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How Do Employers View Applicants With and Without Children?

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ABSTRACT

Objective: This study investigates how parenthood influences employers' hiring decisions and the underlying signals that drive this discrimination.

Background: Prior research has consistently shown a motherhood penalty in hiring, whereas evidence on fatherhood remains less clear. Yet, most studies simplify parenthood into a binary distinction between parents and non-parents, neglecting potential variations based on the number and age of children. Moreover, little research has examined the underlying reasons for these disparate hiring decisions.

Method: A state-of-the-art vignette experiment was conducted with 452 real recruiters in Flanders (Belgium). Recruiters evaluated fictitious job applicants, whose parental status varied, on invitation rating and 16 theoretically relevant stigmas.

Results: Mothers received lower invitation ratings than non-mothers, regardless of the number and age of children, which can be understood by a range of negative stigma, including lower flexibility, higher absenteeism risk, higher career break risk, and lower willingness to work overtime. For men, a penalty was found when they had many children, especially older children. Compared to fathers with fewer children, those with three children were seen as less ambitious, less flexible, less likely to work overtime, and more likely to have experienced recent loss of skills.

Conclusion: The study highlights the persistent motherhood penalty and demonstrates that the fatherhood effect depends on the number and age of children.

1 | Introduction

Correspondence experiments have consistently demonstrated that the presence of children leads to differences in hiring chances for men and women (Arena et al. 2023; Correll et al. 2007; El Haj et al. 2024; Lippens et al. 2023). However, this poses a substantial problem, as differentiating among job applicants based on their parental status is unfair and prohibited (European Union Agency for Fundamental Rights [EU AFR] 2018). Moreover,

the number of employed and job-seeking individuals who have children is substantial. The sixth European Working Conditions Survey conducted by Eurofound (2015) reveals that in 2015, 47.4% of employed individuals and 33.6% of job seekers across 35 European countries had children either of their own or of their cohabiting partner living in their household.

The existing literature has shown that female job applicants with children typically experience lower hiring chances than

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childless women, illustrating a phenomenon known as the “motherhood penalty”, whereas male job applicants with children experience no adverse effects overall (Arena et al. 2023; Blau and Kahn 2017; El Haj et al. 2024; González et al. 2019; Hipp 2020). Instead, male job applicants with children may experience even higher hiring chances than childless men, a pattern referred to as the “fatherhood premium” (Cheung et al. 2022; Correll et al. 2007; Dias et al. 2020; El Haj et al. 2024).

However, much of this literature simplifies parenthood into a binary distinction between parents and non-parents (e.g., Bygren et al. 2017; Correll et al. 2007), overlooking crucial variations such as the number and age of children. Yet, in practice, the heterogeneity in terms of these factors is likely to influence hiring decisions in different ways (El Haj et al. 2024). Concretely, employers may assess parents with more children in a non-linear manner. Since couples’ ideal number of children in Belgium averages at two (Beaujouan and Berghammer 2019), employers might perceive one or two children as manageable but view additional children as a greater caregiving burden (Dorofeeva 2020; Oesch et al. 2017). At the same time, applicants with one child might also be seen as more likely to expand their families than those with two, raising concerns about future family planning (Becker et al. 2019). In addition to the number of children, having younger children also often requires more immediate care, which employers may see as a potential distraction from work (Becker et al. 2019; Nautet and Piton 2021). All these concerns about family responsibilities and caregiving demands may result in adverse hiring decisions for parents.

These variations in the number and ages of children are therefore essential to understanding in which cases parenthood affects hiring chances (El Haj et al. 2024). Despite its importance, this heterogeneity has been largely neglected in experimental research (El Haj et al. 2024). In light of this, we conduct a state-of-the-art vignette experiment in which job applications from fictitious male and female individuals with a varying number of children of different ages are submitted to genuine recruiters. Through this approach, we aim to answer the following research questions in the first stage of our study:

RQ1a. *What are the effects of revealing parenthood on the likelihood of being invited to a job interview as a male or female job applicant?*

RQ1b. *To what extent are these effects moderated by the number of children?*

RQ1c. *To what extent are these effects moderated by the age of children?*

The potential differences in hiring chances are underpinned by a complex web of discrimination theories that seek to explain how parenthood influences hiring outcomes (Arena et al. 2023; El Haj et al. 2024). Confronting these theoretical arguments with empirical reality is important. After all, different theories, and consequently different explanations for discrimination, require different approaches aimed at addressing group perceptions or eliminating uncertainty (such as adding anticipatory arguments or reference letters to job applications) as opposed

to increasing punishment and competition (Baert et al. 2015; El Haj et al. 2024; Lippens et al. 2022).

