a simple controlled setting. Testing models of discrimination by using laboratory methodology that involves a small number of players who perform tasks and interacting with each other during a finite number of periods might be met with some skepticism. Of course discrimination is a complex issue since several motives could explain it including economic and social or psychological factors. However the laboratory has the advantage of measuring discrimination in a controlled environment, defining a priori the reference group rather than inferring it from survey data, and avoiding any possible role for contextual effects (e.g. the political, social or religious context for instance). This approach allows circumventing some difficulties attributed to other empirical methodologies.⁵ In contrast to survey studies, our analysis relies on actual and costly decisions instead of subjective reported behavior.

Our aims are threefold. First, we measure experimentally the extent of discrimination in hiring decisions through a controlled setting where employers can observe workers' individual characteristics before recruiting them. Second, we explore whether discrimination, if any, is

⁵ Measuring discrimination with standard empirical approaches poses several difficulties. Surveys of attitudes towards minority groups in the market are not likely to produce honest and accurate responses. Approaches based on wage comparison may also have several shortcomings. First, these approaches might not be easy to quantify and only proxies for expected performance are generally observed. Second it may be difficult to isolate outcomes difference resulting from labor discrimination and those resulting from differences in productivity. Third, in general these empirical tests have difficulties distinguishing between taste-based and statistical models of discrimination. Field experiments may also raise some difficulties. For instance, a problem with personal approaches is that it may be difficult to ensure of the matching, motivation of testers and to ensure that all aspects of the workers' performance are strictly identical during the interview (Heckman and Siegelman, 1993).

either statistical or taste-based. Third, we investigate to what extent the nature of information that is available to the employer matters. For this purpose, we vary the level of information available to the employer across our treatments.

To answer these questions, we designed a framed field experiment using a two-stage game that combines a hiring stage and a real effort task. There are four treatments in the experiment, all of which have a first and a second stage of interaction in common. In the first stage of the game, (called *hiring* stage), each participant acts as an employer behind a veil of ignorance about her/his final role (e.g. Sutter and Weck-Hannemann, 2003).⁶ Precisely each participant as an employer receives information about several other participants (workers) and is asked to rank them from her/his most preferred to her/his least preferred worker. Once all participants have submitted their rankings, roles are randomly assigned by the computer and pairs composed of an employer and a worker are formed using a mechanism similar to the one suggested by Bogomolnaia and Jackson, (2002) and used in Castillo and Petrie (2010). In a second stage (called *decoding* stage), each worker within each pair has to perform a real effort task (a decoding task) under a tournament scheme. The worker who wins the tournament receives a monetary prize that is equally shared between her and her employer.

Treatments differ in the nature of the information available to the employer during the hiring stage. In our baseline treatment, employers are only informed about some workers' demographics including level of education, academic discipline, gender and skin color. Therefore, in this treatment, employers can only form beliefs about each worker's potential ability based on these observed individual characteristics. In a second treatment (called *score* treatment), employers receive additional information about each worker's potential ability. This information consists in the number of decoded tasks realized by each worker in a

⁶ This type of design is known as strategy method (Selten, 1967).

previous tournament implemented during a preliminary phase of the experiment. This tournament was run in similar conditions to the one that would be implemented in the second stage of the game. The third treatment (called *success* treatment) is similar to the baseline treatment except that employers are now informed whether the worker won or lost the preliminary tournament. Finally in a fourth treatment (called *competitiveness* treatment), employers receive information about each worker's degree of competitiveness. The degree of competitiveness was elicited during the preliminary phase in which all participants were asked to choose their preferred remuneration scheme between a flat wage scheme and a tournament scheme.

The comparison between our baseline and the other treatments allows us to test whether discrimination is mainly group-biased or statistical. If discrimination is taste-based, then it should remain unchanged across our treatments. In the opposite, if it is due to a lack of information, then discrimination should be lower in the treatments with additional information about potential workers' ability. Furthermore, the comparison across our treatments with information allows us to measure precisely which information is the most relevant for the employer and leads to less discrimination. Indeed although all these measures may potentially provide useful information about workers' ability, none of them is sufficient to infer correctly future workers' performance in the tournament implemented in stage two of the game.

The score measure conveys precise information on player's previous performance and allows the employer to directly compare participants. The success measure provides information regarding players' relative performance which strongly depends on the previous opponent. For instance, a player may have lost the tournament if he was matched with top performers. In sharp contrast, he may have won the tournament simply because he was matched with a poor performing worker. Finally, the *competitiveness* measure provides undoubtedly the less accurate signal of workers' future performance. Nevertheless, it may be helpful for the

employers in their hiring decisions since it could reveal whether the worker may be willing to outperform or not. Indeed several previous studies have shown that individuals with strong competitive preferences are more inclined to outperform than others (Charness and Grosskopf, 2001; Charness and Rabin, 2002; Abbink and Sadrieh, 2009; Charness *et al.* 2013).

Our paper is close to previous studies that have investigated discrimination in hiring decisions (Anderson and Hauptert, 1999 and Rödin and Özcan, 2011). Rödin and Özcan (2011) conducted an experiment in Sweden and asked participants to guess the performance of other participants in the room using facial portraits or voice messages. The authors found that candidates not perceived as stereotypically Swedish were considered to be worse performers than others. Anderson and Hauptert (1999) investigated experimentally statistical discrimination in hiring practices. In their experiment, the employers were required to hire a specified number of workers and had to pay an “interview cost” in order to observe the productivity of each individual. The authors observe that in the absence of an interview, the employer tends to rely on the population average, which is a type of “statistical discrimination.” Discrimination against the less productive group of workers was diminished when the interview cost was reduced, since this allowed employers to search for the most productive workers, regardless of skin color. In our paper, we go one step further by investigating whether the degree of accuracy of information matters in deterring discrimination. This is done in our experiment by varying the accuracy of the information provided to decision makers across our different treatments.

Our paper is also closely related to Castillo and Petrie (2010)’s seminal paper. In their study, the authors measure discrimination in a public good game with a sorting task where players can select their partners. During the sorting stage, a digital photo and some information on

past behavior is provided to help participants in their decisions. The authors find evidence of racial discrimination. They also observe that discrimination is reduced with information regarding previous decisions. Our paper differs from this study in many respects. First, we focus our attention on hiring practices and performance rather than on contribution decisions. While monetary contributions to public goods may be driven by social preferences and expectations on partners' behavior, we use here a real effort task in order to investigate the relationship between beliefs regarding workers' performance, information and discrimination. Second, we ask participants to hire a subordinate worker who will perform a task which reflects an employer-employee relationship. Third, we investigate how discrimination is influenced by information by varying the nature of this information available to the employer across treatments. To the best of our knowledge, the extent to which the degree of accuracy of information matters in such a context of hiring decisions with opportunity of discrimination has not been yet examined experimentally.

To anticipate our findings, we observe both significant gender and race discrimination in the baseline treatment where no relevant information on ability is provided. Both black and female workers are ranked worse than other participants. The introduction of information on ability or competitiveness reduces discrimination significantly, suggesting that discrimination is mainly due to a lack of information rather than preferences. Our findings also indicate that the extent of discrimination reduction strongly depends on the nature of the additional information available. Discrimination is significantly reduced when additional information on ability is available in the *score* treatment. Although employers also use the information regarding *competitiveness* or *success* in their hiring decisions, this information is not sufficient to totally deter discrimination.

