

# What signals do employers use when hiring? Evidence from a survey experiment in the apprenticeship market

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## Abstract

How do employers use different types of signals – that is, information believed to be associated with productivity – when hiring apprentices? We use a survey experiment in Switzerland – a country with a well-developed dual training system – to study employers’ hiring behaviour. The results reveal that whenever possible, employers resort to *direct signals*, i.e., information such as educational credentials and aptitude test scores, when making hiring decisions. However, in contexts of high uncertainty, notably, when candidates’ profiles convey ambiguous signals, they are more likely to use *probabilistic* signals, such as socio-economic status indicators, to complement their assessments. Consequently, in contexts of high uncertainty, candidates with lower socio-economic status are more likely to be discriminated against in the apprenticeship market.

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## 1) Introduction

When hiring, employers use different types of information to select strong candidates. Some of this information is closely connected to the skills required on the job and to the candidates' abilities. This is the case for example of education credentials, grades, test results and work experience. However, research has shown that employers also use information that is *not directly* related to skills, including ethnicity, socio-economic background, age and appearance (Riach and Rich, 2002; Zschirnt and Ruedin, 2016; Agerström and Rooth, 2011). Employers who (rightly or wrongly) assume these characteristics to be associated with labour market performance use them to screen applicants. While this is a known fact, surprisingly, few studies — particularly quantitative ones — address the question of the relative weight employers attribute to these two different types of information and under what circumstances they de-emphasize direct measures of ability and rely on other characteristics.

In this article, we investigate which types of information employers prioritise when they screen CVs in the apprenticeship market. We hypothesise that employers prefer relying on *direct signals*, i.e., information that is more unequivocally connected to the skills an employer requires for a job. Direct signals generally consist of information that is performance-based, standardised, or validated by independent agencies/actors, such as educational qualifications (e.g., high school diplomas), test scores (e.g., assessment centre results), work certificates (e.g., recommendations from previous employers), and other objective assessments (e.g., driver's licence). We expect employers to trust these signals because they are — or appear to be — more reliable and informative than other types of information.

Even if employers prefer to rely on direct signals, these sometimes convey insufficient or ambiguous information about candidates' skills and qualities. In such instances, we expect

recruiters to resort to — what we call — *probabilistic signals* to complete their assessment, even though these signals are less directly associated with applicants' competencies.

Probabilistic signals include indices such as age, gender and ethnicity (Spence, 1972), markers of socio-economic background and extracurricular activities (e.g., golfing as an indicator of upper-class background or volunteering as an indicator of pro-social values). The literature offers various explanations concerning how such characteristics may affect hiring behaviour. Statistical discrimination theory predicts that employers have certain beliefs about the average group productivity and use these characteristics to refine their assessments of applicants. Consequently, employers are less (more) likely to hire individuals who are atypical for their group (Spence, 1972; Arrow, 1973). England and Lewin (1989) instead suggest that employers may be prone to 'error discrimination' due to incorrect assumptions about the average performance of certain groups. How often the employers' productivity assessment will be wrong depends on the distribution of these qualities around the average.<sup>1</sup> An alternative explanation points to the so-called taste for discrimination (Becker, 1957). Becker argues that employers may intentionally refuse to hire members of particular groups because of dislike or because they fear discrimination by employees or customers. Finally, social psychology proposes that discrimination is due to automatic processes of in- and out-group classifications and the use of cognitive shortcuts (Fiske, 1998; Kahneman, 2011; Birkelund, 2016).

Whichever the cause, assessments based on probabilistic signals are likely to be imperfect and influenced by stereotypes and/or employers' personal experiences with particular groups. These imprecisions motivate our decision to call such signals 'probabilistic'<sup>2</sup>.

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<sup>1</sup> We understand statistical discrimination in a broad sense, including that employers will under- or overestimate the productivity of individuals who are atypical for their group. We understand 'error discrimination' as employers holding erroneous assumptions about the average group performance.

<sup>2</sup> We take the statistical discrimination approach but acknowledge that error and taste discrimination, cognitive shortcuts and stereotypes are likely to occur contemporaneously in hiring processes.

There is ample evidence that employers use both direct and probabilistic signals when making hiring decisions. However, we know little regarding the circumstances that favour the use of one or the other type of signals. This is an important question, because many of the signals we call probabilistic may engender labour market discrimination. For this reason, we investigate when employers prioritise different types of signals and why. To this end, we rely on a survey experiment simulating a hiring process in the apprenticeship market. In recent years, survey experiments have become increasingly popular to study hiring behaviour (Di Stasio, 2014; Auspurg and Hintz, 2015; Liechti et al., 2017; Auer et al., 2019) because they offer an ethically less problematic alternative to field experiments (Zschirnt, 2016). In particular, Protsch and Solga (2017) use a similar setting, namely, factorial surveys (FS), to study labour market integration in the German apprenticeship market.

More precisely, we test our expectations by studying the recruitment preferences of employers who act as vocational trainers for commercial apprenticeships (office clerks) in Switzerland in 2017. Studying apprentice recruitment is well suited to our aim because the main direct signals (grades, aptitude tests) can easily be controlled in our experimental setting. Other direct signals, that are more difficult to control, such as work experience, are not really relevant for this group, and good controls of direct signals are essential to highlight the impact of probabilistic ones. In fact, the literature shows that it is difficult to distinguish the effect of age and work experience (Neumark et al., 2015) and correctly estimating the effect of ethnicity at later stages in life, as an initial disadvantage increases over time. Here, we can analyse labour market chances in a setting that maximises comparability, yielding conservative estimates of possible disadvantages.

Switzerland provides a good context to study employers' prioritisation of different signals in the apprentice market because of the high share of dual apprenticeships within the total upper secondary education population (ca. 65 per cent) and because of the diversity of the apprentices regarding ambition level, ethnic background, and gender (SKBF, 2018). Furthermore, the vocational education and training (VET) system is characterised by low involvement of public

interventions, such as subsidies, that incentivise firms to offer apprenticeships. Thus, the system is not prone to significant distortions in competition (Gonon and Maurer, 2012; Wettstein and Gonon, 2009). The equilibrium of supply and demand rests on decentralised cooperation among the state, social partners and the firms involved in the Swiss VET. An important element of this cooperation is the provision of firms with the freedom to choose which apprentices to hire (Busemeyer and Trampusch, 2012). Therefore, it is safe to assume that Swiss firms that hire apprentices do so based on similar criteria as those used in hiring regular employees, which enhances the generalisability of our results to the overall labour market.

## **2) Employers' use of *direct* and *probabilistic* signals when hiring apprentices**

Recruiting new staff implies uncertainty, which is mainly due to information asymmetry. Employers need to swiftly determine the true qualities of candidates, who themselves have an incentive to hide their weaknesses and emphasise their strengths (Spence, 1972; Arrow, 1973).

To choose the best apprentices, employers first select based on the information conveyed in the candidates' CVs. Unlike standard economic theory, which suggests that signals come at a cost (Spence, 1972; Arrow, 1973), we adopt a broader definition of this concept and argue that all the features that employers — rightly or wrongly— *believe* to be associated with productivity or some other desired quality, can be used as signals and thus affect hiring decisions (Liechti et al., 2017; Auer et al., 2019).

In theory, the decision model we postulate expects that employers screen applicants by relying on direct information and, only if necessary, refine their productivity assessment in an iterative process by including information drawn from probabilistic signals. In this way, employers may

consider group averages or be influenced by stereotypes and automatic in- and outgroup classifications (Fiske, 1998; Fiske et al., 2007; Kahneman, 2011; Agerström and Rooth, 2011). This information is likely to be considered in terms of what employers in interviews often call ‘gut instinct’ (Waldinger and Lichter, 2003). Examples of such *probabilistic signals* are unalterable characteristics (nationality, gender) and characteristics that disclose a candidate’s socio-economic background (place of residence) or values revealed through extracurricular activities (sports, volunteering). All this information may hint at the candidate’s possession of particular skills. What is important is that productivity expectations based on these probabilistic signals are derived from assumed group averages rather than individualised assessments. We thus distinguish signals in terms of whether they promise to inform about candidates’ ability in a direct, objective, reliable and individualised way or whether they are subject to employers’ *interpretation* and are the result of intuitive statistical reasoning.

## **2.1) Assessing candidates by means of direct and probabilistic signals**

In the following section, we first discuss direct and probabilistic signals and derive the respective hypotheses. In a second step, we present our main hypothesis about the relationship between these signals.

In apprentice recruitment, employers are likely to focus on hiring productive and trainable candidates to maximize the outcome of the practical *and* theoretical training delivered through firm- and school-based components (Wettstein and Gonon, 2009; SKBF, 2018). Accordingly, we expect employers to rely on characteristics that are direct signals of productivity and trainability and only if needed probabilistic signals that complete this picture (see next section).

In general, apprentices’ CVs include three types of signals: first, direct signals that are related especially to previous educational performance (certificates, grades, and test scores, Protsch and Solga, 2015); second, probabilistic signals associated with socio-demographic characteristics

(nationality, gender, residence); and third, probabilistic signals disclosing the socio-economic background and/or the values of a candidate, in particular, extracurricular activities (hobbies and interests).

### **2.1.1) Direct signals: Educational performance indicators**

Educational credentials<sup>3</sup>, including grades and aptitude test scores, are exemplary direct signals for commercial apprenticeships because they are (or at least perceived to be) objective and allow for an easy comparison among candidates. These signals are very important in Switzerland and in other countries where school-to-work transitions are highly institutionalized, and employers can be expected to trust educational credentials (Di Stasio and van de Werfhorst, 2016). In fact, in Switzerland, typical application documentation includes copies of grades and certificates by default, accordingly, this information is easily available and used by employers (Imdorf, 2009<sup>4</sup>). Second, due to the VET system there is close institutional contact between schools and employers (Ryan, 2001), which fosters trust. Third, employers have an incentive to use education-related information because they want to ensure the trainability of an apprentice. Employers consider literacy and math to be particularly important skills<sup>5</sup>, thus these grades likely affect hiring preferences (Hupka-Brunner et al., 2010) — also because grades have been empirically shown to strongly correlate with successful completion of the apprenticeship curriculum (Siegenthaler, 2010).

Similarly, in stratified education systems (such as Switzerland's) one's educational track can serve as a signal (Rosenbaum, 2001: 37). Students who are enrolled in demanding tracks are likely to

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<sup>3</sup> The literature shows that grades and other educational credentials are not necessarily objective. Rather, grades can be influenced by the socio-economic status of the pupil (Bourdieu, 1987) and by teacher characteristics (Rockoff, 2004). While in the US, employers do not trust grades to capture relevant abilities and prioritize other types of direct signals, in Switzerland they consider them good indicators of performance (Rosenbaum, 2001).

<sup>4</sup> This was confirmed with qualitative interviews (Interview 1/2/3, Table S12, Supplementary Material).

<sup>5</sup> This was validated with qualitative interviews (Tables S8-S12, Supplementary Material).

have stronger cognitive skills than those enrolled in less demanding tracks, and thus should be favoured by employers (Protsch and Dieckhoff, 2011; Solga and Kohlrausch, 2013).

Finally, aptitude tests (AT) can also provide highly relevant information to employers. In Switzerland, a 4-hour standardised, computer-based, professional aptitude test, which is provided by a private firm, is widely used by employers to assess applicants (Siegenthaler, 2010; Schnyder, 2016). The AT is designed to capture a broad range of competences beyond academic performance. This test assesses skills that are relevant to the occupation, including logical and networked thinking, concentration and organisational skills (Gateway, 2019). A standardised test *suggests* a high level of comparability, unlike grades, which may be perceived to be biased by teachers, school and peer-group effects and influenced by tracks and other situational factors (Rosenbaum, 2001: 136ff).