However, noticeable gaps persist in the empirical investigation of the theoretical channels of unequal treatment of parents and non-parents (Arena et al. 2023; El Haj et al. 2024). First, while some studies have investigated the explanatory signals behind the differences in hiring chances related to parenthood, they focus on a narrow set of signals and often lack a solid theoretical foundation (Arena et al. 2023; El Haj et al. 2024). For example, Cha (2013) explores perceptions related to willingness to work overtime, but this isolated focus holds the risk that observed effects pick up variations in perceptions left out of the analysis. For instance, the effects identified by Cha (2013) may also be driven by absenteeism risk (Becker et al. 2019), as both absenteeism risk and willingness to work overtime relate to workplace presence. Second, while theoretical channels such as statistical discrimination and taste-based discrimination are commonly invoked to explain hiring biases, their specific applications to parenthood remain underexplored, especially for taste-based discrimination (El Haj et al. 2024). Third and last, different manifestations of parenthood (i.e., number and age of children) are not only likely to influence hiring decisions but may also shape the signals perceived by employers in similar ways. Understanding how these manifestations generate distinct signals is therefore crucial for unpacking the mechanisms of parenthood-based discrimination.

By using an experimental design, we can integrate these theoretical channels and evaluate a range of signals underlying hiring decisions and their relationship with different manifestations of parenthood. In our experiment, recruiters assess applicants not only on hireability but also on 16 signals rooted in various theories, which we discuss in the next section. This allows us to address the following research questions in the second stage of our study:

RQ2a. *What does revealing parenthood signal to recruiters as a male or female job applicant?*

RQ2b. *To what extent are these effects moderated by the number of children?*

RQ2c. *To what extent are these effects moderated by the age of children?*

2 | Background

The achievement of complete labor market equality between men and women remains an ongoing challenge despite notable advancements, as demonstrated by Goldin (2014). One of the critical stages where these disparities emerge is during the hiring process (Matysiak and Cukrowska-Torzewska 2021). Therefore, gender bias in hiring continues to attract scholarly attention, with extensive research investigating its causes and manifestations (e.g., Calluso and Devetag 2024; Galos and Coppock 2023; Lippens et al. 2023; Schaerer et al. 2023; Van Borm and Baert 2022).

However, findings in this domain are highly mixed. Some studies find no evidence of gender-based discrimination in hiring (e.g., Asali et al. 2018; Van Borm and Baert 2022),

while others document biases against women (e.g., González et al. 2019; Kübler et al. 2018), and still others report discrimination against men (e.g., Booth and Leigh 2010; Lippens et al. 2023). These inconsistencies are further complicated by heterogeneity in results based on applicant, recruiter, and contextual characteristics, with effects varying in both magnitude and direction across seemingly similar studies (Calluso and Devetag 2024; Lippens et al. 2023; Van Borm and Baert 2022). For instance, studies suggest that the results may depend on factors such as the ethnicity of the applicant (e.g., Weichselbaumer 2020), the gender of the recruiter (e.g., Bosak and Sczesny 2011), whether the job is male- or female-dominated (e.g., Booth and Leigh 2010), or the gender composition of the applicant pool (e.g., Heilman 1980).

Another key explanation for these mixed findings, as highlighted by Goldin (2014, 2021), is that women may experience discrimination only at specific moments in their lives, particularly those linked to parenthood. While historical gender differences in hiring have often been attributed to various factors previously discussed, today's differences are increasingly associated with parenthood (Baert 2014; Baert et al. 2016; Blau and Kahn 2017; Verniers and Vala 2018). Indeed, discrimination against mothers is now widely recognized as one of the most severe forms of gender-based workplace discrimination (Goldin 2014, 2021; Kleven et al. 2024; Painter et al. 2012).

To tackle this type of labor market discrimination based on parenthood, policymakers require a deeper understanding of its root causes. Two seminal (economic) theories that apply to this scenario are statistical discrimination and taste-based discrimination (El Haj et al. 2024; Guryan and Charles 2013; Lang and Spitzer 2020; Neumark 2018). Alongside complementary theories, they provide a theoretical framework for identifying the signals that drive discriminatory behavior, which is central to answering RQ2 (El Haj et al. 2024). Within this framework, 16 relevant signals can be grouped into four distinct clusters, each addressing different dimensions of hiring bias. The following paragraphs elaborate on these theories, their associated clusters, and the relevant signals.