The rest of our paper is organized as follows. Section 2 describes our experimental design and procedures. Section 3 discusses the behavioral hypotheses that we propose for evaluation. Section 4 reports the results from the different treatments of our design. Section 5 discusses our main findings and their interpretations. Finally section 6 concludes the paper.

2. The Experiment

The experiment consists of four treatments that are described in detail below.

2.1. The treatments.

2.1.1. The baseline treatment (no information treatment)

The baseline treatment consists of two stages. In a first stage (called *hiring stage*), each participant observes the individual characteristics of seven other participants (level of education, academic discipline, gender and skin color) and is asked to rank them from her/his most preferred to her/his least preferred (See the screenshot in figure A1 of Appendix A). Once all participants have submitted their rankings, pairs are formed using a four-step mechanism similar to the one suggested by Bogomolnaia and Jackson, (2002). This mechanism was also used in Castillo and Petrie (2010). In step one, a participant is chosen randomly by the computer and is assigned the role of employer A1. Then, a pair is formed with this employer and her/his best ranked worker (called worker B1). In a second step, one participant among the remaining six participants who have not yet been assigned to a pair is randomly chosen and assigned the role of employer A2. A second pair is formed with that person and her/his best ranked worker from the remaining people (worker B2). Third, one person among the remaining four participants who have not been previously assigned to a pair is randomly chosen and assigned the role of employer A3 and is matched with the first player on player A3's ranking among the remaining people (called worker B3). In the fourth step, the

two participants who are not already assigned to a pair are matched together (employer A4 and worker B4, respectively). At the end of this stage, four pairs (firms) are composed. This mechanism is incentive-compatible (Bogomolnaia and Jackson, 2002).

In the second stage (called *tournament* stage), workers within each pair have to perform a decoding task during three minutes. Precisely participants are asked to decode sets of numbers into letters from a grid of letters that is displayed on their computer screen during three minutes (see figure A2 in Appendix A). The decoding task adopted in our study is the same as that in Charness *et al.* (2013).⁷ Once the three minutes have elapsed, the worker's performance is compared with the performance of another worker chosen randomly within the group of eight participants. The worker with the highest (lowest) performance receives a monetary prize of 360 (20) ECUs that is equally divided between her and her employer.⁸

2.1.2. *The treatments with information*

The three remaining treatments are identical to the baseline treatment except that additional information about each worker's potential ability is now available to the employers to help them in their hiring decision. They differ from each other regarding the nature of this information. In the *score* treatment, in addition to the demographics mentioned above, the employer is also informed about each worker's performance in a previous similar tournament to the one implemented in stage two. Precisely the participant is informed about the number of decoded tasks realized by each worker in a previous tournament implemented during a preliminary phase. This preliminary phase will be described in detail in the next sub-section.

In the *success* treatment, employers have no information about the exact performance of each worker during the preliminary phase but are informed about the issue of this previous

⁷ We have chosen a fastidious and boring task to induce sufficient disutility to the participants. However we have deliberately selected a simple task such that level of education or academic field should not influence performance during the task.

⁸ In case there was a tie, a random draw was used to break this tie.

tournament.⁹ In the *competitiveness* treatment the additional information available consists in each worker's degree of competitiveness. This measure was elicited during the preliminary phase by asking each participant to choose her/his preferred remuneration scheme between a flat wage scheme and a tournament scheme. In this treatment participants are informed about the choice done by each worker between these two remuneration schemes.

2.2. Procedures and parameters

2.2.1. Information and parameters

The experiment consists of 6 sessions conducted at the CREM-CNRS (LABEX-EM) institute of the University of Rennes 1, France. A total of 144 undergraduate students in business, economics, law and engineering have been recruited via the ORSEE software (Greiner, 2004). 50 percent of the participants are women. Regarding ethnicity, around 10 percent of participants self-classify as Black, 6 percent as Arabs, 6 percent as Asian and the large remaining majority of people self-classify as Caucasian.¹⁰ Average age is 22 years (S.D. 4.8 years). Participants earned an average amount of 18.32€ (S.D. 4.54€), including a show-up fee of 4 Euros.¹¹ Some of the participants may have participated in experiments before, but none have experience in any experiment similar to ours. No individual participated in more than one session of this study. On average, sessions lasted about 90 minutes including instructions and payment of participants. The experiment has been computerized using the Z-tree software package (Fischbacher, 2007).

There are 24 players in each session. At the beginning of each session, participants are randomly matched into groups of 8 players. Each session consists of two successive

⁹ It was common knowledge that the matching during the tournament implemented during the preliminary stage was not necessarily the same as the one implemented during the stage two of the game.

¹⁰ We deliberately recruited a significantly higher proportion of Caucasian participants to replicate artificially a situation with a majority group and other minority groups (e.g. Davis, 1987).

¹¹ The experimental currency units (ECU) are converted to Euros at a predetermined conversion rate of 40ECUs = 1 Euro.

treatments: participants play first the baseline treatment (*no information* treatment) and then play one of the three other treatments (either the *score*, the *success* or the *competitiveness* treatment).¹² To avoid any wealth effect, players are informed about the issue of the first treatment only at the end of the experiment. Instructions for each treatment are given at the beginning of each treatment (see instructions in appendix B). Summary information about the six sessions is given in Table 1.

[Table 1: About Here]

2.2.2. Preliminary phase

Before playing the main experiment, subjects were asked to participate in a preliminary phase. This preliminary phase consists of two parts. During a first part, participants had to fill out an individual questionnaire in which they had to report their level of education, age, gender and their academic discipline. In addition, they were asked to choose an avatar to identify themselves among a list of thirty photos generated for the experiment from the website <http://www.elvover.com> (see the screenshot in figure A3 of Appendix A). Avatars mainly differed by gender and skin color. For more realism we also introduced some variability in other characteristics such as hair color or face shape.¹³

Typically experimentalists ensure that the identities of participants are not revealed in order to preserve both anonymity and confidentiality. However in some specific cases, revealing the identity of other participants may be important. This may be the case for instance when partner selection becomes the main purpose of the experiment. Some studies on partner

¹² We deliberately chose not to reverse the order of these two treatments. The reason is that it would have been irrelevant to provide full information before playing the baseline treatment in which no information is available.

¹³ One may reasonably conjecture that these other characteristics of facial expression may also matter in partner selection (Eckel and Wilson, 2000). To avoid this, we ensured during a pilot experiment that the avatars did not differ too much in these other characteristics and that there were no systematic correlations between these other characteristics and gender or skin color.

selection have been conducted by resorting to digital photos (Andreoni and Petrie, 2004; 2008; Castillo and Petrie 2010) or use pre-play observation and face-to-face communication (e.g. Mulford et al., 1998). The problem with a face-to-face interaction is that it does not preserve anonymity and may potentially introduce some confounding factors (Eckel and Wilson, 2000). Alternative procedures consist in using smiley (Eckel and Wilson, 2000) or avatars (e.g. Fiedler and Haruvy, 2009; Duffy, 2011; Fiedler et al. 2011). There are indeed several advantages to use avatars. First, avatars guarantee both confidentiality and anonymity among participants within a session since true identity is never revealed. Second, while face-to-face interactions are undoubtedly more realistic, avatars offer the advantage of a better control. Finally, avatars allow the experimentalist to vary some characteristics while maintaining others unchanged.¹⁴