The fact that employers trust a standardised test may, however, be surprising in light of recent research suggesting that grades are better predictors of life outcomes than AT or intelligence quotient (IQ) tests (Siegenthaler, 2010; Borghans et al., 2016) because grades also capture the social dimension of skills. In fact, grades are likely influenced by tractability and socio-economic background and are based on longer observation periods. Conversely, a one-shot test may be influenced by the student's performance on the day of the test and thus could also be considered less reliable than grades (Rosenbaum, 2001: 186ff.). In sum, from a theoretical perspective, the AT test seems to have an ambiguous signalling value.

In Switzerland it is not mandatory for the candidate to include the AT test in the application documentation, but it is increasingly common and explicitly requested by several international banks, big retail firms, and other employers (Schnyder, 2016). While official statistics on the incidence of AT use for applications per sector are not available, it is known that the firm delivering these certificates performed 30,000 tests in 2016 (Schnyder, 2016). In the same year in Switzerland, 79,000 apprenticeship positions were vacant and 55,000 were filled (SBFI, 2016a).

From these figures, we can assume that a substantial portion of the apprentices were asked to include or had voluntarily included such a test in their dossiers.

Concerning direct signals, we formulate the following expectation:

**H1a:** Employers evaluate apprenticeship candidates with good educational credentials (i.e., grades, school track and AT scores) more positively than candidates with worse educational credentials.

The practical relevance of studying the effect of an AT is that taking the AT costs 100 Swiss francs and is consequently not accessible to all youth, possibly impacting the distribution of labour market opportunities because it could be associated with family status, as well.

### **2.1.2) Probabilistic signals: Socio-economic status, nationality and extracurricular activities**

Educational sociology convincingly shows that parents' socio-economic status (SES) affects their children's educational achievements (Douglas, 1964). On average, between 10 and 20 per cent of the variance in PISA test scores can be accounted for by controlling for SES (OECD, 2016). To maximise expected trainability, employers may favour candidates whose parents have achieved high professional status (doctors, lawyers) (Ganzeboom and Treiman, 1996) because they assume that these candidates will perform better and/or have more support at home than candidates with lower SES (Feinstein et al., 2008). In Switzerland, it is not uncommon to indicate the professional background of one's parents in an application letter or in the CV<sup>6</sup> for apprenticeship positions. Accordingly, this information is readily available to employers.

Socio-economic background may also manifest itself in the choice of extracurricular activities. Taking part in sports such as golfing or playing classical music may signal an upper-class

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<sup>6</sup> This was ascertained with qualitative interviews (Interview 3, Table S12, Supplementary Material).

background (Bourdieu, 1987). Conversely, skateboarding or hip-hop dance may be perceived as lower-class activities. The notion that extracurricular activities act as signals has been studied, among others, by Rooth (2011), who documents an advantage among applicants who have engaged in competitive individual sports. Accordingly, we expect extracurricular activities to influence employers' assessments through different stereotypes associated with a hobby and through the expectation that such activities increase an individual's human and social capital and/or disclose particular values (Handy, 2009; Baert and Vujić, 2016; Fossati et al., 2019). A commercial apprenticeship is the most sought-after type of apprenticeship (SBFI, 2016b), it requires a good level of school-related skills (language and maths in particular<sup>7</sup>) and is one of the more demanding curricula for apprentices. Therefore, employers should try to select the most promising students, whereby SES can be used as a screening device.

Previous literature shows that regarding nationality, both first- and second-generation minority candidates are often disadvantaged in the labour market (Riach and Rich, 2002; Zschirnt and Ruedin, 2016; Auer et al., 2019; Fossati et al., 2019) and are more likely to underperform at school (OECD, 2016). Both teachers and employers are found to expect lower achievement and to evaluate minority candidates more negatively than their native counterparts (van Ewijk, 2011). There are various reasons for such negative assessments: employers may personally dislike specific ethnic groups or nationalities (taste for discrimination, Becker, 1957) or might act upon (unconscious) stereotypes that link specific groups to traits such as competence or perceptions of (cultural) closeness (Fiske, 1998; Auer et al., 2019). Overall, we expect employers to favour apprentice candidates with a native background over those with a minority background. Thus, with regard to probabilistic signals, we expect the following:

**H1b:** Employers evaluate apprenticeship candidates with a higher SES and/or with a native background more positively than candidates with a lower SES and/or migration background.

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<sup>7</sup> This was confirmed with qualitative interviews (Interviews 1/2/4/6/8, Table S12, Supplementary Material).

## 2.2) When do employers resort to probabilistic signals?

We expect that employers who want to select a strong candidate will give more weight to direct signals because they convey more reliable information on candidates' competencies than probabilistic signals (see Di Stasio and van de Werfhorst, 2016 for a similar argument at the country level).

Our main argument, however, is that when direct signals convey *uncertainty* about a candidate's productivity, employers will resort to probabilistic signals. Uncertainty may be induced, for instance, if a student has poor grades in some subjects and excellent grades in others. Or when they have poor (high) grades but do well (poorly) on standardised tests such as AT or IQ tests. In such situations, employers are likely to believe that productivity expectations can be rendered more precise by including *additional* signals, even if these yields less reliable information and are subject to the employer's interpretation (Guryan and Charles, 2013).

We expect employers to consider probabilistic signals in three instances, out of which we are able to test the first one. First, probabilistic signals may be used in situations of uncertainty, e.g., when little is known about a candidate or when a profile conveys ambiguous/incongruent information (Dovidio and Gaertner, 2000). In such instances, probabilistic signals can be used to complement and/or correct the information conveyed by direct signals. Second, probabilistic signals may gain importance in occupations in which employers aim to 'hire the right attitude' rather than hire for specific skills. This is the case when skills can easily be learned on the job (e.g., low-skilled work) or are irrelevant (e.g., unskilled work) (Pager et al., 2009; Waldinger and Lichter, 2003). Third, probabilistic signals are more likely to be used in situations of cognitive overload or in situations where fast decision-making is required (Fiske, 1998; Kahneman, 2011; Birkelund, 2016). In such instances employers will rely on characteristics such as gender, ethnic origin and socio-economic status that can be easily observed and processed, because they trigger cognitive shortcuts, such

as automatic in- and out-group classifications. Commercial training is the most sought-after apprenticeship (SBFI, 2016b). These mechanisms may be relevant especially for attractive employers that are likely to receive substantially more applications than firms, in other fields, that offer less attractive positions. Moreover, in contexts that are either complex and/or uncertain, probabilistic signals are — for different reasons — likely to tip a decision in one direction or another because they are easier to process (Pager et al., 2009) compared to direct signals.

In detail, we expect the following:

**H2a:** In general employers prefer to rely on direct signals when hiring.

**H2b:** However, when candidates' profiles convey ambiguous or inconsistent information, employers will also consider probabilistic signals.

## **3) Data and method**

### **3.1) Experimental setup**

Directly observing employers' hiring behaviour is difficult. Thus, the literature agrees that experimental settings<sup>8</sup> are an effective way to study research questions linked to recruitment. An often-used method in economics is correspondence testing (Riach and Rich, 2002; Zschirnt and Ruedin, 2016). However, this method raises ethical concerns because it directly affects the application and selection processes, potentially generating costs for employers and altering labour market competition for candidates (Zschirnt, 2016). This is why we carried out an online FS experiment with in-firm vocational trainers involved in hiring apprentices (we refer to them as employers) in Switzerland in 2017. In FS, participants are given fictitious descriptions of situations (vignettes), which respondents are asked to evaluate, and which are randomly assigned

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<sup>8</sup> See Table S1, Figures S2-S4 for the experimental protocol and Figure S5 and Tables S2-S7 for robustness checks (Supplementary Materials).

to them. These fictitious descriptions approximate a brief CV that an apprentice candidate would send to apply for a position in a firm.

FS is a widely applied method in the social sciences and is increasingly used to study hiring behaviour (Biesma et al., 2007; Di Stasio and Gërkhani, 2015; Auer et al., 2019; Liechti et al., 2017). After presenting the respondent with general questions about the firm for which they work, we asked them to express their hiring preferences for two types of apprenticeships in commercial business, namely, a *certificat fédéral de capacité* (CFC) and an *attestation de formation professionnelle* (AFP) position. The apprentices in these programmes are trained in areas such as economics, languages and general branch knowledge. We sought to vary the required skill level of the apprenticeship position by including the two-year programme for youth with lower educational achievements (AFP) and a three-year programme targeting those with higher educational achievements (CFC) to ensure that our results are not driven by the specific skill level of the apprenticeship considered.

The respondents evaluated two sets of five vignettes and indicated how willing they would be to hire each of the candidates (0=very unwilling, 10=very willing). The respondents' evaluations do not directly measure real outcomes (successful hire); rather, each response is a stated choice and thus an indirect evaluation of an applicant's expected productivity and suitability. However, studies such as those by Webb and Sheeran (2006) and De Dreu et al. (2001) show that there is a high correlation between stated and actual behaviour.

An advantage of our study is that we capture *employers'* preferences and do not rely on samples of a non-target population, such as students. Moreover, experimental settings ensure that characteristics that may be unobserved by the researcher but observed by the employer are controlled for. Finally, the literature agrees that FS delivers a more valid measurement of preferences being less prone to social desirability bias than item-based techniques because it is more difficult for the respondents to identify and follow patterns of social desirability when multiple dimensions vary contemporaneously (Auspurg and Hinz, 2015).

We analysed the impact of nine dimensions that provide key information on candidates' educational and socio-economic backgrounds and vary these values randomly (Table 1, and Table S2, Supplementary Material). We relied on a D-efficient (90.03<sup>9</sup>) sample of 325 vignettes from all 19,683 possible combinations to maximise the orthogonality of the dimensions (Auspurg and Hinz, 2015). These designs are particularly useful when a low number of respondents can be expected, i.e. when studying hard-to-reach populations. The D-efficient design we chose also orthogonalises all two-way interactions allowing us to obtain unbiased estimates of all main and two-way effects. This is particularly important for our second model where we create an uncertainty variable and interact it with the different probabilistic signals.

Prior to introducing the five vignettes for each of the two apprenticeship positions<sup>10</sup>, we explained the evaluation setting and mentioned that candidates should be rated independently from one another. We also specified that all candidates were 16 years old (the typical age to start an apprenticeships), were motivated to start such a training and had obtained their education in Switzerland, as to avoid diverging assumptions about human capital endowments for individuals with an immigration background.

The online survey was administered to all approved in-firm vocational trainers in the French-speaking Canton of Vaud (Switzerland). We obtained their contacts from the official centralised registry. The data collection took place between March and May 2017. We obtained data for 840 individual recruiters who rated 7877 vignettes, reaching an exceptionally high response rate of

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<sup>9</sup> Auspurg and Hinz (2015: 27) define D-efficiency as "(...) a measure of the goodness of an experimental design (...) [that allows] to select one that provides the maximum statistical information, given sensible numbers of respondents and vignettes per respondent". D-efficiency captures orthogonality and balance of the design. The higher the D-efficiency value, the higher the statistical power of the estimates (D-efficiency >90 corresponds to vignette dimension correlations of <0.05, Auspurg and Hinz, 2015: 48).

<sup>10</sup> We randomized both the order in which the vignettes were presented for each of the two jobs and the order in which the jobs were displayed.

~63 per cent. In terms of experimental robustness, we find that each vignette has been rated by a minimum of four employers and that correlations among the vignette dimensions and also the employer characteristics are negligible.

### 3.2) Operationalisation and estimation strategy

Table 1 presents the dimensions that we varied in the candidates' CVs. In terms of direct signals, we included educational tracks, namely the *voie pre-gymnasiale*, which is followed by students who aim to go on to higher education; the *voie générale 1*, which is for academically weaker students; and the *voie générale 2* for students, who are between these two categories. We also included two types of grades that employers<sup>11</sup> deem particularly relevant for this position (French and maths) and varied them from a mere 'pass' (grade 4), to 'average' (grade 4.5) and 'good' (grade 5). Moreover, we included AT test scores that also mirror pass, average and good results (40, 50 and 60 points, respectively).