First, the theory of statistical discrimination posits that recruiters do not possess sufficient information to determine an applicant's productivity, which leads them to rely on stereotypes that may or may not be correct (Aigner and Cain 1977; Arrow 1973; Phelps 1972). In the context of parenthood, the literature suggests that this lack of information might result in mothers, in particular, being perceived as less productive at work (El Haj et al. 2024).

This theory introduces a first cluster of signals—signals featuring an applicant's perceived general productivity drivers—which are directly linked to statistical discrimination theory. Mothers are often seen as prioritizing family over their careers, with the expectation that they will sacrifice career advancement to balance work and family responsibilities, potentially hindering their ability to fully perform their role as employees (Casper et al. 2002; Morgan et al. 2013). Conversely, parenthood may also foster perceptions of maturity, particularly for men, which could be viewed as advantageous in a professional setting (Benard and Correll 2010; Correll et al. 2007). However, this

positive perception may not extend to all fathers; when men are perceived as highly involved in caregiving or as deviating from traditional norms, for example, by being a single father, they too may be evaluated less favorably (Eagly 1987; Steffens et al. 2019). The four such signals that are mentioned multiple times theoretically in the literature are ambition, commitment, flexibility, and maturity (Benard and Correll 2010; Correll et al. 2007; Fuegen et al. 2004; Morgan et al. 2013; Sools et al. 2007).

Second, the lower perceived productivity associated with statistical discrimination can be further explained by the time trade-off theory (Becker 1965). This latter theory presents a model for understanding how individuals allocate their time between different activities based on their preferences and the market value of their time (Becker 1965). When applied to parenthood, this theory predicts that the time an applicant spends with children cannot be used to work or develop skills, which further leads to impressions of reduced productivity (Anxo et al. 2007; Symeonidou 2004).

This theory comprises signals about an applicant's perceived time trade-off-related productivity drivers. Parents, particularly mothers, devote significant time to childcare and household duties, which can result in more frequent absences from work to manage these family responsibilities (Becker et al. 2019; Symeonidou 2004; Weisshaar 2018). Such interruptions may also contribute to skill depreciation over time (Weisshaar 2018). The literature identifies four key signals within this cluster: absenteeism risk, career break risk, overtime willingness, and recent loss of skills (Becker et al. 2019; Cha 2013; Weisshaar 2018).

Third, the lower perceived productivity in statistical discrimination might also be related to normative discrimination theory (Benard and Correll 2010). This latter theory posits that recruiters may discriminate against mothers because they believe that success in the labor market signals stereotypically male qualities, in contrast with qualities that are culturally expected of mothers (Benard and Correll 2010; Rabaté and Rellstab 2022).

This theory gives rise to a third cluster of signals, which pertain to an applicant's perceived gender-typical productivity drivers. The stereotypical male qualities are assertiveness and dominance, which are opposed to stereotypical female qualities, such as nurturance and warmth (Benard and Correll 2010; Chatman et al. 2022; Eagly and Johnson 1990; Okimoto and Heilman 2012).

Last, taste-based discrimination theory suggests that recruiters may discriminate against job applicants due to perceived concerns that employers, colleagues, or customers' utility could be affected by collaborating with them (Becker 1957). In essence, individuals have a "taste" rather than any economic rationale to avoid contact with members of certain (demographic) groups over other groups (Becker 1957). However, as noted by El Haj et al. (2024), research on this form of discrimination in the context of parenthood is scarce, underscoring the need to explore this channel further. Recent peer-reviewed empirical work demonstrates that this channel is an important explanation for other forms of discrimination in hiring, such as ethnic hiring discrimination (Jacobs et al. 2022; Lippens et al. 2022). In the context of parenthood-based discrimination, taste-based discrimination

could also be relevant because strong identification with parenthood may or may not be a basis for a human connection or because, based on time trade-off theory, parents typically have less time to invest in social interactions (Becker 1965; Budig and England 2001; El Haj et al. 2024; Lois and Becker 2023).