In the second part of the preliminary phase, participants were asked to perform decoding tasks under different remuneration scheme. The task was similar to the one implemented in stage two of each treatment. These tasks allowed us to elicit some measures of individual's ability and degree of competitiveness. In a first game (flat wage), participants were asked to decode sets of numbers into letters from a grid of letters during three minutes under a flat wage scheme of 100 ECU. This means that participants could solve as many problems as they like and were paid the same wage irrespective of their performance. The second game (tournament) is similar to the previous one except that participants were paid under a tournament scheme. This game was strictly identical to the game played during the second stage of each treatment; each player received 180 ECU (20 ECU) if he/she won (lost) the

¹⁴ The inconvenience of avatars is that there is a non null probability that some participants may choose an avatar that does not perfectly depict them. Although we acknowledge that such effect may exist, this is unlikely to account for our results for several reasons. First, we were careful to avoid this possibility by not mentioning the purpose of the experiment before this choice. Second, we ensured using a post experiment questionnaire that participants chose the most appropriate avatar. In particular we ensured that participant's gender (which was collected at the end of the experiment during the post experimental questionnaire) and the proportion of each ethnic group corresponded to the selected avatar. Third, even if such bias does still exist, this cannot explain differences observed across our treatments. Finally, the main purpose of the experiment was mainly focused on the employer's decision, which should not be *a priori* affected directly by a biased choice of avatar.

tournament and zero otherwise. The third game (choice) consisted of two stages. In stage one, before performing the decoding task, participants were asked to choose their preferred remuneration scheme (i.e. either a flat wage scheme of 100 ECU or a tournament).¹⁵

To avoid any wealth effect, participants were not informed about the issue of each game before the end of the experiment. Instructions for each game were sequentially distributed and read aloud to participants.

Based on these games we elicited three measures of potential ability or competitiveness that were given to the employers in the different treatments. The *score* measure was calculated based on the total number of correctly decoded tasks realized in the tournament game. The *success* indicator consisted of a binary measure indicating whether the player won or not this tournament game. The *competitiveness* measure was a binary measure indicating whether the participant chose a flat wage scheme or a tournament remuneration scheme in the choice game of the preliminary phase.¹⁶

3. Behavioral hypotheses

To illustrate what we expect to happen in our experiment, we present in this section our behavioral hypotheses. Consider first the baseline treatment. In this treatment, employers have no information about each worker's ability. Therefore, if employers have neither preference for discrimination nor stereotypes on particular groups, they should consider demographics as pure noise and irrelevant information and should consequently assign ranks randomly. One may however conjecture that employers may have (dis)taste for hiring people (not) belonging to their own group (Becker, 1957; Lang, 1986; Athey and al., 2000). Indeed several social psychology experiments (Tajfel *et al.* 1971; Billig and Tajfel, 1973; Turner and Brown, 1978;

¹⁵ To control for order effects, the third game was played twice :before the flat wage (game 1) and after the tournament (game 2).

¹⁶ The first game (flat wage) was not directly used in this study. However it allowed the participants to choose their preferred remuneration scheme during the third game after having experienced both schemes.

Vaughan *et al.* 1981; Diehl, 1988; Pratto and Shih, 2000)¹⁷ and more recently, experiments in economics (Glaeser, et al, 2000; Eckel and Wilson, 2004; Bernhard *et al.*, 2006; Goette *et al.*, 2006; Falk and Zehnder, 2007; Buchan *et al.*, 2008; Fiedler et al., 2011)¹⁸ have confirmed the existence of ingroup favoritism.¹⁹ Most of these studies report own-race or own-gender favoritism but also in-group favoritism based on other individual characteristics such as socio-professional status, education or place of residence (Bouckaert and Dhaene, 2004). Based on these findings, we conjecture that participants may be influenced by their in-group preferences when ranking others. Consequently one may expect employers to attribute a better rank to those belonging to their own group. Our conjecture is summarized below in H1:

H1: (In-group favoritism) In all treatments, participants with in-group preferences should assign better ranks to those belonging to their own reference group defined by ethnicity, gender and education.

Our second conjecture relies on the assumption of statistical discrimination in a context of incomplete information about the worker's future performance (Phelps, 1972; Arrow, 1973). The idea behind statistical discrimination is that in absence of relevant information about performance or if the cost of gaining such information is excessive, the employers may rely

¹⁷ In-group favoritism and out-group discrimination have been very robust findings in the social psychology literature. In-groups are groups we identify with, and out-groups are ones that we do not identify with. In-group favoritism relies on the concept of social identity that is a central concept in social psychology developed by Tajfel and Turner (1979). More recently, economists have begun to include social identity into economic analysis. In Akerlof and Kranton's studies (2000; 2002; 2005), social identity is associated with a norm for behavior and any deviation from this norm causes disutility.

¹⁸ Glaeser et al. (2000) observe that participants who are paired with a partner of a different ethnicity or nationality send back less money to their partner. In a rather similar context, Eckel and Wilson (2004) find that African-Americans are less likely to be trusted than the majority Caucasian groups. (See also Bernhard, et al, 2006; Goette, et al., 2006; Falk and Zehnder, 2007). Buchan et al. (2008) also find evidence of some in-group favoritism in trust for American students. In the context of a trust game experiment conducted in a virtual world environment with avatars, Fiedler et al. (2011) observed that the proposers are more likely to choose the socially closer responders. Note however that other studies fail to find any indication of an in-group bias at all (Guth et al., 2005; Bouckaert and Dhaene, 2004; Haile et al., 2006). For instance, according to Bouckaert and Dhaene, (2004), ethnic favoritism tends to vanish when the parties of different ethnic origins share enough other characteristics such as gender, socio-professional status and place of residence. Finally some studies found mixed evidence of in-group favoritism (Slonim and Guillen, 2010).

¹⁹ Survey data have also provided evidence of in-group favoritism and own-race bias on hiring and wages (Stoll, Raphael, and Holzer, 2004; Giuliano, Leonard and Levine, 2011), evaluations of students by teachers (Dee, 2005), arrest rates or vehicle search by police officers (Donohue and Levitt, 2001; Antonovics and Knight, 2009).

on (mistaken) stereotypes that some workers belonging to some specific (minority) groups are less qualified on average than others (Phelps, 1972; Arrow, 1973). Several experimental studies have provided support in favor of statistical discrimination in different contexts including trust games (Fershtman and Gneezy, 2001; Falk and Zehnder, 2007; Burns 2011)²⁰, public good games (Castillo and Petrie, 2010)²¹, battle of the sexes games (Holm, 2000) or performance (Anderson and Hauptert, 1999; Rödin and Özcan, 2011).²² Based on these previous studies, we conjecture that in addition to in-group favoritism, discrimination may also be due to incomplete information and (erroneous) stereotypes. If this is the case, one should therefore observe lower discrimination when the employer receives additional information regarding the worker's ability. Consequently one should observe less discrimination (if statistical) in the success, score and competitiveness treatments than in the baseline treatment. This is summarized in H2:

H2: Discrimination (if statistical) should be lower in the treatments with information compared to the baseline treatment.