**Table 1:** Vignette levels and dimensions

\*\*\* Table 1 here \*\*\*

In terms of probabilistic signals, we presented candidates with parents from Switzerland (natives), Albania and Portugal. We chose Albanian and Portuguese migration backgrounds because these represent the largest immigrant groups in Vaud, except for individuals stemming from neighbouring countries (especially France<sup>12</sup>). Moreover, two out of three profiles on average displayed female applicants to match the proportion of women in this occupation. SES was

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<sup>11</sup> See information on the preparatory qualitative interviews Tables S8-S12 (Supplementary Material).

<sup>12</sup> Figure S1 (Supplementary Material) provides information on the main immigrant groups in the Canton of Vaud, Switzerland.

indicated by listing the father's occupation<sup>13</sup>, including doctors, insurance consultants and construction workers (for high, medium and low SES, respectively) (Hupka-Brunner et al., 2010; Ganzeboom and Treiman, 1996). Finally, we added extracurricular activities namely, playing the violin (high SES) and skateboarding for boys and hip-hop dancing for girls (low SES), as well as a neutral sport (handball). We also included participation in theatre activities and scout leadership (compared to a baseline category with no mention) to signal good interpersonal skills.

To test the hypothesis concerning employers' hiring preferences under uncertainty, we rely on a sub-sample of N=1,245 rated vignettes selected from the total N=7,877. Thereby, we confine our analysis to those candidate profiles, which displayed either unmistakably consistent (no uncertainty) or clearly inconsistent direct signals (high uncertainty). Then, in order to test the influence of uncertainty we construct a variable that distinguishes among candidates with consistently bad grades and a bad AT (aptitude test) score (=0), candidates with inconsistent direct signals, namely vignettes displaying low (high) grades and high (low) AT scores (=1) and candidates with consistently good grades and good AT score (=2). We then interact this variable with the probabilistic signals to assess if indeed these signals gain importance when uncertainty is high.

We believe this is a good way to operationalise uncertainty because the inconsistent information focuses on direct signals, which should be most valued by employers who, when hiring, aim at maximising trainability and productivity.

Our data have a nested structure because each respondent evaluated five fictitious CVs for each apprenticeship. Therefore, as recommended in the specialised literature, we estimated multilevel linear models (Skrondal and Rabe-Hesketh, 2008; Auspurg and Hinz, 2015) that accounted for

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<sup>13</sup> While not officially requested, information concerning parents' occupations is often provided in Switzerland. The interviewed employers stressed the importance of the family context for a successful apprenticeship (Interview 6/8, Table S12, Supplementary Material).

correlation in the error terms and control for employers' characteristics in additional estimates (Table A1). When analysing the influence of uncertainty regarding direct signals using a sub-set of the original data, we ensure to control for the somewhat higher correlations among the vignette dimensions (magnitude between 0.06 and max. 0.13, Table S7, Supplementary Material) by always including all vignette dimensions as control variables.<sup>14</sup> This allows us to ensure that the estimates are unbiased even when using only a subsample four these models.

## 4) Results

### 4.1. Factors influencing employers hiring decisions in the apprenticeship market

The results of the general multilevel model presented in Table 2 (additional specifications in Table A1 and Figure A1, in the appendix), which is estimated using the whole sample of vignettes (N=7877) shows that employers rely on different types of signals when selecting apprentices.

**Table 2:** Multilevel model of factors influencing employers' evaluations of apprenticeship applicant profiles

\*\*\* Table 2 here \*\*\*

Note: Standard errors in parentheses, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

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<sup>14</sup> Note that in general, with a D-efficient design it would not be necessary to control for all other vignette dimensions as the design ensures orthogonality.

In hypothesis H2a, we expected employers to base their decisions primarily on direct signals whenever possible. The results support this expectation and show that, first, employers on average evaluate significantly more positively candidates with good grades. Thereby, the effect of grades in French<sup>15</sup> is greater than that of those in math<sup>16</sup>. Second, candidates who were enrolled in the more-demanding VG2 and VP tracks are rated significantly better than those enrolled in the less-demanding VG1. Finally, having an excellent AT score (60 points) has the biggest impact on employers' evaluation. Compared to profiles achieving 40 points, on average, employers' evaluation is significant and 1.58 points higher on a 0-10 scale. Interestingly, unlike for grades, employers make almost no distinction between profiles with 60 points (+1.58 points) and profiles with 50 points (+1.37 points) compared to the reference category.

With regard our hypothesis H1b on probabilistic signals, we can see that only information on social-skill enhancing extracurricular activities have a significant impact on the rating (theatre and scout leader as opposed to no such activity). Rather than improving the evaluation of a candidate's profile, this information is used to sanction profiles lacking extracurricular engagement. In other words, employers evaluate a candidate who does not indicate a hobby significantly worse than a candidate who indicates a hobby, regardless of its type.

In contrast to the expectations in H1b, all other socio-economic and demographic variables do not significantly affect the recruitment decision in the overall sample.<sup>17</sup> However, as hypothesised in H2b, things could be different under conditions characterised by uncertainty, where we expect probabilistic signals to be more important than in settings with low uncertainty.

#### **4.1. What influences recruitment under conditions of uncertainty?**

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<sup>15</sup> Grades below 4 are failing grades; grade 4=pass; grade 5=good; grade 6=excellent.

<sup>16</sup> This finding is supported by qualitative evidence (Supplementary Material).

<sup>17</sup> The results remain unchanged when controlling for respondent characteristics (Table A1).

To assess employers' hiring preferences in conditions of uncertainty, we rely on the above described sub-sample (N=1,245) consisting of candidates whose school grades and test results are either consistently good, consistently bad (= low uncertainty) or where the grades are good (bad) and the results of the aptitude test are bad (good) (= high uncertainty). According to our hypothesis H2b, probabilistic signals should have a significant effect foremost when employers evaluate candidates who are characterised by inconsistent direct signals.

The results are presented in Figure 1 (the full regression models are available in Table A2, Models 2-5), which displays the contrasts of the predicted ratings based on interaction models for the three uncertainty conditions and for the four probabilistic signal variables.

Starting with social origin, signalled by the father's occupation (Figure 1, first graph), we can see that under conditions of certainty (either consistently good or consistently bad credentials) the father's occupation has no significant impact on the rating of the candidate. In contrast, for applicants in condition of uncertainty (inconsistent credentials) having either an insurance agent or a construction worker as father significantly decreases their ratings as compared to candidates having a doctor as father. This result is perfectly in line with our expectations. First, we find that probabilistic signals are seen as 'inferior' to direct ones and are used to refine the evaluation of an application only when the latter are not reliable. Second, the graph shows that having a higher socio-economic status (SES) background is crucial in situations of uncertainty, leading to the discrimination of individuals with a less favourable background in cases of doubt. In other words, a favourable SES can, to some extent, compensate for inconsistent performances, which makes it a less apparent but non-negligible source of potential disadvantage in the hiring process.

**Fig 1:** Contrasts of predicted ratings for different uncertainty profiles and probabilistic signals

**\*\*\* Figure 1 here \*\*\***

Note: Estimates are based on interaction models Table A2, Models 2-5 (shown in the appendix).

Reference categories are: social background: father is a doctor; nationality: Swiss; social hobby: scout leader; class-related hobby: violin.

The second graph in Figure 1 focuses on national origin. Contrary to expectation, this signal does not significantly affect the evaluation of inconsistent profiles. Apparently, recruiters do not rely on national origin as a sorting variable even in contexts where direct signals convey high uncertainty. This may be due to the fact that the national groups we have selected are rather well integrated in the region where the survey was carried out, as these do not belong to recent immigration waves. Another possible reason is that other probabilistic signals, such as family background, are considered more trustworthy in terms of expected performance during an apprenticeship. In fact, this interpretation is supported by the findings of the preparatory interviews where employers consistently regard the family as crucial support for an apprentices' successful program completion. Accordingly, it is plausible that employers are aware that it is the social status of the family and not the migration background per se that determines the overall level of support to be expected for an apprentice. This is a very interesting finding and suggests that results could have been different if only migration background had been included in the description, allowing recruiters to make assumptions with regard to socio-economic stats. Further research should test whether more reliable probabilistic signals are able to 'crowd out' less reliable ones.

Let us now move to the impact of extracurricular activities. We tested two types of activities: the first dimension considered the impact of hobbies that may indicate social skills. Being a scout leader was compared to playing in a theatre and to candidates who do not participate in any

activity (third graph in Figure 1). Here we do not find the expected effect. We find instead that candidates who have consistently bad credentials, are significantly penalised if they reported being 'scout leaders'. This result, unexpected on the basis of our model, suggests that interactions between signals can produce a whole range of interpretations by employers that are difficult to predict ex-ante. In this case, we can only speculate that the combination of weak certified skills and strong leadership, is not desirable ('stupid boss' stereotype).

The fourth graph in Figure 1 compared extracurricular activities intended to capture SES by signalling an upper-class activity (playing violin), a class-neutral activity (handball) and an anti-tradition or somewhat 'rebellious' activity (skateboard). Like in the case of the social-skill related hobby, results are not consistent with our expectations. The only significant effect we find here is a positive impact of handball relative to violin for candidates with consistently bad credentials. This result is difficult to interpret and, as argued above, could suggest that interactions between signals can generate a range of different interpretations, possibly based on situational stereotypes. Alternatively, and as suggested by the wide differences by which employers consider hobbies, it may be that such extracurriculars trigger individualised ways to assess a candidate. Some employers may like a particular hobby (e.g., football) and consider this a positive signal, others instead dislike may dislike the same activity because it that may take too much attention or energy and might negatively impact on the work. This would be in line with research suggesting that employers tend to hire employees that resemble themselves (homophily, Rivera, 2012) and that this may vary for different employers.

Overall, our results are only partly in line with our expectation that probabilistic signals significantly affect employers' ratings in situations of uncertainty. This is clearly the case for family background, but neither for nationality, nor for extracurriculars. Our discussion above suggests that interactions between signals are important, and that the same signals can be interpreted differently for candidates with different levels of documented credentials. Particularly striking is the result that specific hobbies are interpreted differently for candidates with

consistently low credentials. These are significantly penalised if they play violin or are scout leaders, whereas everybody else is not.

Unfortunately, with our data we cannot provide a more detailed explanation of these results, but the impression is clearly that probabilistic signals are interpreted also in interaction with direct signals. This insight resonates with the findings of Behaghel et al 2010,<sup>18</sup> who concluded that weak formal credentials are interpreted differently for candidates with a migration background. Overall these findings underscore the need for further research in how employers interpret not only single, but particularly combinations of, signals. In fact, in a real hiring situation, candidates display a number of signals simultaneously, and if we want to understand how hiring processes work, the role of interactions among signals is crucial.

## 5) Conclusion

This article contributes to the understanding of how employers use different types of signals when selecting candidates. In fact, we know that employers use and interpret different types of information but we know little with regard to when priority is given to either direct or probabilistic signals.

We started by hypothesising that employers should generally prefer direct signals such as objective credentials, documented work experience or other validated information over probabilistic signals such as gender, age, and nationality. Moreover, we expected that when confronted with uncertainty, i.e. when direct signals are inconsistent, employers would use probabilistic signals to complement their assessment.

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<sup>18</sup> Behaghel et al 2010, in their evaluation of anonymous CV recruitment in France, found that candidates with a migration background were more likely to be invited for an interview if the information concerning their ethnic origin was revealed instead of blinded. They concluded that this was probably due to a different interpretation of the often weaker formal credentials of candidates with a migration background, who benefitted from some form of understanding from employers when the background was revealed.