The fourth and final cluster contains signals regarding perceived attitudes toward collaboration. More specifically, this cluster includes signals related to collaboration with employers, colleagues, and customers (Dalle et al. 2024; El Haj et al. 2024; Sterkens et al. 2021; Van Borm et al. 2021). In addition to these three signals, we include an additional signal concerning the applicant's social network. Young children can impact a parent's existing and new social network, potentially influencing attitudes toward collaboration (Lois and Becker 2023).

3 | Method

To answer our research questions, we conducted a state-of-the-art vignette experiment. This is a method often used to study hiring decisions and the stigma behind them (Kuziemko et al. 2015; Sterkens et al. 2021; Van Belle et al. 2019; Van Borm et al. 2021). In this context, this type of experiment is an application of the factorial survey method, in which recruiters assess fictitious applicants ("vignettes") who have specific characteristics ("vignette factors") that vary across a predetermined number of categories ("vignette levels"; Auspurg and Hinz 2014). The experimental setup in a survey offers multiple advantages. First, it allows valid causal inference of the vignette factors (internal validity; Auspurg and Hinz 2014). Second, compared to traditional surveys, vignette experiments increase ecological validity by concealing the primary research objective and prompting recruiters to make trade-offs akin to real-life hiring decisions (Auspurg and Hinz 2014). This is supported by the fact that strong correlations between vignette experiments and real-life scenarios have been observed in prior research (Hainmueller et al. 2015).

The vignette experiment was conducted in Flanders, the northern region of Belgium. In 2023, the labor force participation of Flemish individuals aged 25–49 stood at 85.6% for women and 93.4% for men, with these figures varying significantly by parental status (Statbel 2024). Employment rates were particularly low among women with three or more children under the

age of 17, dropping to 66.7%. On average, women in Flanders are expected to have 1.54 children, and the average age at first childbirth is 30.9 years (Eurostat 2023a, 2023b). Furthermore, part-time work is relatively common in Flanders, especially among women. In 2023, 34.2% of women aged 25–49 worked part-time, compared to just 6.5% of men (Statbel 2024). This is partly attributable to childcare availability and affordability, which are critical factors for parental labor force participation (Connelly and Kimmel 2003). While the Flemish government has prioritized expanding childcare capacity in its recent policy agreements, there remains a notable shortfall (Child and Family, n.d.). In 2023, there were only 44.6 childcare places available per 100 children aged 0 to 3 years, highlighting ongoing challenges in meeting demand (Growing Up 2024).

3.1 | Vignette Design

Each recruiter was tasked with evaluating a deck of five unique vignettes in a tabulated format, with each vignette representing a hypothetical job applicant—we clarify the exact scenario in the following subsection. In line with Auspurg and Hinz's (2014) recommendation, this choice for tabular vignettes instead of textual vignettes is grounded in their superior suitability for decision-oriented tasks, particularly in the evaluation of fictitious resumes based on diverse criteria (Auspurg and Hinz 2014). Furthermore, prior studies support the comparability of assessment results between tabular and textual vignettes (Auspurg and Hinz 2014; Sauer et al. 2020; Shamon et al. 2019). The job applicants were characterized by factors that varied randomly across two to five levels. An overview of the factors and their corresponding levels is provided in Table 1, which we discuss further below.

To address RQ1a–RQ1c, the two key factors were the number of children and their age. Of these, the first factor included five levels: unknown parental status, 0 children, 1 child, 2 children, and 3 children. The second factor consisted of three levels: unknown age, young children, and old children. We constructed the age levels by considering the childbearing cycle model, with an average age gap of 2 to 2.5 years between siblings (Becker et al. 2019; Nautet and Piton 2021; Thoma et al. 2016). For young children, the age range began at 1 year, with subsequent intervals of 2 years, resulting in ages of 1, 3, and 5 years for job applicants with multiple children. Old children were categorized

TABLE 1 | Vignette factors and levels.

Vignette factors	Vignette levels
Number of children	{Unknown parental status, 0 children, 1 child, 2 children, 3 children}
Age of children	{Unknown age, young children ^a , old children ^b }
Gender	{Man, woman}
Age of applicant	{28, 32, 35, 38, 42}
Marital status	{Married, divorced, cohabiting, unmarried}
Relevant working experience	{None, about 2 years, more than 5 years}
Extracurricular activities	{None mentioned, voluntary work, sports activities, cultural activities}

^aDepending on the number of children, the levels were 1 year; 1 and 3 years; and 1, 3, and 5 years.