Our third hypothesis concerns the sensitivity of statistical discrimination, if any, to the nature of the information available to the employer about workers' ability. The different measures of performance or competitiveness may potentially provide useful information to help the employer in her hiring decisions. However it seems that none of them is sufficient to infer correctly each worker's future performance in the tournament. The *score* measure provides

²⁰ Using an experimental approach to study ethnic discrimination in Israeli Jewish society, Fershtman and Gneezy (2001) found that both Ashkenazic and Eastern males invest less money if their opponent is an Ashkenazic male, which suggests that discrimination is not due to in-group favoritism but due to statistical discrimination ((mistaken) ethnic stereotypes). Burns (2011) found a systematic pattern of distrust towards black partners, even by black proposers, largely attributable to mistaken behavioral stereotypes, and also inconsistent with out-group bias. Falk and Zehnder (2007) performed a citywide trust experiment to explore how ethnic diversity in a city district impacts trustworthiness between inhabitants. They found evidence of statistical discrimination against minorities in addition to some in-group favoritism.

²¹ Using a public good game experiment, Castillo and Petrie (2010) observed that racial discrimination tends to disappear when information on performance is provided, which is consistent with statistical discrimination.

²² Other studies have attempted to test experimentally different aspects of statistical discrimination such as the effects of the relative sizes of "majority" and "minority" populations (Davis, 1987) or second-moment statistical discrimination (Dickinson and Oaxaca, 2009).

the most accurate signal of players' potential productivity although it does not give any guarantee on future performance. The *success* measure conveys information regarding the relative performance of participants. However, the success in the tournament may also simply reflect pure good luck or the fact that the individual was matched with a very low-productive worker. Finally, the competitiveness measure seems to provide the less accurate signal about workers' future performance. Nevertheless, it may be useful for the employer in her hiring decision. Indeed we may reasonably conjecture that the degree of competitiveness may be a strong predictor of future performance. Indeed previous studies have shown that individuals with strong competitive preferences are more likely to outperform in a contest (e.g. Charness and Grosskopf, 2001; Charness and Rabin, 2002; Abbink and Sadrieh, 2009; Charness *et al.* 2013). To summarize, our hypothesis concerning treatment differences are specified in H3.

H3: One should observe less (statistical) discrimination in the score treatment, followed in turn by the success and the competitiveness treatments.

Our last conjecture concerns the question of whether statistical discrimination (if any) relies on erroneous stereotypes (Aigner and Cain, 1977; Cornell, and Welch, 1996; Pinkston, 2003) or—corresponds to actual group averages (Phelps, 1972; Arrow, 1973; Lundberg and Startz, 1983). Regarding gender differences, evidence from previous empirical studies is mixed. Some studies found individual differences, showing for instance that women are more averse to competition than are men (Gneezy *et al.*, 2003; Gneezy and Rustichini, 2004; Niederle and Vesterlund, 2007; Vandegrift and Brown, 2005; Datta Gupta *et al.*, 2013) or that women are more risk averse than men (see Byrnes, *et al.* 1999; Eckel and Grossman, 2008). Evidence of gender differences in performance is less clear cut. Some studies have shown that men's performance increases significantly when paid under a competitive scheme while women's performance remains unchanged (e.g. Gneezy *et al.*, 2003; Gneezy and Rustichini, 2004). Other studies find no systematic gender difference in performance although there are

substantial gender differences when participants subsequently choose the scheme they want to apply to their next performance (Niederle and Vesterlund, 2007; Masclet *et al.*, 2012).

Regarding ethnic differences, the evidence is even more mitigated. Some studies report significant ethnicity differences in trust and trustworthiness (Petrie, 2004), reciprocity (Eckel and Wilson, 2007; Burns, 2011) or contribution to public goods (Castillo and Petrie, 2010).²³ Other studies find no significant race differences and conclude that stereotypes on ethnicity are not supported by actual mean differences (Rödin and Özcan, 2011) or are more likely to be explained by other determinants such as income differences (Haile *et al.*, 2006).²⁴ Based on these previous studies, we conjecture that if stereotypes are erroneous, one should observe no relationship between performance and assigned rank. Our conjecture is stated precisely in hypothesis H4.

H4: If statistical discrimination is based on mistaken stereotypes, one should observe no relationship between actual performance and assigned rank in the baseline treatment.

4. Results

In section 4.1 we investigate whether people discriminate during the hiring stage in the baseline treatment. We then investigate in section 4.2 whether this discrimination is statistical or taste-based and how it is affected by changes in provided information. Finally we check in section 4.3 whether stereotypes (if any) are erroneous or are self-fulfilling in equilibrium.

²³ Petrie (2004) finds that black men are the least trusting of all groups, and that people treat them as such. Burns (2011) and Eckel and Wilson (2007) find that skin color is related to both trust and reciprocity. The authors observe that darker skinned players trust less and are less likely to be trusted, though they are not less trustworthy (see also Garbarino and Slonim, 2009 for a survey). Castillo and Petrie (2010) find that black people contribute significantly less than white people in public good games.

²⁴ Haile *et al.* (2006) find that differences in trust behavior are more likely to be explained by income differences rather than by ethnicity. Rödin and Ozcan (2011) find that the strong negative beliefs associated with stereotypes on ethnicity are false as they are not supported by corresponding mean differences in candidates' actual test scores.

4.1. Discrimination and average ranking in the *no information* treatment

Table 2 provides some preliminary information about average received ranking based on individual characteristic in the baseline treatment.²⁵ It shows that females are ranked on average 0.69 higher than males, indicating that females are less preferred than males by employers. A Mann Whitney test shows that this difference is statistically significant ($z=3.443$; $p=0.0006$). Black participants are also ranked on average 0.81 higher than Caucasian people ($z = -2.699$; $p=0.0069$). On average black females are ranked 1.21 higher than white males. Ranks are also negatively correlated with the level of education. Participants who studied for less than two years after high school are ranked 1.02 higher than those who spent two to three years studying ($z=-4.872$; $p=0.0000$) and 1.79 higher than those who studied for more than three years ($z=-5.866$; $p=0.0000$). These findings are summarized in result 1:

Result 1. *In the no information treatment, both blacks and females are ranked worse than whites and males, respectively. Participants with a lower education level are also ranked worse.*

Support for result 1. To provide more formal evidence of discrimination, we ran estimates on the determinants of ranking decisions. Table 3 reports the results of Ordinary Least Squares estimates²⁶ of the determinants of the employer's ranking decision. The dependent variable $rank_i^j$ corresponds to the rank player j assigns to player i , $\forall i, j; i \neq j$. The independent variables include player i 's demographics. We also add dummy variables that control for the fact that both players i and j have the same level of education or the same

²⁵ A higher rank means that the participant was less preferred by the employer.

²⁶ To check the robustness of our findings, we also ran Ordered Logit estimates (not reported here but available upon request). These estimates provide very similar findings.

academic field. Finally an interaction term “same level of education*same studies” is also included.

Column (1) of Table 3 confirms our previous findings. It shows that being a female or being black is associated with a higher rank. In the opposite being Asian is associated with a lower rank. Altogether these findings provide evidence of the existence of discrimination toward black people and females.

The variables “level of education” and “engineering” capture negative and significant coefficients. At first glance these findings may be surprising since our real task did not require any specific skill or qualification. However these results may be interpreted in the light of the signaling theory according to which employers may interpret the signal of a higher education level as correlated with a greater ability even if education does not necessarily increase the individual productivity (Spence, 1973). In other words, even if education here does not contribute to the worker’s productivity in the decoding task, it could still have value to the employer as it may reveal some intrinsic ability.

4.2. Taste-based versus statistical discrimination

Our findings have shown that in absence of information about previous performance in the baseline treatment, participants do not hesitate to discriminate against females, black or least educated people. These results may reflect either in-group favoritism or statistical discrimination. There are at least two ways to disentangle between taste-based and statistical discrimination. First, if discrimination is due to in-group favoritism, one should observe for instance that females (black people) should be less likely to discriminate against other females (black people). Second, if discrimination is taste-based, it should not be affected by additional information regarding worker’s potential ability. These two assumptions are tested in the next subsections.