Our findings are only partly in line with our expectations. The results from a survey experiment shows that direct signals, i.e. objective credentials such as school grades and results of an aptitude test, significantly affect employers' ratings but other types of information do not. However, we also found that for a subsample of candidates with highly inconsistent credentials, other signals, that are less directly related to ability, may, in some instances become important. This is the case particularly for SES, signalled by the father's occupation). In these cases, when objective credentials convey an uncertain picture, employers rate children of mid-skilled or low-skilled workers significantly lower than those whose father is a medical doctor. Family background, instead exerts no significant effect on the evaluation of candidates whose objective credentials are either consistently good or consistently bad and thus do not convey uncertainty. Contrary to our expectations, national origin, does not seem to matter even in situations of uncertainty. We speculated that this could be because the information of family background is considered to be more relevant and 'crowds out' the potential impact of national origin.

Contrary to expectations are also the result for extracurricular activities, which do not have a significant effect under conditions of uncertainty. These activities are more likely to have an impact for profiles with bad credentials, as if the information on extracurriculars is interpreted in conjunction with the overall level of credentials. Again, a finding that speaks in favour of analyses of labour market signalling that consider signal interaction.

Our findings open up avenues for future research, in particular regarding the importance of the studying in more detail how different types of signals interact and shape employers' preferences. In in this article we were only able to highlight some suggestive evidence that such interactions exist between direct and probabilistic signals and that they matter for candidate evaluation. Future research should identify such interactions more systematically and understand why the same signal can impact different candidates differently.

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## Tables and Figures

**Table 1:** Vignette levels and dimensions

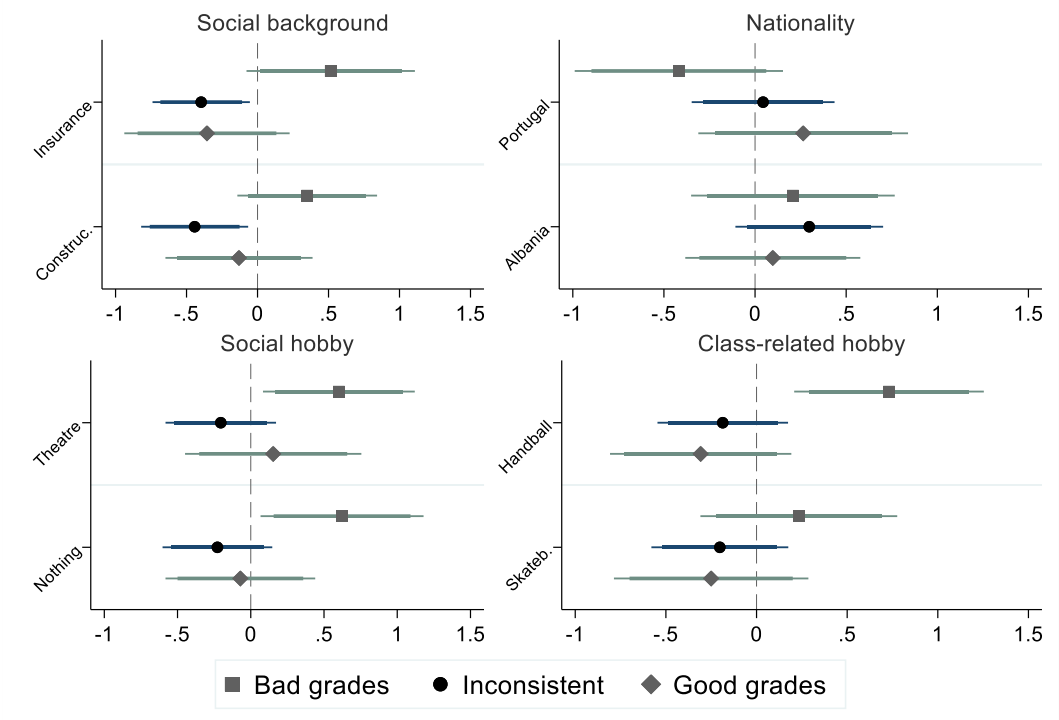
	Dimensions	Levels
<b>Direct signals</b>		
1	Grade in French	<ul style="list-style-type: none"> <li>- 5.0 (good)</li> <li>- 4.5 (satisfactory)</li> <li>- 4.0 (pass/sufficient)</li> </ul>
2	Grade in math	<ul style="list-style-type: none"> <li>- 5.0 (good)</li> <li>- 4.5 (satisfactory)</li> <li>- 4.0 (pass/sufficient)</li> </ul>
3	Educational track	<ul style="list-style-type: none"> <li>- VP (voie pre-gymnasiale)</li> <li>- VG (voie générale) with level 2 in math and French</li> <li>- VG (voie générale) with level 1 in math and French</li> </ul>
4	Attitude test score	<ul style="list-style-type: none"> <li>- 60 (very good)</li> <li>- 50 (satisfactory)</li> <li>- 40 (sufficient)</li> </ul>
<b>Probabilistic signals</b>		
5	Profession of the father	<ul style="list-style-type: none"> <li>- Doctor</li> <li>- Insurance consultant</li> <li>- Construction worker</li> </ul>
6	Hobby	<ul style="list-style-type: none"> <li>- Violin</li> <li>- Handball</li> <li>- Skateboarding (male candidates) / hip-hop dance (female candidates)</li> </ul>
7	Extra-curricular activity	<ul style="list-style-type: none"> <li>- Nothing (reference)</li> <li>- Scout leader</li> <li>- Member of a theatre company</li> </ul>
8	Nationality of parents	<ul style="list-style-type: none"> <li>- Swiss</li> <li>- Portuguese</li> <li>- Albanian</li> </ul>
9	Gender	<ul style="list-style-type: none"> <li>- Male</li> <li>- Female</li> <li>- Female</li> </ul>
3 <sup>9</sup> -full factorial 19683 combinations, D-efficient sample of 90.03		

**Table 2:** Multilevel model of factors influencing employers' evaluations of apprenticeship applicant profiles

<b>Model 1</b>		
<b>Direct signals</b>		
<i>Grades</i>		
<hr/>		
French 4 ref.		
French 4.5	0.473***	(0.040)
French 5	0.783***	(0.039)
Math 4 ref.		
Math 4.5	0.268***	(0.039)
Math 5	0.547***	(0.040)
<hr/>		
<i>Track</i>		
Low (VG1) ref.		
Medium (VG2)	0.323***	(0.040)
High (VP)	0.627***	(0.039)
<hr/>		
<i>Attitude test</i>		
Low (40p) ref.		
Medium (50p)	1.373***	(0.039)
High (60p)	1.578***	(0.040)
<hr/>		
<b>Probabilistic signals</b>		
<i>Socio-demographics</i>		
<hr/>		
Female ref.		
Male	-0.055	(0.034)
Switzerland ref.		
Portugal	0.029	(0.040)
Albania	0.016	(0.039)
Doctor ref.		
Insurance	-0.065	(0.039)
Construction	0.005	(0.040)
Violin ref.		
Handball	-0.020	(0.039)
Skateboarding	-0.018	(0.040)
Scout ref.		
Theatre	-0.050	(0.040)
Nothing	-0.207***	(0.039)
<hr/>		
<i>Position applied for</i>		
Higher skilled (CFC) ref.		
Lower skilled (AFP)	0.115***	(0.032)
<hr/>		
Var. respondent level	1.647	(0.092)
Var. vignette level	2.004	(0.034)
<hr/>		
Constant	4.889***	(0.081)
<hr/>		
N	7877	
aic	29643.488	
bic	29789.894	
Ll	-14800.744	

Standard errors in parentheses, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001.

**Figure 1:** Contrasts of predicted ratings for different uncertainty profiles and probabilistic signals



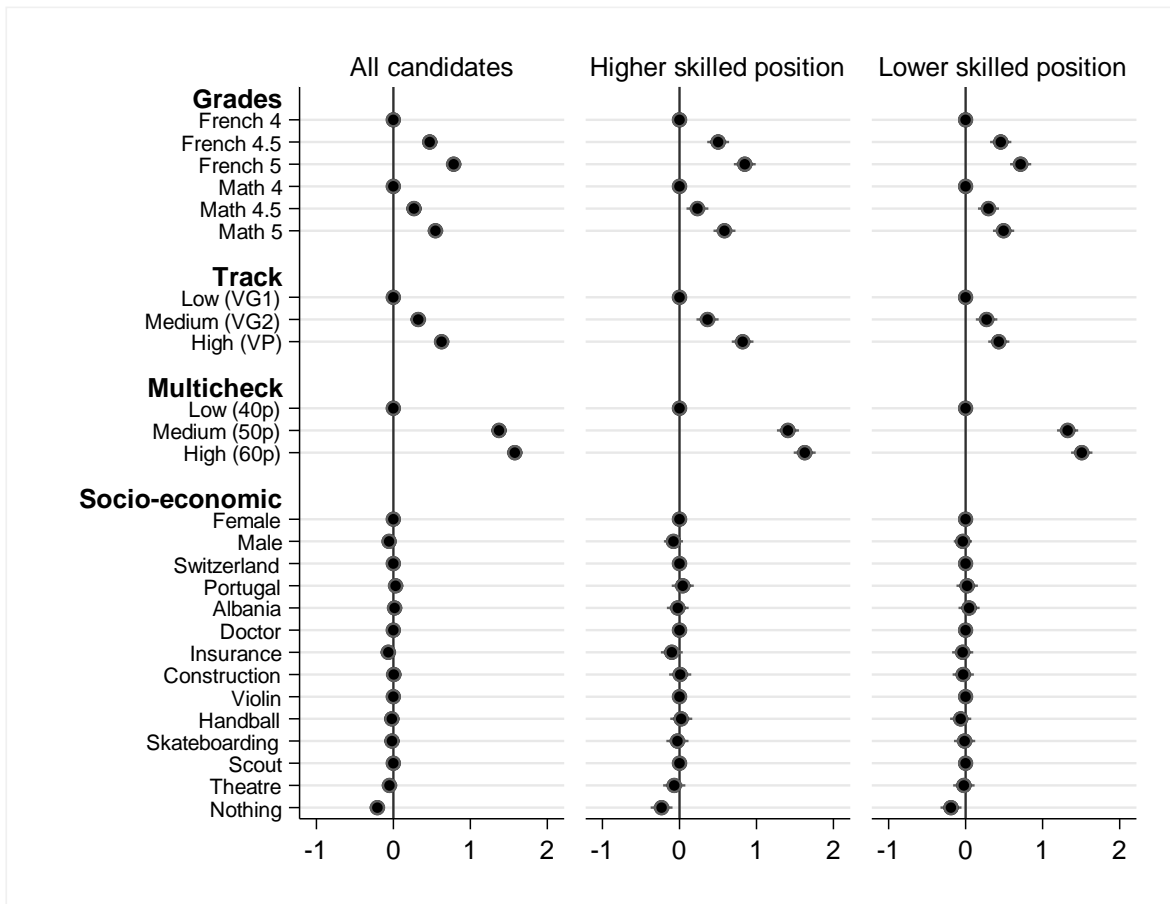
Contrasts of predicted ratings 90% and 90% confidence intervals

*Note:* Estimates are based on interaction models Table A2, Models 2-5 (shown in the appendix).

Reference categories are: social background: father is a doctor; nationality: Swiss; social hobby: scout leader; class-related hobby: violin.

## Appendix

**Figure A1:** Factors influencing employers' hiring decisions: results by occupations



Notes: Estimation based on Model 1 in Table 2.