^bDepending on the number of children, the levels were 6 years; 6 and 8 years; and 6, 8, and 10 years.

from 6 years of age onwards, followed by intervals of 2 years, resulting in ages of 6, 8, and 10 years for applicants with multiple children.

The conditions “unknown parental status” and “unknown age” were not explicitly mentioned in the vignettes. This information was conveyed by the absence of data. The inclusion of these alternative control conditions in the experiment served several purposes. Primarily, it caused the research goal to be kept more vague, thereby minimizing socially desirable responses—we later discuss other ways in which we further minimized this risk. Additionally, although HR professionals confirmed to us that it does happen within our geographical context, not all applicants disclose this information in real-life settings, considering their awareness of the motherhood penalty and the likelihood of having received advice to avoid mentioning children during job applications (Bright Horizons 2018). Finally, it allowed us to evaluate the impact of withholding this information on the job applicant's hiring chances, as this ambiguity could influence risk-averse recruiters' decisions (El Haj et al. 2024).

Closely related to parental status is the applicant's gender, our third factor, which enables recruiters to differentiate between mothers and non-mothers, as well as between fathers and non-fathers (Correll et al. 2007; El Haj et al. 2024). This distinction prompted the inclusion of gender as a crucial factor in addressing the heterogeneous effects of parenthood, resulting in the split between men and women in the analyses. To be able to correctly estimate these gender-specific effects, we explicitly incorporated all two-way interactions in our D-efficient design, as specified in Auspurg and Hinz (2014). We return to our D-efficient design below.

The fourth factor revealed the applicant's age in years, with values of 28, 32, 35, 38, and 42 years of age. An applicant's age might influence recruiters' judgments as they could anticipate future parenthood (e.g., younger and childless women may be perceived as having a higher chance of maternity in the future than older and childless individuals) (El Haj et al. 2024; Nautet and Piton 2021; Petit 2007). The lower age limit of 28 years was chosen to avoid infrequent cases involving young applicants with three children or older children. This choice is supported by the average age of Flemish women at the birth of their first child (Eurostat 2023a). The upper age limit of 42 years was chosen to align with the average age of individuals still bearing children. Evidence suggests that only 1% of women give birth beyond the age of 42 years, thus making it unrealistic to include older applicants with very young children (Statbel 2022). The other ages were selected between the upper and lower age limits, with the differences between the applicants being neither too large nor too small. We limited ourselves to five levels to avoid number effects due to a substantially higher number of levels than for the other factors (Auspurg and Hinz 2014).

As a fifth factor, we manipulated the applicant's marital status, resulting in four levels: unmarried, cohabiting, married, and divorced. First, research indicates that female job applicants may be rated less favorably once they are married, while the opposite trend is observed for male job applicants (Jordan and Zitek 2012). Second, despite shared custody becoming more prevalent after divorces, sole-mother custody or an arrangement

where children predominantly stay with the mother remains noteworthy (Cancian and Meyer 1998; Meyer et al. 2017). Being divorced could increase the penalty as it could create the impression that the applicant may need to navigate their responsibilities more independently, especially in terms of childcare (El Haj et al. 2024). Last, recognizing that it is relatively unusual for job applicants to provide information about their children without mentioning their marital status, we introduced this variable to enhance the experiment's realism and ecological validity.

Last, we added the job applicant's relevant working experience (none, about 2 years, more than 5 years) and extracurricular activities (none mentioned, voluntary work, sports activities, cultural activities) as a sixth and seventh variable, respectively. These additions, drawn from previous literature, aimed to mimic real-life hiring decisions and cover up the main goal of the research, as these variables are typically revealed on resumes (Di Stasio 2014; Van Belle et al. 2019, 2020; Van Borm et al. 2021). Note that we defined relevant working experience as experience directly related to the job in question rather than the applicant's total working experience. This design choice was made to minimize potential misinterpretation, particularly for older applicants, as shorter working experience could otherwise suggest lengthy employment interruptions.

It should be noted that presenting both the number and age of children in separate rows in a tabulated vignette could potentially reveal the experiment's setup to the recruiters, leading to socially desirable responses. Hence, we introduced a factor called “family situation” in the tabulated vignette, combining the job applicant's marital status, the number of children, and the age of the children. For instance, a recruiter would see “married, two children (1 and 3 years)” under “family situation” for a married job applicant with two young children. In cases with unknown conditions, the experiment displayed only the known information. For instance, a divorced applicant with an unknown parental status would be presented as “divorced”. Sample vignettes have been added in Table S1 to make this clear.