4.2.1. Is there any systematic mistrust toward some particular groups?

To check whether there is some intra-group favoritism or instead a systematic mistrust toward some particular groups, we ran additional estimates of the determinants of ranking decisions.

Columns (2) and (3) of table 3 replicates estimate (1) for separate pools depending on whether the employer j is also a female or a black people, respectively. The variable “ i is female” captures a positive and significant coefficient in estimate (2), indicating that females are also ranked higher by other females. Similarly, the positive and significant coefficient associated with the variable “ i is black” in column (3) also shows that black people discriminate against other black people.

All together these findings reveal a systematic mistrust toward both females and black people, which clearly refutes the hypothesis H1 of in-group favoritism (Holm, 2000; Fershtman and Gneezy, 2001). The only evidence of some in-group favoritism is captured by the negative and significant coefficients associated to the variables “*same studies*” and “*same level of education*”. We also estimated Ordered Logit models on the determinants of discriminating behavior in the no information treatment to investigate in further details the characteristics of people who discriminate (estimates not reported here but available upon request). The dependent variable takes the value zero if player i does not discriminate. It takes the value 1 if she/he discriminates based on either gender or race. Finally this variable takes the value 2 if the participant discriminates both on gender and race. This variable was constructed by comparing player i ’s effective ranking with a hypothetical purely random ranking that would reflect an absence of discrimination. These additional estimates indicate that more educated people are less likely to discriminate, which confirms previous findings (e.g. Falk and Zenhder, 2007). Other demographics are not significant. Our findings are summarized in result 2.

Result 2. *There is some systematic mistrust toward females and black people.*

4.2.2. Is discrimination reduced when relevant information about performance is available?

To ascertain with more precision whether observed discrimination is due to in-group favoritism or due to the fact that people form (erroneous) beliefs about who are the high and low performers, we need to go one step further and compare the extent of discrimination across our different treatments. If discrimination is only due to preferences, it should remain unchanged across treatments. In sharp contrast, if it is a matter of incomplete information, then discrimination should be reduced when employers receive additional information about each worker's performance.

Table 4 reports the results of OLS estimates of the determinants of average ranking received by each participant in each treatment. The dependent variable *average rank* corresponds to the average ranking received by player i from the seven other group members. Column (1) reports estimates of determinants of ranking in the *no information* treatment. Columns (2), (3) and (4) report similar estimates in the *competitiveness*, *success* and *score* treatments, respectively. The independent variables shown in table 4 are similar to those presented in table 3. In addition, measures of performance (*competitiveness*, *success* and *score*) are included in the information treatments. The “*competitiveness*” variable is a dummy variable that takes one if the ranked player chose a tournament during the third preliminary game and zero otherwise. The dummy variable “*success*” takes one if the ranked player won the tournament played during the preliminary phase and zero otherwise. Finally the variable “*score*” corresponds to the total number of correct tasks performed in the tournament implemented during the preliminary game.

Column (1) of table 4 confirms our previous findings, showing that both females and black people are ranked higher while more educated people and engineers receive a lower

rank. The variable “competitiveness” in column (2) captures a negative and significant coefficient. This finding indicates that employers use this information to rank workers by assigning a lower rank to individuals who chose the tournament during the preliminary phase. After controlling for the degree of competitiveness, the “female” variable still captures a positive and significant coefficient in column (2). However this coefficient is slightly less significant compared to the baseline treatment. The coefficient associated to the “black” variable is still highly significant. Altogether these findings suggest that introducing information about competitiveness helps the employer in her hiring decision but such signal is insufficient to make discrimination totally disappear.

The coefficient associated to the “*success*” variable in column (3) is also negative and highly significant, indicating that employers assign a lower rank to those who won a previous tournament. Column (3) also indicates that introducing information about previous success is sufficient to make discrimination against both females and black people disappear. However it also indicates that not all ethnic discrimination has disappeared totally, as shown by the negative and significant coefficient associated with the “Asian” variable. Furthermore the coefficient of the level of education variable still remains highly significant.

Column (4) of table 4 provides rather different findings. The coefficient of the “*score*” variable in column (4) is also negative and highly significant. But more importantly is the fact that introducing such information about previous performance makes both gender and ethnic discrimination totally disappear.

Altogether, our findings indicate that information on performance or competitiveness helps employers in making their hiring decisions. We also observe that additional information on potential ability or competitiveness has a significant effect in reducing discrimination. Altogether this finding and the fact that there exists some systematic mistrust toward particular groups tend to indicate that discrimination is mainly due to a lack of information

rather than due to preferences and in-group favoritism. This supports hypothesis H2. Finally, consistent with hypothesis H3, we also find that the nature of information available matters a lot and that the degree of accuracy of the information is important. These findings are summarized in result 3.

Result 3. *a) Introducing relevant information about ability reduces significantly both gender and ethnic discrimination. b) The nature of information that is available to the employers matters.*

4.3. Average Performance and competitiveness

Our findings reported in the previous sub-section clearly indicate that discrimination against some particular groups is mainly statistical. In this sub-section we check whether beliefs used to support statistical discrimination are erroneous or are self-fulfilling in equilibrium.

If stereotypes are erroneous, one should observe no difference in performance between discriminated groups and non discriminated groups.

To check this, we compare average performance between discriminated and non discriminated groups in the preliminary stage. To avoid any endogeneity problem (*i.e* the fact that a lower performance may simply reflect a reaction to being discriminated) we were careful in not using performance after the hiring stage but rather performance during the preliminary phase.

On average females performed 46.69 decoding tasks (SD=7.33) during the tournament of the preliminary phase while males decoded on average 45.75 tasks (SD=8.95). A Mann-Whitney pairwise statistical test indicates that this difference is not statistically significant ($z=0.866$; $p=0.386$). Interestingly, our data reveal that females perform even more tasks (mean=40.90; SD=7.92) than males (mean=33.23; SD=16.90) in the flat wage game of the preliminary phase ($z=2.219$; $p=0.0265$). We do not want to overstate this finding however since the flat wage

scheme was not implemented in this main experiment (See a companion paper, Masclet *et al.*, 2012 for a detailed discussion about these gender differences).

Our data also indicate that if there are some differences in performance across ethnical groups, these differences are neither systematic nor robust to changes in the remuneration scheme. On average Black people perform significantly less tasks than Caucasians during the tournament of the preliminary phase ($z=2.296$; $z=0.0217$). However no difference was found under the flat wage scheme ($z=0.856$; $p=0.3918$). Arab people also perform significantly less than Caucasian people during the tournament but this difference is only significant at 10% level ($z=1.864$; 0.0623). No difference is found under a flat wage scheme ($z=1.362$; $p=0.1731$). Finally no difference is found between Caucasians and Asians neither in the flat wage ($z=1.493$; $p=0.1354$) nor in the tournament ($z=0.653$; $p=0.5138$).