**Table A1:** Alternative model specifications by occupations and with respondent characteristics

	All candidates				Higher-skilled position				Lower-skilled position			
	M1		M2		M3		M4		M5		M6	
<b>Candidate characteristics</b>												
<b>Direct signals</b>												
<i>Grades</i>												
French 4 ref.												
French 4.5	0.473***	(0.040)	0.452***	(0.041)	0.502***	(0.055)	0.491***	(0.057)	0.457***	(0.054)	0.429***	(0.055)
French 5	0.783***	(0.039)	0.746***	(0.041)	0.848***	(0.055)	0.820***	(0.057)	0.715***	(0.053)	0.664***	(0.055)
Math 4 ref.												
Math 4.5	0.268***	(0.039)	0.271***	(0.041)	0.233***	(0.055)	0.240***	(0.057)	0.297***	(0.053)	0.298***	(0.055)
Math 5	0.547***	(0.040)	0.551***	(0.041)	0.584***	(0.055)	0.581***	(0.057)	0.494***	(0.054)	0.505***	(0.055)
<i>Track</i>												
Low (VG1) ref.												
Medium (VG2)	0.323***	(0.040)	0.338***	(0.041)	0.364***	(0.056)	0.381***	(0.058)	0.273***	(0.054)	0.287***	(0.056)
High (VP)	0.627***	(0.039)	0.655***	(0.040)	0.820***	(0.055)	0.848***	(0.057)	0.431***	(0.053)	0.457***	(0.055)
<i>Attitude test</i>												
Low (40p) ref.												
Medium (50p)	1.373***	(0.039)	1.360***	(0.041)	1.409***	(0.055)	1.390***	(0.057)	1.326***	(0.053)	1.319***	(0.055)
High (60p)	1.578***	(0.040)	1.570***	(0.041)	1.627***	(0.056)	1.619***	(0.057)	1.509***	(0.054)	1.500***	(0.055)
<b>Probabilistic signals</b>												
<i>Socio-demographics</i>												
Female ref.												
Male	-0.055	(0.034)	-0.058	(0.035)	-0.079	(0.048)	-0.084†	(0.050)	-0.036	(0.046)	-0.034	(0.048)
Switzerland ref.												
Portugal	0.029	(0.040)	0.036	(0.041)	0.043	(0.055)	0.061	(0.057)	0.020	(0.054)	0.015	(0.055)
Albania	0.016	(0.039)	0.023	(0.041)	-0.022	(0.055)	-0.029	(0.057)	0.045	(0.053)	0.068	(0.055)
Doctor ref.												
Insurance	-0.065†	(0.039)	-0.064	(0.041)	-0.100†	(0.055)	-0.092	(0.057)	-0.038	(0.053)	-0.046	(0.055)
Construction	0.005	(0.040)	-0.000	(0.041)	0.009	(0.055)	0.010	(0.057)	-0.031	(0.054)	-0.049	(0.055)
Violin ref.												
Handball	-0.020	(0.039)	-0.019	(0.041)	0.022	(0.055)	0.022	(0.057)	-0.064	(0.053)	-0.055	(0.055)
Skateboarding	-0.018	(0.040)	-0.018	(0.041)	-0.026	(0.056)	-0.023	(0.058)	-0.013	(0.054)	-0.014	(0.055)
Scout ref.												
Theatre	-0.050	(0.040)	-0.039	(0.041)	-0.068	(0.056)	-0.060	(0.058)	-0.022	(0.054)	-0.007	(0.056)
Nothing	-0.207***	(0.039)	-0.194***	(0.040)	-0.232***	(0.055)	-0.227***	(0.057)	-0.189***	(0.053)	-0.170**	(0.054)
<b>Controls</b>												

<i>Position applied for</i>								
Higher skilled (CFC) ref.								
Lower skilled (AFP)	0.115***	(0.032)	0.116***	(0.033)				
<b>Firm characteristics</b>								
1-9 empl. ref.								
10-49 empl.			-0.053	(0.132)		-0.064	(0.138)	-0.034 (0.151)
50-249 empl.			0.224	(0.145)		0.195	(0.150)	0.239 (0.166)
>250 empl.			0.375*	(0.176)		0.301	(0.183)	0.466* (0.206)
<i>Firm type</i>								
Public firm ref.								
Private-public			0.153	(0.244)		0.199	(0.254)	0.070 (0.277)
Independent enterprise			-0.269	(0.178)		-0.284	(0.185)	-0.224 (0.201)
Enterprise part of a franchise			-0.591†	(0.327)		-0.399	(0.341)	-0.767* (0.367)
Non-profit organisation			0.387	(0.253)		0.487†	(0.263)	0.286 (0.285)
Other			0.176	(0.241)		0.212	(0.251)	0.149 (0.274)
<i>Sector</i>								
Pub. admin ref.								
Insurance			-0.526	(0.324)		-0.677*	(0.336)	-0.245 (0.378)
Bank			0.164	(0.363)		-0.124	(0.378)	0.452 (0.408)
Commerce			-0.266	(0.237)		-0.427†	(0.247)	-0.097 (0.269)
Real estate and trusteeship			0.159	(0.240)		0.038	(0.250)	0.292 (0.276)
Machine ind.			-0.226	(0.286)		-0.430	(0.298)	0.015 (0.322)
Service and administration			-0.136	(0.203)		-0.252	(0.211)	0.053 (0.230)
Pub. transport			-1.381*	(0.603)		-1.218†	(0.623)	-1.912** (0.740)
Other sector			-0.057	(0.202)		-0.199	(0.210)	0.113 (0.229)
<b>Respondent characteristics</b>								
Resp. age			-0.001	(0.006)		-0.002	(0.006)	-0.000 (0.006)
Resp. Swiss			-0.251	(0.154)		-0.272†	(0.160)	-0.205 (0.176)
Resp. gender			-0.134	(0.106)		-0.080	(0.110)	-0.169 (0.120)
No. years worked in firm			0.003	(0.006)		0.000	(0.007)	0.007 (0.007)
Vocational instructor			0.318	(0.257)		0.302	(0.268)	0.326 (0.288)

Influence hiring decision		0.018	(0.069)			0.023	(0.071)			-0.008	(0.078)	
Difficulty recruiting		-0.206***	(0.052)			-0.229***	(0.054)			-0.185**	(0.059)	
Constant	4.889***	(0.081)	5.480***	(0.494)	4.781***	(0.102)	5.638***	(0.518)	5.148***	(0.102)	5.472***	(0.561)
Var. respondent level	1.647	(0.092)	1.442	(0.085)	1.652	(0.102)	1.393	(0.093)	1.859	(0.113)	1.709	(0.109)
Var. vignette level	2.004	(0.037)	2.005	(0.349)	1.975	(0.049)	1.980	(0.051)	1.766	(0.045)	1.746	(0.046)
N	7877		7367		4020		3766		3857		3601	
aic	29643.488		27685.098		15509.527		14481.774		14597.427		13591.083	
bic	29789.894		27982.003		15635.508		14743.592		14722.580		13851.020	
ll	-14800.744		-13799.549		-7734.763		-7198.887		-7278.713		-6753.542	

Standard errors in parentheses, † p<0.1, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001.  
These are alternative specifications of the Model 1 in Table 2.



**Table A2:** Multilevel model of the effect of the interaction between uncertainty and probabilistic signals on employers' evaluations of apprenticeship applicant profiles

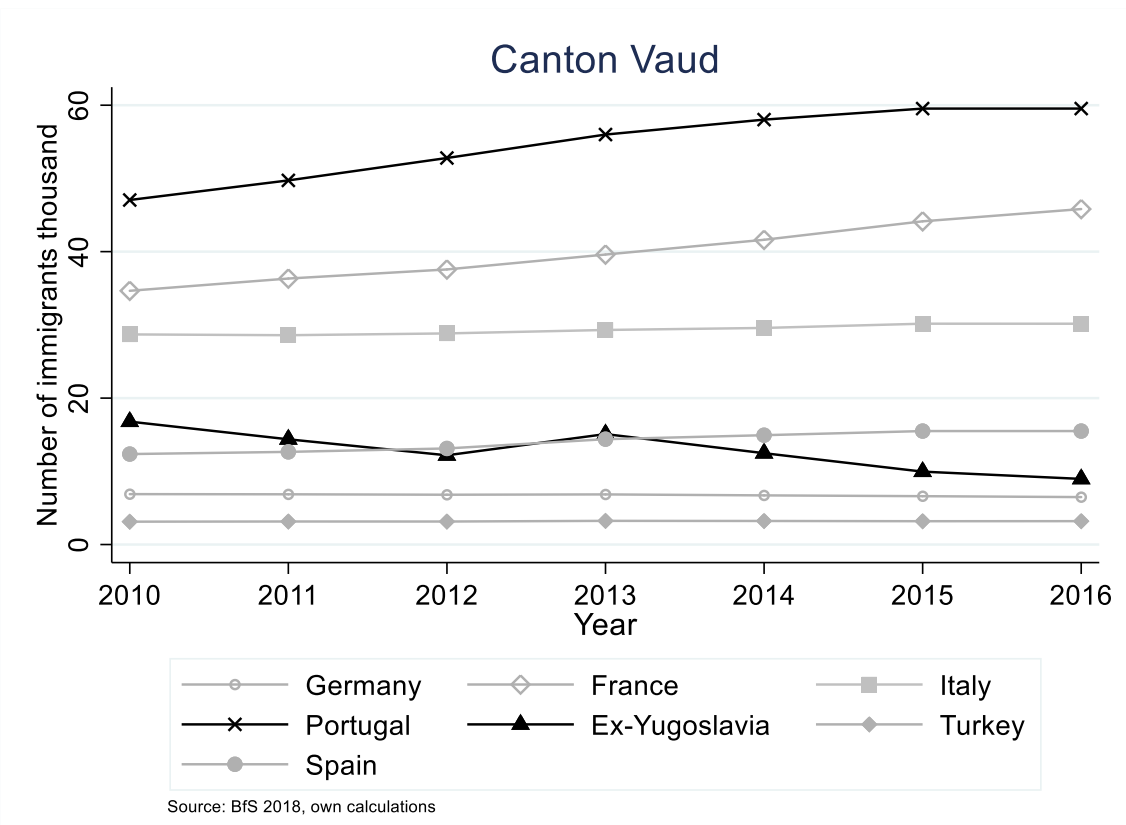
	(1) Vignettes and uncertainty	(2) Interaction with nationality	(3) Interaction with father's profession	(4) Interaction with social hobby	(5) Interaction with class- related hobby					
VGI (ref)										
VGs	<b>0.308*</b>	<b>(0.129)</b>	<b>0.356**</b>	<b>(0.136)</b>	<b>0.285*</b>	<b>(0.130)</b>	<b>0.401**</b>	<b>(0.139)</b>	0.247	(0.131)
VP	<b>0.696***</b>	<b>(0.128)</b>	<b>0.714***</b>	<b>(0.130)</b>	<b>0.681***</b>	<b>(0.129)</b>	<b>0.749***</b>	<b>(0.131)</b>	<b>0.672***</b>	<b>(0.130)</b>
Violin (ref)										
Hanball	0.012	(0.133)	-0.034	(0.137)	-0.080	(0.137)	0.014	(0.134)	<b>0.731**</b>	<b>(0.267)</b>
Skateboard	-0.129	(0.133)	-0.158	(0.140)	-0.217	(0.142)	-0.074	(0.134)	0.233	(0.277)
Scout (ref)										
Theatre	0.093	(0.135)	0.100	(0.135)	0.224	(0.151)	<b>0.601*</b>	<b>(0.264)</b>	0.070	(0.138)
Nothing	0.022	(0.132)	-0.005	(0.136)	0.013	(0.142)	<b>0.623*</b>	<b>(0.284)</b>	0.017	(0.135)
Female (ref)										
Male	-0.114	(0.113)	-0.076	(0.116)	-0.120	(0.116)	-0.074	(0.118)	-0.049	(0.116)
Switzerland (ref)										
Portugal	-0.044	(0.140)	-0.418	(0.292)	-0.012	(0.143)	0.065	(0.153)	0.014	(0.149)
Albania	0.239	(0.132)	0.208	(0.285)	0.263	(0.136)	<b>0.278*</b>	<b>(0.137)</b>	0.222	(0.141)
Doctor (ref)										
Insurance	-0.161	(0.127)	-0.183	(0.128)	0.515	(0.303)	-0.163	(0.141)	-0.231	(0.137)
Construction	-0.129	(0.126)	-0.171	(0.127)	0.350	(0.251)	-0.194	(0.138)	-0.206	(0.128)
CFC (ref)										
ADF	0.164	(0.100)	0.162	(0.100)	0.155	(0.100)	0.153	(0.100)	0.156	(0.100)
Consistently bad grades (ref)										
<b>Inconsistent profiles</b>	<b>1.269***</b>	<b>(0.133)</b>	<b>1.069***</b>	<b>(0.272)</b>	<b>1.796***</b>	<b>(0.225)</b>	<b>1.818***</b>	<b>(0.232)</b>	<b>1.721***</b>	<b>(0.224)</b>
<b>Consistently good grades</b>	<b>2.782***</b>	<b>(0.142)</b>	<b>2.620***</b>	<b>(0.285)</b>	<b>3.233***</b>	<b>(0.286)</b>	<b>3.169***</b>	<b>(0.257)</b>	<b>3.298***</b>	<b>(0.253)</b>
Portugal #		0.462	(0.361)							
Inconsistent Portugal #		0.682	(0.416)							
Good grades Albania #		0.090	(0.358)							
Inconsistent										