Combining all the vignette levels for these seven factors resulted in a vignette universe of 7200 unique combinations (i.e., $2 \times 4 \times 5 \times 3 \times 5 \times 3 \times 4$). Given the impracticality of evaluating all 7200 vignettes, a sample was drawn using a D-efficient resolution V design. A D-efficient design combines those vignette levels that maximize statistical power while also aiming for a balanced distribution of cell sizes across categories (Auspurg and Hinz 2014). Initially, we ran Auspurg and Hinz's (2014) algorithm and Kuhfeld's (2010) free macro %MktEx on the applicant characteristics. This resulted in a sample of 300 vignettes with a D-efficiency of 91.9%, exceeding the minimal level of 90% (Auspurg and Hinz 2014). This sample was complemented by cases with levels that were given a higher weight. Specifically, it might be more common for job applicants to omit information about their children from their resumes, particularly when the applicant has zero children. Therefore, applicants with an unknown parental status were assigned a slightly higher weight than applicants with zero children. This adjustment aligns more closely with real-life settings, enhancing the ecological validity of the experiment. Subsequently, we randomized the factor “age of children” by adapting illogical combinations (e.g., a job applicant with an unknown parental status or zero children cannot

have any age specified for those children). Following this, we blocked the 300 vignettes into 60 decks by randomly allocating five vignettes to each deck (Auspurg and Hinz 2014). These decks were then randomly assigned to recruiters to increase design efficiency and internal validity. Last, we randomized the sequence of vignette presentations within each deck to avoid order effects (Auspurg and Hinz 2014).

Finally, the vignettes of the hypothetical job applicants shown to recruiters were identical in structure but tailored to specific job positions. Each recruiter evaluated applicants for a single job vacancy. These job vacancies were designed based on two underlying job characteristics. First, we considered the required educational degree for the job as mothers may face greater disadvantages in low-skilled jobs than in high-skilled jobs (Budig and Hodges 2010; González et al. 2019; Todd 2001). Second, we considered gender domination in the job as mothers may face a greater disadvantage in male-dominated jobs than in female-dominated jobs (Booth and Leigh 2010; Cha 2013; Glauber 2012). We categorized jobs as male-dominated or female-dominated when men or women, respectively, made up 70% or more of the workforce, following the classification by Leuze and Strauß (2016) and the Organization for Economic Co-operation and Development (OECD 2002). Jobs were considered gender-neutral when the share of men or women ranged between 40% and 60%. To enhance the external validity of the experiment, we excluded jobs in which one gender constituted less than 2.5% of the workforce. Based on qualification criteria determined by the Public Employment Agency of Flanders (n.d.), these two job characteristics resulted in the following nine jobs: (i) kitchen worker, (ii) commercial assistant, (iii) bookkeeper, (iv) cleaner at people's homes, (v) administrative assistant, (vi) nurse, (vii) truck driver, (viii) setup operator for CNC machine tools, and (ix) ICT analyst developer. Further details about the job characteristics and descriptions are available in Table S2.

3.2 | Data Collection

Responses were collected from a sample of professional recruiters. We invited 5340 recruiters between July and September 2023 to participate in our online vignette experiment. Their email addresses were extracted from the job vacancy listings of the Public Employment Agency of Flanders, Belgium's largest job site (Delbeke 2019). This ensured that the recruiters had experience with selection decisions, enhancing population validity. Moreover, to improve external validity, the email addresses were randomly sampled from the vacancy listings of the jobs employed in the experimental design.

A total of 939 recruiters initiated the survey. However, 23 did not agree with informed consent and were excluded. Additionally, 417 recruiters did not complete the survey and were excluded. A further 46 recruiters failed the attention check question and were removed from the sample. Finally, one respondent provided implausible demographic information, indicating an age of 100 years and having more than 10 children, and was excluded. This resulted in a final sample of 452 recruiters who had accurately completed the entire experiment by evaluating five fictitious applicants each, yielding a total of 2260 observations. We return to their representativeness below.

In the first part of the experiment, recruiters were tasked with assisting in a selection decision for a job vacancy for a fictional company rather than their own to preserve the experiment's internal validity. Recruiters were then asked to complete a comprehension check after viewing the job and its corresponding description. This check aimed to verify whether recruiters' perceptions about the job characteristics matched the objective job characteristics from the Public Employment Agency of Flanders (which was the case for our experiment).