Regarding the degree of competitiveness captured by the remuneration choice in the choice game of the preliminary phase, our data indicate that males are more likely to choose the tournament scheme than females. On average 61.11% of males choose the tournament scheme against only 36.11% of females in the first choice game. A Mann-Whitney pairwise statistical test indicates that this difference is significant ($z=-2.991$, $p = 0.0028$). These findings are consistent with previous findings in the literature showing that women are more averse to competition than are men (Gneezy *et al.*, 2003; Gneezy and Rustichini, 2004; Vandegrift and Brown, 2005; Niederle and Vesterlund, 2007; Datta Gupta *et al.*, 2013). Finally no difference was observed across ethnic groups or across other individual characteristics.

Altogether these findings indicate that if there are any differences across groups, these differences are neither systematic nor robust to changes in the remuneration scheme. These findings are summarized in result 4.

Result 4. *There are no systematic differences across gender or race in performance, suggesting that statistical discrimination in the no information treatment mainly rely on erroneous beliefs.*

5. Discussion

In our experimental setting, discrimination against females and blacks occurs when no information regarding productivity is provided. This discrimination totally disappears when precise information regarding previous performance is made available to the decision makers. These findings are consistent with previous laboratory studies (Especially with Castillo and Petrie, 2010). Recruiters in the labor market often face situations where information regarding applicant's productivity is imperfect. We therefore go one step further by examining hiring decisions with intermediate information. We show in this paper that the more accurate the information on productivity is, the sharper is the discrimination decrease in hiring decision. Decision makers are not content with weak information and discrimination persists until provided information is considered as relevant enough. This result clearly points to the existence of statistical discrimination in our laboratory setting.

Several precautions should be taken however in interpreting and extrapolating our findings. First one has to keep in mind the nature of the participants. Indeed the fact that participants were mainly undergraduate students may not be representative for the study of discrimination existing in the population at large. For instance one may conjecture that students may be less inclined to discriminate than other population since some previous studies have shown that more educated people are less inclined to discriminate than others (e.g. Falk and Zenhder, 2007). We acknowledge such limitation of our study. A natural extension of this work may consist in running a similar experiment with a broader population.

Second, the artificial nature of both effort and hiring decisions in the laboratory may have induced some biases. For instance one may argue that conducting our experiment in a decontextualized setting where interactions are limited may not have given much room to preference based discrimination mechanisms. Indeed, Becker defines taste for discrimination as “disutility caused by contact with some individuals” (Becker, 1957). Our findings do not lead to the conclusion that taste-based discrimination does not exist in the labor market. We can however argue that in a context where direct interactions in the workplace between recruiters and employees are not considered, statistical discrimination may occur. And more importantly is the fact that such discrimination is particularly sensitive to the accuracy of the information made available to the recruiter.

6. Conclusion

There are many examples of discrimination in everyday life, particularly in hiring or wage setting decisions in the labor market. Several studies have provided large evidence of both gender and ethnic discrimination in labor market. For instance it is widely known that females get lower wages than males even after controlling for other factors such as human capital. Our study aims at contributing to this existing literature by investigating experimentally the extent and the determinants of discriminatory treatment in hiring decisions.

We present a new experimental design that permits us to investigate discrimination in hiring decisions and to distinguish between statistical and taste-based discrimination. This is done by varying across treatments the nature of the information available to employers during the hiring stage.

We have five key findings.

First, consistent with previous findings, we find that the conditions for the occurrence of discrimination are rather weak (Holm, 2000). A simple experimental setting is sufficient for

the emergence of discrimination. In particular, we observe both significant gender and race discrimination when no relevant information is available on workers' potential ability. In the opposite, employers assign better ranks to people who have a higher education level or engineering academic field.

Second, our data show a systematic discrimination against females and black people. Both blacks and females also discriminate against other blacks and females. This finding clearly refutes the hypothesis of in-group favoritism. The only evidence for some in-group favoritism is that people are more likely to assign a better ranking to those who have the same academic field and/or the same level of education as themselves.

Third, the introduction of information on ability or degree of competitiveness helps employers in making their hiring decisions. This additional information helps to deter discrimination significantly, suggesting that discrimination is mainly due to a lack of information rather than preferences.

Fourth, less discrimination is observed in the *score* treatment, followed in turn by the *success* and the *competitiveness* treatments. This finding indicates that both the nature and the degree of accuracy of the information available to the employer matters a lot.

Fifth, the fact that discrimination in our experiment is mainly statistical raises the question about whether stereotypes correspond or not to actual group averages. Some authors argue that statistical discrimination is based on erroneous stereotypes and that it is only due to errors in signals (Aigner and Cain, 1977; Cornell, and Welch, 1996; Pinkston, 2003) while others consider that stereotypes reflect actual group averages, in particular because beliefs become self-confirming at equilibrium (Lundberg and Startz, 1983). Our data show that if there are some individual differences both in performance and competitiveness, such differences are not systematic across demographic groups and seem to be context-dependent. Altogether

these findings suggest that discrimination observed in this experiment is mainly based on erroneous stereotypes that may be deeply rooted in some belief formation processes.

One natural extension of our research would be to investigate whether our findings hold with different pools of participants by recruiting more heterogeneous population. Future research should help to further delineate the boundaries of discrimination.

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Table 1. *Summary of the Experimental Sessions*

Session Number	Number of participants	Treatments	
1	24	Baseline	Score
2	24	Baseline	Score
3	24	Baseline	Success
4	24	Baseline	Success
5	24	Baseline	Competitiveness
6	24	Baseline	Competitiveness
Total	144		

Table 2. Ranking in the no information treatment

Characteristics	All	Males	Females
<i>Ethnicity</i>			
Caucasian	3.946 (1.113)	3.645 (1.141)	4.262 (0.996)
Black	4.752 (0.842)	4.595 (0.725)	4.857 (0.939)
Arabic	3.964 (1.630)	3.171 (1.506)	5.285 (0.756)
Asian	3.394 (1.540)	2.762 (0.929)	3.771 (1.800)
<i>Field</i>			
Economics	4.039 (1.246)	3.734 (1.233)	4.494 (1.138)
Management	3.462 (0.887)	3.085 (1.042)	3.696 (0.749)
Law	4.102 (1.123)	3.535 (1.233)	4.450 (0.932)
Engineering	3.792 (1.177)	3.476 (1.649)	3.910 (1.068)
<i>Level of education</i>			
< 2 years	4.863 (0.985)	4.549 (1.037)	5.257 (0.771)
2-3 years	3.841 (1.000)	3.397 (0.846)	4.325 (0.938)
>3 years	3.071 (0.903)	2.468 (0.883)	3.421 (0.726)
All	4.000 (0.000)	3.655 (1.167)	4.345 (1.074)

Note: Reported numbers correspond to average ranking and standard deviations are given in parentheses.

Table 3. Determinants of average ranking in the no information treatment

Dep. Var. $Rank_i^j$	Rank received by player i from players j		
	(1) All j	(2) j is Female	(3) j is Black
i is Female	0.886*** (0.12)	0.796*** (0.18)	-0.041 (0.42)
i is Black	0.384** (0.19)	0.483* (0.30)	1.170** (0.49)
i is Arab	0.099 (0.26)	0.367 (0.40)	-0.217 (0.78)
i is Asian	-0.602** (0.25)	-0.875*** (0.31)	0.330 (1.43)
i 's Level of education	-0.480*** (0.04)	-0.327*** (0.06)	-0.787*** (0.21)
i Economics	-0.167 (0.18)	-0.014 (0.23)	0.473 (0.67)
i Management	-0.272 (0.23)	-0.124 (0.31)	1.306 (1.01)
i Law	-0.202 (0.20)	0.104 (0.27)	1.584** (0.73)
i Engineering	-0.611** (0.25)	-0.434 (0.38)	1.522 (1.29)
i and j have same studies	-0.326** (0.16)	-0.595** (0.25)	0.075 (0.61)
i and j have same level of education	-0.439*** (0.16)	-0.523** (0.25)	-0.971* (0.50)
i and j have same educ. and same studies	0.481 (0.30)	0.546 (0.46)	1.070 (0.82)
Constant	5.039*** (0.19)	4.623*** (0.25)	4.858*** (0.49)
Observations	1008	504	105
R squared	0.171	0.140	0.309

Notes: *** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level. Robust Standard errors are in parentheses.