Albania # Good grades			-0.111	(0.396)						
<b>Insurance # Inconsistent</b>					<b>-0.912*</b>		<b>(0.355)</b>			
Insurance # Good grades					-0.871		(0.461)			
<b>Construction # Inconsistent</b>					<b>-0.793*</b>		<b>(0.318)</b>			
Construction # Good grades					-0.481		(0.391)			
<b>Theatre # Inconsistent</b>								<b>-0.806*</b>		<b>(0.335)</b>
Theatre # Good grades								-0.448		(0.410)
<b>Nothing # Inconsistent</b>									<b>-0.851*</b>	<b>(0.332)</b>
Nothing # Good grades								-0.694		(0.408)
<b>Handball # Inconsistent</b>									<b>-0.917**</b>	<b>(0.323)</b>
<b>Handball # Good grades</b>									<b>-1.039**</b>	<b>(0.369)</b>
Skateboard # Inconsistent									-0.436	(0.341)
Skateboard # Good grades									-0.484	(0.390)
Constant	4.875***	(0.214)	5.039***	(0.287)	4.535***	(0.247)	4.416***	(0.270)	4.571***	(0.260)
Var. respondent level	1.289	(0.165)	1.293	(0.164)	1.302	(0.165)	1.279	(0.165)	1.290	(0.164)
Variance vignette level	2.521	(0.142)	2.504	(0.141)	2.490	(0.140)	2.504	(0.142)	2.493	(0.140)
N	1245		1245		1245		1245		1245	
aic	5147.069		5149.868		5146.279		5146.616		5145.201	
bic	5234.226		5257.533		5253.944		5254.281		5252.866	
ll	-2556.534		-2553.934		-2552.140		-2552.308		-2551.601	

Note: Standard errors in parentheses, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001.

Supplementary material for the article: What signals do employers use when hiring? Evidence from a survey experiment in the apprenticeship market

Figure S1: Largest immigrant groups in the French-Speaking Canton of Vaud, Switzerland (2010-2016)



**Table S1:** Experimental protocol

Date	Step
3 March 2017	Postal letter announcing the survey
8 March 2017	Electronic survey link
14 March 2017	Reminder to those who had not yet responded
3 April 2017	Second reminder to those who had not yet responded
	Survey closed
Response rate	63.20 per cent (completed surveys 840 of 1329)

Figure S2: First screen of the vignette experiment: Instructions about the task of evaluating two different apprenticeship positions

## Evaluation

Dans la partie qui suit, nous allons vous demander d'évaluer quelques candidat·e·s fictif·ve·s de deux apprentissages différents: **Employé·e de commerce CFC (profil élargi)** et **Assistant·e de commerce de détail (AFP)**.

Figure S3: Second screen of the vignette experiment: Description of apprenticeship positions

## Employé·e de commerce CFC (profil élargi)

Nous vous présentons à présent **cinq candidat·e·s fictif·ve·s** pour un apprentissage d'**Employé·e de commerce CFC (profil élargi)** dans votre entreprise/organisation.

(Dans le cas où votre entreprise/organisation n'embauche pas ce type d'apprenti·e, veuillez néanmoins évaluer ces candidat·e·s en **imaginant** qu'une décision sera prise de mettre au concours un poste de ce type dans un avenir proche.)

**Veillez noter que chaque profil doit être évalué indépendamment l'un de l'autre.**

Tous les candidats ont **16 ans**, ils/elles ont **achevé l'école obligatoire en Suisse** et ils/elles sont très **motivé·e·s** par la perspective d'entamer leur formation professionnelle.

**Figure S4: Third to seventh screens:** Respondents are presented with five candidate descriptions (order is randomized)

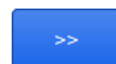


### Candidat(e)

La candidate a des parents d'origine suisse. La profession de son père est ouvrier dans le secteur de la construction. À l'école, elle a suivi la voie générale niveau 1 en maths et en français. Elle a atteint la note de 4.5 en français et la note de 4.0 en mathématiques. Dans un test d'aptitude Multicheck, elle a obtenu une valeur de 60 comme résultat global, indiquant qu'elle a dépassé les exigences pour un apprentissage dans la profession concernée. Dans son temps libre, elle fait de la danse hip-hop. De plus, elle est cheffe scout.

*Veillez indiquer dans quelle mesure vous seriez prêt(e) à engager ce(tte) candidat(e), 0 = pas du tout prêt(e), 10 = tout à fait prêt(e).*

Pas du tout prêt(e) 0	1	2	3	4	5	6	7	8	9	Tout à fait prêt(e) 10
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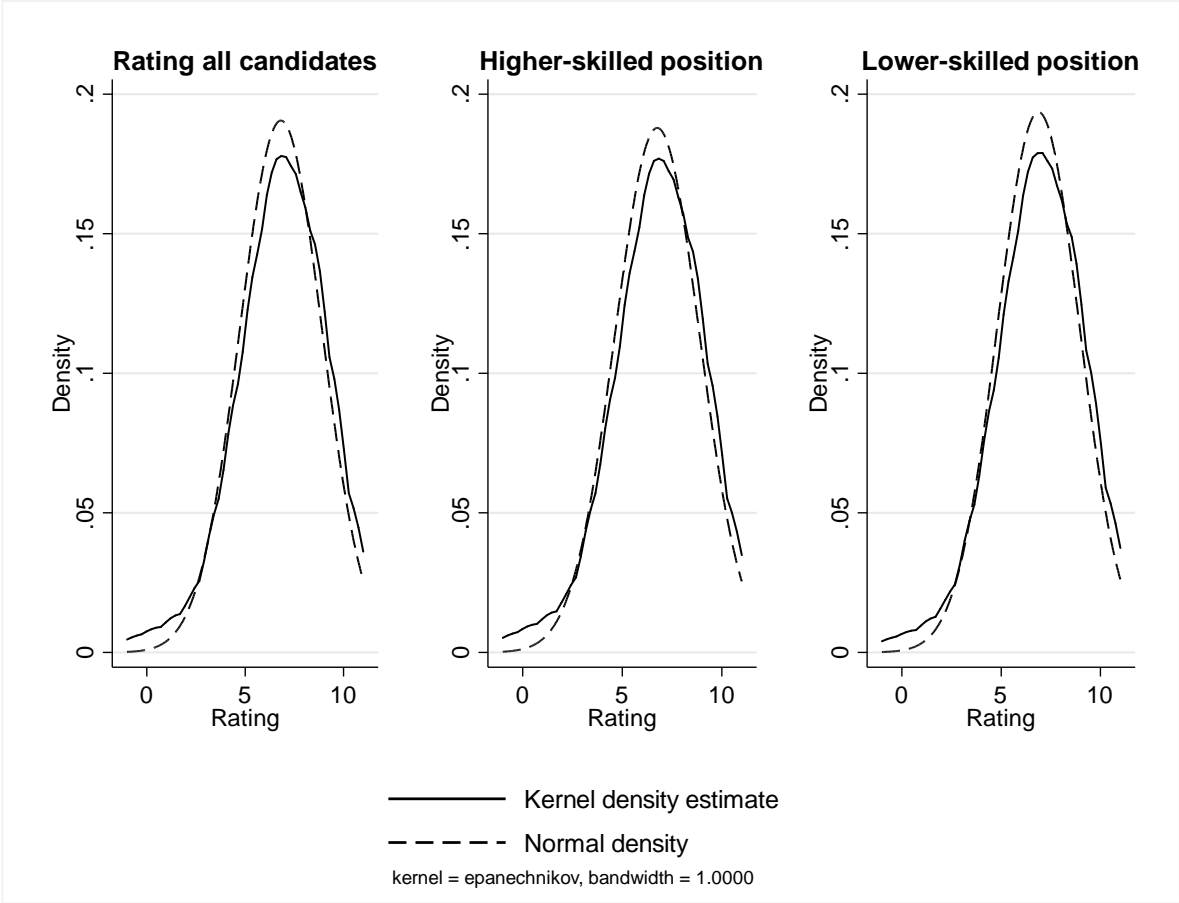
*Note:* This experiment was followed by a second experiment for the second apprenticeship position. The order of the experiments is randomised.

## Experimental robustness

**Table S2:** Correlation matrix for all candidates by occupation, whole sample (N=7877)

<b>All candidates</b>	Gender	Nationality	Profession	French	Math	AT	Track	Hobby 1	Hobby 2
Gender	1								
Nationality	0.01	1							
Profession	0.01	0.00	1						
French	0.00	0.02	0.01	1					
Math	-0.00	0.00	-0.00	0.01	1				
AT test	-0.00	0.01	-0.00	0.00	0.02	1			
Track	0.01	0.01	0.03	0.00	0.03	-0.01	1		
Hobby	-0.01	0.01	-0.01	-0.00	0.01	0.0018	-0.02	1	
Extra-activity	-0.02	-0.01	0.00	0.01	-0.02	-0.01	0.01	0.01	1
<b>Higher-skilled position (CFC)</b>	Gender	Nationality	Profession	French	Math	AT	Track	Hobby 1	Hobby 2
Gender	1								
Nationality	0.00	1							
Profession	0.03	0.00	1						
French	-0.01	0.00	0.01	1					
Math	0.01	0.00	0.02	0.01	1				
AT test	0.01	-0.01	0.00	0.01	0.01	1			
Track	-0.01	-0.01	0.04	0.01	-0.01	-0.01	1		
Hobby	0.01	0.00	-0.03	0.00	0.01	0.00	-0.01	1	
Extra-activity	-0.01	0.02	-0.01	-0.02	-0.02	-0.01	0.01	0.00	1.00
<b>Lower-skilled position (AFD)</b>	Gender	Nationality	Profession	French	Math	AT	Track	Hobby 1	Hobby 2
Gender	1								
Nationality	0.04	1							
Profession	0.04	-0.01	1						
French	0.00	-0.01	-0.01	1					
Math	0.00	0.01	0.01	0.01	1				
AT test	0.01	0.00	0.02	0.01	0.03	1			
Track	0.01	-0.01	0.02	0.02	0.00	0.01	1		
Hobby	0.01	0.00	-0.02	-0.02	0.02	0.01	0.00	1	
Extra-activity	-0.01	-0.01	0.02	-0.02	-0.03	-0.01	-0.01	0.01	1.00

Figure S5: Distribution of the dependent variable: employers' rating of apprentice profiles by occupation (whole sample, N=7877)



**Table S3:** Correlations between vignette dimensions and employer characteristics (whole sample, vignette N=7877)

<b>Vignette dimensions</b>	Gender	Nationality	Profession	French	Math	AT	Track	Hobby 1	Hobby 2
Gender	1								
Nationality	0.02	1							
Profession	0.04	-0.01	1						
French	0.00	0.00	0.01	1					
Math	0.00	0.01	0.01	0.01	1				
AT test	0.00	0.00	-0.00	0.00	0.02	1			
Track	-0.00	-0.00	0.03	0.00	0.00	0.01	1		
Hobby	0.00	0.01	-0.02	-0.01	0.02	0.00	-0.00	1	
Extra-activity	-0.01	-0.01	0.01	-0.02	-0.01	0.01	0.00	0.01	1
<b>Respondent/ firm characteristics</b>									
Gender resp.	-0.01	-0.00	0.01	0.00	-0.00	0.00	-0.00	0.00	0.00
Nationality resp.	-0.00	-0.00	0.00	0.00	0.01	-0.00	-0.00	0.00	-0.00
Age resp.	-0.00	-0.00	0.00	0.00	0.00	0.01	-0.00	-0.00	-0.00
Difficulty recruiting apprentices	-0.00	-0.00	-0.01	-0.01	-0.00	-0.00	0.00	0.01	0.00
No. apprentices	0.01	0.00	-0.00	0.00	-0.00	-0.01	-0.00	-0.01	0.00
No. employees	0.00	0.01	-0.00	0.00	0.00	-0.00	-0.00	-0.01	-0.01
Years worked frim	-0.00	0.01	-0.00	0.01	-0.00	0.01	-0.00	-0.00	-0.00
Years recruiting experience	0.00	-0.00	-0.01	0.01	0.00	0.00	-0.01	-0.00	-0.00

**Table S4:** Interactions of direct signals with nationality

	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)	(Model 7)
French 4 ref.							
French 4.5	0.473*** (0.040)	0.496*** (0.070)	0.473*** (0.040)	0.471*** (0.040)	0.474*** (0.040)	0.473*** (0.040)	0.473*** (0.040)
French 5	0.783*** (0.039)	0.762*** (0.070)	0.781*** (0.039)	0.782*** (0.039)	0.783*** (0.039)	0.781*** (0.039)	0.785*** (0.039)
Math 4 ref.							
Math 4.5	0.268*** (0.039)	0.268*** (0.039)	0.111 (0.070)	0.267*** (0.039)	0.269*** (0.039)	0.270*** (0.039)	0.270*** (0.039)
Math 5	0.547*** (0.040)	0.549*** (0.040)	0.507*** (0.070)	0.545*** (0.040)	0.548*** (0.040)	0.547*** (0.040)	0.548*** (0.040)
Low track ref.							
Medium track	0.323*** (0.040)	0.320*** (0.040)	0.321*** (0.040)	0.317*** (0.071)	0.325*** (0.040)	0.323*** (0.040)	0.322*** (0.040)
High track	0.627*** (0.039)	0.628*** (0.039)	0.627*** (0.039)	0.608*** (0.069)	0.629*** (0.039)	0.627*** (0.039)	0.626*** (0.039)
Low AT (40p) ref.							
Medium AT (50p)	1.373*** (0.039)	1.371*** (0.039)	1.377*** (0.040)	1.372*** (0.039)	1.427*** (0.070)	1.372*** (0.039)	1.372*** (0.039)
High AT (60p)	1.578*** (0.040)	1.577*** (0.040)	1.576*** (0.040)	1.576*** (0.040)	1.629*** (0.070)	1.576*** (0.040)	1.576*** (0.040)
Female ref.							
Male	-0.055 (0.034)	-0.054 (0.034)	-0.059° (0.034)	-0.055 (0.034)	-0.054 (0.034)	-0.055 (0.062)	-0.055 (0.034)
Switzerland ref.							
Portugal	0.029 (0.040)	-0.008 (0.070)	-0.107 (0.071)	0.045 (0.070)	0.055 (0.072)	0.051 (0.050)	-0.015 (0.070)
Albania	0.016 (0.039)	0.053 (0.070)	-0.047 (0.070)	-0.024 (0.070)	0.096 (0.070)	-0.004 (0.048)	0.109 (0.070)
Doctor ref.							
Insurance	-0.065° (0.039)	-0.065° (0.039)	-0.064 (0.039)	-0.065° (0.039)	-0.066° (0.039)	-0.065 (0.039)	-0.019 (0.070)
Construction	0.005 (0.040)	0.006 (0.040)	0.008 (0.040)	0.007 (0.040)	0.006 (0.040)	0.005 (0.040)	0.007 (0.069)
Violin ref.							
Handball	-0.020 (0.039)	-0.019 (0.040)	-0.022 (0.039)	-0.018 (0.039)	-0.021 (0.039)	-0.021 (0.039)	-0.021 (0.039)
Skateboard	-0.018 (0.040)	-0.020 (0.040)	-0.015 (0.040)	-0.015 (0.040)	-0.017 (0.040)	-0.018 (0.040)	-0.019 (0.040)
Scout ref.							
Theatre	-0.050 (0.040)	-0.051 (0.040)	-0.041 (0.040)	-0.052 (0.040)	-0.051 (0.040)	-0.053 (0.040)	-0.052 (0.040)
Nothing	-0.207*** (0.039)	-0.208*** (0.039)	-0.201*** (0.039)	-0.209*** (0.039)	-0.207*** (0.039)	-0.210*** (0.039)	-0.209*** (0.039)
CFC ref.							
ADF	0.115*** (0.032)	0.114*** (0.032)	0.114*** (0.032)	0.115*** (0.032)	0.114*** (0.032)	0.115*** (0.032)	0.115*** (0.032)
<i>Interactions</i>							
Portugal #		0.020 (0.101)					
French 4.5							

French 5	0.092	(0.102)		
Albania #	-0.087	(0.102)		
French 4.5				
Albania #	-0.024	(0.103)		
French 5				
Portugal #	0.304**	(0.102)		
Math 4.5				
Portugal #	0.104	(0.103)		
Math 5				
Albania #	0.175°	(0.100)		
Math 4.5				
Albania #	0.016	(0.100)		
Math 5				
Portugal #			-0.007	(0.102)
VGs				
Portugal # VP			-0.042	(0.101)
Albania # VGs			0.024	(0.102)
Albania # VP			0.096	(0.100)
Portugal #				-0.099 (0.101)
Medium				
(50p)				
Portugal #			0.022	(0.104)
High (60p)				
Albania #			-0.066	(0.101)
Medium				
(50p)				
Albania #			-0.173°	(0.100)
High (60p)				
Male #				-0.061 (0.090)
Portugal				
Male #				0.058 (0.088)
Albania				
Portugal #				0.035 (0.101)
Insurance				
Portugal #				0.098 (0.102)
Construction				
Albania #				-0.170° (0.100)
Insurance				
Albania #				-0.102 (0.100)

Construction

Constant	4.889***	(0.081)	4.890***	(0.088)	4.951***	(0.088)	4.899***	(0.088)	4.851***	(0.089)	4.892***	(0.083)	4.875***	(0.087)
N	7877.000		7877.000		7877.000		7877.000		7877.000		7877.000		7877.000	
aic	29643.488		29649.315		29641.816		29649.379		29644.554		29645.680		29645.380	
bic	29789.894		29823.608		29816.108		29823.672		29818.846		29806.029		29819.673	
ll	-14800.744		-14799.658		-14795.908		-14799.690		-14797.277		-14799.840		-14797.690	

Standard errors in parentheses

° p<0.1, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table S5:** Interactions of individual direct signals with gender

	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)	(Model 7)
French 4 ref.							
French 4.5	0.473*** (0.040)	0.464*** (0.049)	0.472*** (0.040)	0.471*** (0.040)	0.472*** (0.040)	0.473*** (0.040)	0.472*** (0.040)
French 5	0.783*** (0.039)	0.789*** (0.049)	0.784*** (0.039)	0.783*** (0.039)	0.781*** (0.039)	0.781*** (0.039)	0.783*** (0.039)
Math 4 ref.							
Math 4.5	0.268*** (0.039)	0.268*** (0.039)	0.276*** (0.049)	0.271*** (0.039)	0.265*** (0.039)	0.270*** (0.039)	0.266*** (0.039)
Math 5	0.547*** (0.040)	0.548*** (0.040)	0.572*** (0.049)	0.549*** (0.040)	0.545*** (0.040)	0.547*** (0.040)	0.547*** (0.040)
Low track ref.							
Medium track	0.323*** (0.040)	0.323*** (0.040)	0.323*** (0.040)	0.297*** (0.050)	0.323*** (0.040)	0.323*** (0.040)	0.324*** (0.040)
High track	0.627*** (0.039)	0.627*** (0.039)	0.627*** (0.039)	0.570*** (0.050)	0.626*** (0.039)	0.627*** (0.039)	0.628*** (0.039)
Low (40p) ref.							
Medium (50p)	1.373*** (0.039)	1.373*** (0.039)	1.373*** (0.039)	1.374*** (0.039)	1.367*** (0.049)	1.372*** (0.039)	1.373*** (0.039)
High (60p)	1.578*** (0.040)	1.578*** (0.040)	1.579*** (0.040)	1.577*** (0.040)	1.533*** (0.049)	1.576*** (0.040)	1.577*** (0.040)
Female ref.							
Male	-0.055 (0.034)	-0.058 (0.060)	-0.023 (0.061)	-0.136* (0.062)	-0.106° (0.062)	-0.055 (0.062)	-0.097 (0.061)
Switzerland ref.							
Portugal	0.029 (0.040)	0.028 (0.040)	0.028 (0.040)	0.034 (0.040)	0.030 (0.040)	0.051 (0.050)	0.029 (0.040)
Albania	0.016 (0.039)	0.016 (0.039)	0.016 (0.039)	0.021 (0.039)	0.016 (0.039)	-0.004 (0.048)	0.017 (0.039)
Doctor ref.							
Insurance	-0.065° (0.039)	-0.066° (0.039)	-0.066° (0.039)	-0.064 (0.039)	-0.066° (0.039)	-0.065 (0.039)	-0.098* (0.048)
Construction	0.005 (0.040)	0.005 (0.040)	0.005 (0.040)	0.006 (0.040)	0.005 (0.040)	0.005 (0.040)	-0.001 (0.049)
Violin ref.							
Handball	-0.020 (0.039)	-0.020 (0.039)	-0.018 (0.040)	-0.018 (0.039)	-0.021 (0.039)	-0.021 (0.039)	-0.019 (0.039)
Skateboard	-0.018 (0.040)	-0.018 (0.040)	-0.016 (0.040)	-0.015 (0.040)	-0.019 (0.040)	-0.018 (0.040)	-0.017 (0.040)
Scout ref.							
Theatre	-0.050 (0.040)	-0.050 (0.040)	-0.051 (0.040)	-0.052 (0.040)	-0.050 (0.040)	-0.053 (0.040)	-0.050 (0.040)
Nothing	-0.207*** (0.039)	-0.206*** (0.039)	-0.209*** (0.039)	-0.207*** (0.039)	-0.208*** (0.039)	-0.210*** (0.039)	-0.206*** (0.039)
CFC ref.							
ADF	0.115*** (0.032)	0.115*** (0.032)	0.115*** (0.032)	0.114*** (0.032)	0.115*** (0.032)	0.115*** (0.032)	0.115*** (0.032)
Male #		0.026 (0.087)					
French 4.5							
Male #		-0.017 (0.087)					

French 5														
Male # Math 4.5														
Male # Math 5														
Male # VGs							0.072	(0.091)						
Male # VP							0.167°	(0.088)						
Male # Medium (50p)									0.021	(0.088)				
Male # High (60p)											0.134	(0.089)		
Male # Portugal													-0.061	(0.090)
Male # Albania													0.058	(0.088)
Male # Insurance														0.102 (0.087)
Male # Construction														0.022 (0.087)
Constant	4.889***	(0.081)	4.890***	(0.083)	4.878***	(0.083)	4.912***	(0.083)	4.910***	(0.083)	4.892***	(0.083)	4.901***	(0.083)
N	7877.000		7877.000		7877.000		7877.000		7877.000		7877.000		7877.000	
aic	29643.488		29647.252		29646.702		29643.882		29644.822		29645.680		29646.000	
bic	29789.894		29807.601		29807.052		29804.231		29805.171		29806.029		29806.349	
ll	-14800.744		-14800.626		-14800.351		-14798.941		-14799.411		-14799.840		-14800.000	