Table 4. Determinants of average ranking in each treatment



Dep. Var.	Mean Rank			
	(1) No info.	(2) Compet.	(3) Success	(4) Score
Competitiveness		-1.678*** (0.29)		
Success			-3.034*** (0.17)	
Score				-0.218*** (0.02)
Female	0.895*** (0.15)	0.660** (0.27)	0.227 (0.17)	0.189 (0.38)
Black	0.498** (0.19)	1.113*** (0.31)	-0.081 (0.26)	-0.290 (0.36)
Arab	0.129 (0.38)	-0.247 (0.27)	0.052 (0.28)	0.000 (0.00)
Asian	-0.630 (0.39)	0.500 (0.33)	-0.503*** (0.17)	0.820 (0.70)
Level of education	-0.463*** (0.06)	-0.458*** (0.10)	-0.375*** (0.07)	-0.048 (0.12)
Economics	-0.275 (0.21)	-0.512 (0.41)	-0.011 (0.20)	-0.440 (0.46)
Management	-0.321 (0.25)	-0.733 (0.56)	0.224 (0.28)	0.065 (0.73)
Law	-0.238 (0.23)	-0.348 (0.44)	-0.258 (0.21)	0.300 (0.61)
Engineering	-0.677** (0.32)	-0.679 (0.51)	-0.181 (0.34)	-1.875* (0.60)
Constant	4.910*** (0.25)	6.040*** (0.54)	6.345*** (0.25)	14.324*** (1.14)
Observations	144	48	48	48
R squared	0.481	0.749	0.921	0.676


Notes: *** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level. Robust Standard errors are in parentheses.

APPENDIX A.

Figure A1: Screenshot of the Hiring stage




It is you

Player	Status	Discipline of study	Level of study
A	Student	Economics	7
B	Student	Law	3
C	Student	Other	2
D	Student	Law	3
E	Student	Management	5
F	Student	Management	1
G	Student	Sciences	6
H	Student	Sciences	1

Your ranking

1 -

2 -

3 -

4 -

5 -

6 -

7 -

Save

Figure A2: Screenshot of the Decoding Task

Lettre	Chiffre
J	4
A	10
P	7
E	6
T	14
C	3
K	5
D	18
L	8
V	16
U	17
R	26
N	1
O	23
Z	11
Q	24
W	21
I	22
B	12
S	25
V	2
F	9
X	19
M	20
H	13
G	15

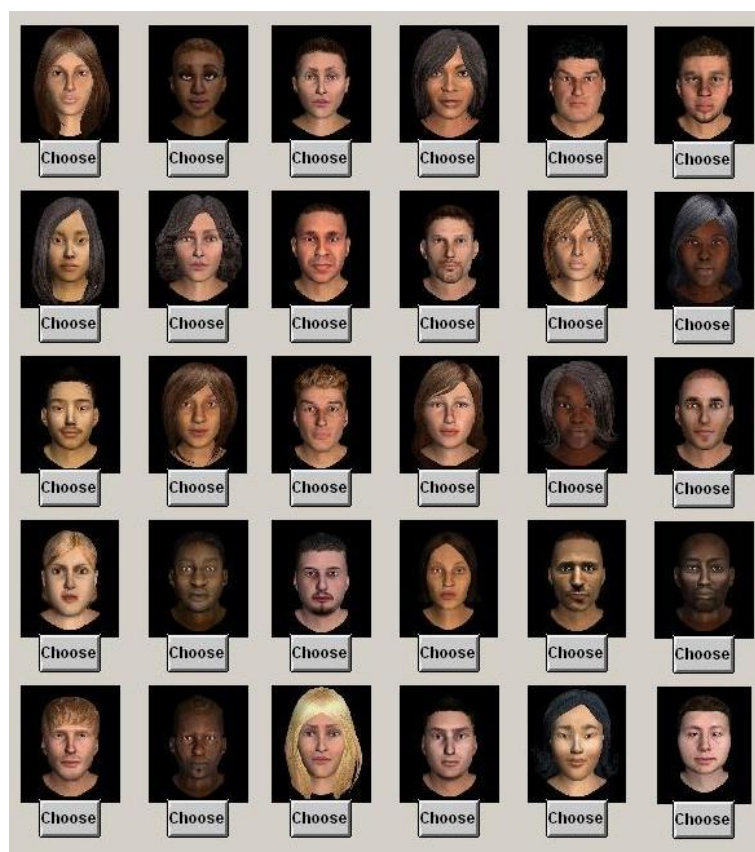
Lettre : A

Chiffre correspondant:

OK

Nombre de bonnes réponses : 0

Figure A3: Screenshot of the list of avatars



Appendix B Instructions *[translated from French]*

General instructions

You are now taking part in an economic experiment. You will take several decisions which are described in this instruction sheet. The instructions are simple. Following them carefully will allow you to earn a considerable amount of money.

Your earnings depend on your own decisions and in some case on the decisions of other participants. It is very important that you read these instructions carefully. Your final earnings will be the sum of what you earn in each game. During the experiment your entire earnings will be calculated in ECU (Experimental Currency Units). At the end of the experiment the total amount of ECU you have earned will be converted to euro at the following rate: 40 ECU = €1. We guarantee anonymity for every decision you take.

Preliminary phase

Questionnaire

During this preliminary phase, you will have to answer a questionnaire which will be displayed on your screen. In particular, you have to provide several information regarding your age, gender, level of study and field of study. You then have to choose an avatar to identify yourself among a set of thirty avatars.

[See figure A3].

You do not have to find your perfect lookalike, but it is very important that you select the avatar which corresponds most closely to you. The screen below gives you an example of what will appear on your computer.

Decoding tasks

Game one [flat wage] [Note to the reader : instructions for each game was given only at the beginning of the current game]

After having filled out the questionnaire, you will have to perform a particular task. This task consists of converting letters into numbers during three minutes. Your screen displays a table with two columns. The first column indicates letters and the second indicates the correspondence in numbers. A randomly drawn letter will appear in the middle of the screen. You must enter the corresponding number in the box on your screen. You must validate your answer by pressing the “OK” button. Once you have validated your answer, you are immediately informed whether your answer is correct or not. If your answer is incorrect, you must enter a new number until the answer is correct. A new letter appears only after you have submitted the correct answer for the current letter. You can convert as many letters as you like during the three minutes.

[See figure A1]

Your payoff in this game is independent of your performance at the task. Precisely, you will receive a payoff of 100 ECU, irrespective of the number of tasks you performed. Then if you decoded 0, 5, 10 or 20 letters, you earn 100 ECU. All participants in the session will receive the same payoff of 100 ECU, irrespective of their performance. You will not be informed of their performance. Your payoff will be displayed only at the end of the experience.