Standard errors in parentheses  
° p<0.1, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table S6:** Interactions of individual direct signals with profession

	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)	(Model 7)
French 4 ref.							
French 4.5	0.473*** (0.040)	0.465*** (0.071)	0.478*** (0.040)	0.474*** (0.040)	0.475*** (0.040)	0.473*** (0.040)	0.472*** (0.040)
French 5	0.783*** (0.039)	0.802*** (0.072)	0.783*** (0.039)	0.783*** (0.039)	0.785*** (0.039)	0.785*** (0.039)	0.783*** (0.039)
Math 4 ref.							
Math 4.5	0.268*** (0.039)	0.270*** (0.039)	0.357*** (0.070)	0.264*** (0.039)	0.268*** (0.039)	0.270*** (0.039)	0.266*** (0.039)
Math 5	0.547*** (0.040)	0.547*** (0.040)	0.500*** (0.071)	0.543*** (0.040)	0.548*** (0.040)	0.548*** (0.040)	0.547*** (0.040)
Low track ref.							
Medium track	0.323*** (0.040)	0.322*** (0.040)	0.327*** (0.040)	0.288*** (0.070)	0.323*** (0.040)	0.322*** (0.040)	0.324*** (0.040)
High track	0.627*** (0.039)	0.625*** (0.039)	0.628*** (0.039)	0.523*** (0.069)	0.626*** (0.039)	0.626*** (0.039)	0.628*** (0.039)
Low (40p) ref.							
Medium (50p)	1.373*** (0.039)	1.375*** (0.039)	1.376*** (0.039)	1.373*** (0.039)	1.311*** (0.069)	1.372*** (0.039)	1.373*** (0.039)
High (60p)	1.578*** (0.040)	1.581*** (0.040)	1.578*** (0.040)	1.580*** (0.040)	1.564*** (0.071)	1.576*** (0.040)	1.577*** (0.040)
Female ref.							
Male	-0.055 (0.034)	-0.056 (0.034)	-0.055 (0.034)	-0.052 (0.034)	-0.055 (0.034)	-0.055 (0.034)	-0.097 (0.061)
Switzerland ref.							
Portugal	0.029 (0.040)	0.029 (0.040)	0.027 (0.040)	0.029 (0.040)	0.029 (0.040)	-0.015 (0.070)	0.029 (0.040)
Albania	0.016 (0.039)	0.016 (0.039)	0.014 (0.039)	0.018 (0.039)	0.017 (0.039)	0.109 (0.070)	0.017 (0.039)
Doctor ref.							
Insurance	-0.065° (0.039)	-0.123° (0.071)	-0.056 (0.070)	-0.160* (0.068)	-0.127° (0.072)	-0.019 (0.070)	-0.098* (0.048)
Construction	0.005 (0.040)	0.074 (0.071)	0.047 (0.070)	-0.038 (0.070)	-0.012 (0.071)	0.007 (0.069)	-0.001 (0.049)
Violin ref.							
Handball	-0.020 (0.039)	-0.019 (0.040)	-0.017 (0.040)	-0.021 (0.039)	-0.018 (0.039)	-0.021 (0.039)	-0.019 (0.039)
Skateboard	-0.018 (0.040)	-0.016 (0.040)	-0.016 (0.040)	-0.012 (0.040)	-0.016 (0.040)	-0.019 (0.040)	-0.017 (0.040)
Scout ref.							
Theatre	-0.050 (0.040)	-0.049 (0.040)	-0.047 (0.040)	-0.050 (0.040)	-0.050 (0.040)	-0.052 (0.040)	-0.050 (0.040)
Nothing	-0.207*** (0.039)	-0.206*** (0.039)	-0.211*** (0.039)	-0.205*** (0.039)	-0.207*** (0.039)	-0.209*** (0.039)	-0.206*** (0.039)
CFC ref.							
ADF	0.115*** (0.032)	0.115*** (0.032)	0.115*** (0.032)	0.115*** (0.032)	0.116*** (0.032)	0.115*** (0.032)	0.115*** (0.032)
Insurance #		0.116 (0.105)					
French 4.5							
Insurance #		0.058 (0.101)					

French 5 Construction # French 4.5	-0.091	(0.102)		
Construction # French 5	-0.117	(0.104)		
Insurance # Math 4.5	-0.095	(0.100)		
Insurance # Math 5	0.070	(0.103)		
Construction # Math 4.5	-0.179°	(0.102)		
Construction # Math 5	0.063	(0.103)		
Insurance # VGs			0.124	(0.101)
Insurance # VP			0.164°	(0.099)
Construction # VGs			-0.018	(0.103)
Construction # VP			0.148	(0.101)
Insurance # Medium (50p)			0.126	(0.101)
Insurance # High (60p)			0.056	(0.102)
Construction # Medium (50p)			0.061	(0.101)
Construction # High (60p)			-0.011	(0.103)
Insurance # Portugal			0.035	(0.101)
Insurance # Albania			-0.170°	(0.100)
Construction # Portugal			0.098	(0.102)
Construction # Albania			-0.102	(0.100)

Male #											0.102	(0.087)		
Insurance														
Male #											0.022	(0.087)		
Construction														
Constant	4.889***	(0.081)	4.883***	(0.087)	4.868***	(0.087)	4.931***	(0.088)	4.911***	(0.087)	4.875***	(0.087)	4.901***	(0.083)
N	7877.000		7877.000		7877.000		7877.000		7877.000		7877.000		7877.000	
aic	29643.488		29646.504		29645.164		29645.857		29649.711		29645.380		29646.000	
bic	29789.894		29820.797		29819.457		29820.149		29824.004		29819.673		29806.349	
ll	-14800.744		-14798.252		-14797.582		-14797.928		-14799.856		-14797.690		-14800.000	

Standard errors in parentheses  
° p<0.1, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table S7:** Correlation of vignette characteristics in the sub-sample (vignette N= 1245)

	Track	Gender	Nationality	Profession	Hobby 1	Hobby 2	Occupation	Uncertainty
Gender	1							
Nationality	-0.089	1						
Profession	-0.085	0.076	1					
Track	-0.044	0.053	-0.001	1				
Hobby	0.076	0.044	-0.044	-0.008	1			
Extra								
activity	0.006	-0.035	-0.133	0.038	0.024	1		
Occupation	-0.006	0.008	0.019	-0.015	0.001	-0.020	1	
<b>Uncertainty</b>	<b>-0.026</b>	<b>-0.016</b>	<b>-0.047</b>	<b>0.019</b>	<b>-0.008</b>	<b>0.012</b>	<b>-0.010</b>	<b>1</b>

## Table S8: Qualitative data: Motivation

To *validate* our interpretations of the results based on the survey experiments and to deepen our understanding of the mechanisms steering employers' hiring decisions, in addition to the survey experiment we also carried out:

- i) eight preparatory qualitative interviews with professionals from both public and private firms and different economic sectors. These interviews were used to prepare the survey experiment and corroborate specific expectations about recruiting in the apprenticeship market.
- ii) an online follow-up survey with open and closed questions among the participants of the survey experiment.

This second online survey was sent to the 355, who had agreed to be contacted for a follow-up study. We thus obtained 208 responses (i.e., a response rate of 58.6 for participants who agreed to answer the follow-up, or a total of 24.8% when we consider the initial sample of 840 participants who participated in the survey experiment).

We were specifically interested in the respondents' interpretation of applicants with inconsistent profiles (e.g., high grades and low AT scores) and asked them to give their opinions about these profiles in an open-ended question (see Table S3 and S4 in the supplementary material). This serves to corroborate our expectation that this particular combination, that we called "bad-day" was indeed deemed as unambiguous as we expect in the theory section.

**Table S9:** Qualitative data collection details

Date	Step
14 March 2017	Respondents to the first questionnaire were asked if they were willing to participate in a brief follow-up survey
May-June 2017	Five qualitative telephone surveys with randomly selected recruiters were held to prepare the qualitative survey and to explore recruiting mechanisms in detail
14 June 2017	We contacted the 355 respondents who had agreed to participate in the follow-up survey by means of an email containing an electronic survey link
Response rate	58.60 per cent (completed surveys 208 of 355)
27 July 2017	Survey closed without a reminder (the response rate was considered high enough).

**Table S10:** Answers to question, “What kind of signal does a profile with a degree of 5 in both math and French and a score of 40 in the attitude test (sufficient/pass) convey to you?”

Answers (codes)	Frequency	Share relative to total number of codes* (%)
1) Trust the grades	79	46.75
2) Student had a bad day when taking the attitude test	41	24.26
3) Further (internal) tests and interviews are needed	32	18.93
4) Trust the attitude test scores	11	6.51
5) Need to see the scores of the different items in the attitude test	11	6.51
6) Attitude test is an unreliable test	9	5.33
7) Strange result	7	4.14
8) Other answer	16	9.47
<b>Survey participants</b>	<b>208</b>	
<b>Missing answers</b>	<b>39</b>	
<b>Total number of responses to question*</b>	<b>169</b>	
<b>Total number of codes*</b>	<b>206</b>	

\*Note: multiple answers per respondent were allowed.

**Table S11:** Examples of citations

<b>What kind of signal does a profile with a degree of 5 in both math and French and a score of 40 in attitude test (sufficient/pass) convey to you?</b>	
1) Trust the grades	
	Je me base sur les notes acquises durant les études. Et non sur un test passé en quelques minutes.
	Je prendrai en considération les notes obtenues à l'école.
	Je me base sur les notes acquises durant les études. Et non sur un test passé en quelques minutes.
2) Student had a bad day when taking the attitude test	
	Je pense que la personne a eu un coup de stress qu'elle n'a pas su gérer, ce qui la pénalise au moment de compléter le test d'aptitude
	Cette personne a peut-être été stressé ou pas à l'aise lors du test d'aptitude. Je la convoquerai quand même vu les excellents résultats scolaires et lui poserai directement la question de ce qu'elle a ressenti lors du test d'aptitude.
	Je pense qu'il a paniqué au test d'aptitude et je me réfère à sa moyenne annuelle.
3) Further (internal) tests and interviews are needed to determine the true quality of the candidate	
	Je pense que je vais quand même convoquer cette personne afin de me faire une idée sur elle et lui faire passer un test de dictée et/ou l'inviter à venir faire un stage de quelques jours.
	Je fais mon propre test
	Tests à faire à la fiduciaire afin d'évaluer le candidat sur nos critères.

Source: Qualitative interviews, see Table S11.

**Table S12: Preparatory interviews: Interviewees' details**

Interviewee code	Interview mode	Date of interview	Interviewee gender	Interviewee's professional role	Firm / organisation characteristics
Int1	Face-to-face	25.05.2016	Female	Apprentice coordinator	Public sector, Public administration
Int2	Face-to-face	16.06.2016	Female	In-firm vocational trainer	Public sector, Public administration
Int3	Face-to-face	27.09.2016	Female	Career counsellor	Public sector, Education
Int4	Telephone	22.05.2017	Female	In-firm vocational trainer	Private sector, Tourism
Int5	Telephone	31.05.2017	Male	In-firm vocational trainer	Public sector, Public administration
Int6	Telephone	01.06.2017	Male	In-firm vocational trainer	Private sector, Bank
Int7	Telephone	01.06.2017	Male	In-firm vocational trainer	Public sector, Public administration
Int8	Face-to-face	08.06.2017	Female	In-firm vocational trainer	Private sector, Retail