Game two [tournament]

In this game, you will have to perform a particular task. This task consists of converting letters into numbers during three minutes. Your screen displays a table with two columns. The first column indicates letters and the second indicates the correspondence in numbers. A randomly drawn letter will appear in the middle of the screen. You must enter the corresponding number in the box on your screen. You must validate your answer by pressing the “OK” button. Once you have validated your answer, you are immediately informed whether your answer is correct or not. If your answer is incorrect, you must enter a new number until the answer is correct. A new letter appears only after you have submitted the correct answer for the current letter. You can convert as many letters as you like during the three minutes.

At the end of the three minutes, your performance in the decoding task will be compared to that of another participant of the session randomly chosen by the computer. The identity of the co-participant will remain unknown.

Your payoff in this game will depend on your performance and the performance of the co-participant you are paired with. You will receive 180 ECU if you decoded more letters than your co-participant. You will receive 20 ECU if you decoded less letters than your co-participant. In case of tie, the computer will randomly choose who

will receive the 180(20) ECU. You will not be informed about the performance of your co-participant. Your payoff will be displayed only at the end of the experience.

Game three [choice game]

This game consists of two stages. In the first stage you will have to choose between two possible modes of payment. Your choice of the mode of payment determines your payoff for this game. In the second stage, you will have to realize a particular task and you will be paid based on the mode of payment you chose in stage 1.

Stage one.

In this stage, you will have to choose between two possible modes of payment. The first mode of payment is a fixed payoff. In other words, your payoff does not depend on your performance in stage 2. If you choose this mode of payment, you will receive 100 ECU, irrespective of the number of tasks you will perform in stage 2. The second mode of payment will depend on your performance and the performance of your co-participant in stage 2. If you choose this mode of payment, at the end of the three minutes, your performance in the second stage will be compared to that of another participant of the session who also chose this mode of payment. This co-participant will be randomly chosen by the computer. You will receive 180 ECU if you perform more tasks than your co-participant in stage 2. You will receive 20 ECU if you perform less tasks than your co-participant. In case of tie, the computer will randomly choose who will receive the 180(20) ECU.

Stage two

In stage two, you will have to perform a particular task. This task consists of converting letters into numbers during three minutes. Your screen displays a table with two columns. The first column indicates letters and the second indicates the correspondence in numbers. A randomly drawn letter will appear in the middle of the screen. You must enter the corresponding number in the box on your screen. You must validate your answer by pressing the "OK" button. Once you have validated your answer, you are immediately informed whether your answer is correct or not. If your answer is incorrect, you must enter a new number until the answer is correct. A new letter appears only after you have submitted the correct answer for the current letter. You can convert as many letters as you like during the three minutes.

If you chose the first mode of payment in stage 1, you will receive a payoff of 100 ECU, irrespective of the number of tasks you performed. Then if you decoded 0, 5, 10 or 20 letters, you earn 100 ECU. All participants in the session who chose this mode of payment will also receive the same payoff of 100 ECU, irrespective of their performance. You will not be informed of their performance.

If you chose the second mode of payment in stage 1, your performance in the decoding task will be compared to that of another participant of the session randomly chosen by the computer. The identity of the co-participant will remain unknown. You will receive 180 ECU if you decoded more letters than your co-participant. You will receive 20 ECU if you decoded less letters than your co-participant. In case of tie, the computer will randomly choose who will receive the 180(20) ECU. Your payoff will be displayed only at the end of the experience.

The experiment *[Note to the reader : instructions for each treatment of the experiment was given only at the end of the preliminary phase]*

[The no information treatment]

You are now part of an eight participants group. A letter from A to H is randomly attributed to each player. This game consists of two stages. In a first step you observe the characteristics of every member of your group and you have to rank them by order of preference. You will then be associated as far as possible with your favourite player to form a team. In a second step a member of the team will enter a tournament against a member of another team. Your earnings depend on the issue of this tournament.

First stage.

In this stage you observe the characteristics of seven other players. The characteristics displayed includes: (1) the level of study (expressed in number of years after high school), (2) the discipline of study and (3) the avatar chosen during the preliminary phase by each participant.

Being informed of these characteristics, you have to rank these seven other players by order of preference. You will assign rank one to your preferred player, rank 2 to your second preferred player, etc. The player you rank at the seventh position is the one you want the least to be associated with. You have to rank each participant

by typing the corresponding letter next to the desired rank. For instance if your favourite participant is the player A you shall type "A" next to the figure "1". If your second favourite participant is player H you shall type "H" next to the figure 2... Of course, you cannot type your own letter in your ranking. Moreover a player cannot be ranked twice in the same ranking. A warning message will be sent in case of any mistake in your ranking.

The screen below gives you an example of what will appear on your computer.

[See figure A2]

Once all participants in the group have submitted their rankings, teams are formed using the following procedure. First, a participant is chosen randomly by the computer and is assigned the role of player X1. Then, a team is formed with this player and her/his best ranked player (called player Y1). In a second step, one participant among the remaining six participants who have not yet been assigned to a pair is randomly chosen and assigned the role of player X2. A second pair is formed with that person and her/his best ranked player from the remaining people (called player Y2). Third, one person among the remaining 4 participants who have not previously been assigned to a pair is randomly chosen and assigned the role of player X3 and is matched with the first player on player A3's ranking among the remaining people (called player Y3). In the fourth step, the two participants who are not already assigned to a pair are matched together (player X4 and player Y4, respectively). At the end of this stage, four pairs (teams) are composed and you are informed of your type (X or Y). However you do not know the identity of the player you are associated with.

Second stage.

In the second stage each team enters a tournament against another team. Your role in this tournament depends on your type:

If you are a player X you do not directly participate in the tournament. Only the player Y you are associated with enters this tournament. Your payoff will depend on the issue of the tournament. If player Y wins the competition, both of you earn 180 ECU. If he loses the competition, both of you earn 20 ECU.

If you are a player Y you directly participate in the competition. This game is similar to the decoding task you played previously during the preliminary phase. Precisely, you have to convert letters into numbers during three minutes. Your screen displays a table with two columns. The first column indicates letters and the second indicates the correspondence in numbers. A randomly drawn letter will appear in the middle of the screen. You must enter the corresponding number in the box on your screen. You must validate your answer by pressing the "OK" button. Once you have validated your answer, you are immediately informed whether your answer is correct or not. If your answer is incorrect, you must enter a new number until the answer is correct. A new letter appears only after you have submitted the correct answer for the current letter. You can convert as many letters as you like during the three minutes.

At the end of the three minutes, the number of letters you decoded is compared to your opponent's performance. Your opponent is randomly chosen by the computer among the other players Y of the session. Your earnings are as follows:

If you decoded more letters than your opponent, you and the player X you are associated with earn 180 ECU each.

If you decoded less letters than your opponent, you and the player X you are associated with earn 20 ECU each.

[The Score treatment]

This game is similar to the preceding one except that in addition to demographic characteristics of each other group members you also receive additional information before taking your ranking decision. This information consists of each participant total number of correct tasks realized during game two [tournament game] played during the preliminary phase.

[The success treatment]

This game is similar to the preceding one except that in addition to demographic characteristics of each other group members you also receive additional information before taking your ranking decision. This information consists of the whether each participant won or lost game two [tournament game] played during the preliminary phase.

[The Competitiveness treatment]

This game is similar to the preceding one except that in addition to demographic characteristics of each other group members you also receive additional information before taking your ranking decision. This information consists of whether the participant chose a fixed payment or the contest during game three [choice game] of the preliminary phase.