Next, recruiters were informed that a colleague who had screened the resumes and conducted initial telephone interviews with the applicants had gathered and summarized the information about the applicants. It was explicitly emphasized that the applicants were formally eligible based on their educational degree and working experience. Following this information, recruiters were asked to provide their insights and recommendations on two aspects.

Initially, recruiters were asked to specify whether they would like to invite the applicant for an interview or hire the applicant based on an 11-point response scale ranging from 0 (completely disagree) to 10 (completely agree) (Baert 2018; Dalle et al. 2024; Di Stasio 2014; Moens et al. 2023; Sterkens et al. 2022). The exact items were: "I would advise inviting this candidate for an interview" and "I would advise hiring this candidate for the described position." These outcome variables, referred to as invitation and hireability rating, served as key metrics in addressing RQ1a–RQ1c.

Subsequently, recruiters were tasked with evaluating each applicant based on a list of 16 signals, using the same 11-point response scale, allowing us to answer RQ2a–RQ2c. As mentioned in Section 2, we organized the signals from peer-reviewed international literature based on four theories into four clusters: (i) perceived general productivity drivers, (ii) perceived time trade-off-related productivity drivers, (iii) perceived gender-typical productivity drivers, and (iv) perceived attitudes toward collaboration. An overview of all the statements in the experiment can be found in Table S3.

In the second part of the experiment, the recruiters were required to complete a post-experimental survey, which consisted of a social desirability check and seven recruiter characteristics. First, we captured recruiters' tendency to respond in socially desirable ways using the Social Desirability Scale (Steenkamp et al. 2010). This scale consists of two subscales, with one measuring egoistic response tendencies (ERT, $\alpha = 0.59$) and the other measuring moralistic response tendencies (MRT, $\alpha = 0.70$). The relatively modest Cronbach's alphas were consistent with the variations documented by Steenkamp et al. (2010), ranging between 0.49 and 0.76 for the ERT scale and between 0.67 and 0.77 for the MRT scale. Second, seven recruiter characteristics were questioned: (i) gender ("man", "woman", "other"), (ii) age (open question), (iii) parental status ("not a parent and no child wish", "not a parent but a child wish", "parent"), (iv) educational degree ("secondary education", "lower tertiary education", "higher tertiary education"), (v) involvement in selection decisions ("yearly or less frequently", "semesterly", "monthly", "weekly", "daily"), (vi) hiring experience ("less than one year", "between one and five

years”, “more than five years”), and (vii) occupation (“manager”, “human resource and career development specialist”, “employment agency employee”, “management assistant”, “general administrative assistant”, “human resource officer”).

3.3 | Sample Description

The average age of the recruiters was 41 years, with 73.9% identifying as women and 79.6% holding at least a lower tertiary educational degree. Our sample was comparable in gender distribution with HR professionals of working age according to the European Social Survey (ESS 2023) but was slightly younger on average (the ESS average was 45 years old) and more educated (the ESS average was 70.1%). The slightly younger age and higher education level of our sample compared to the ESS average can partly be explained by the fact that excluded participants were, on average, older and more highly educated. Similar to Sterkens et al. (2021), the ESS average is based on Belgian data from the 2020 wave of ESS for the following ISCO-08 codes: 1212 (Human resource managers), 2423 (Personnel and careers professionals), 3333 (Employment agents and contractors), and 4416 (Personnel clerks). The recruiters were well qualified for the experimental task, with 40.9% evaluating applicants daily and 91.8% possessing at least 1 year of experience in the evaluation of applicants. More recruiter characteristics can be found in the first column of Table S4.

In the remaining portion of Table S4, the sample is divided into two subsamples based on the gender of the applicants. Within each subsample, a further distinction is made based on the main treatment (i.e., parental status). Columns I.4 and II.4 present the difference between the two parental statuses, along with the results of a t-test to determine the statistical significance of these differences. Recruiters evaluating mothers or fathers exhibited similar characteristics to those evaluating non-mothers or non-fathers, respectively. This observation supports the conclusion that parental status was successfully randomized among recruiters.

4 | Results

4.1 | Effect of Revealing Parenthood on Invitation Rating

In this subsection, we present the results of our investigation of how invitation rating may be affected when the applicant reveals parenthood (RQ1a) and the extent to which this impact is moderated by the number of children (RQ1b) and their ages (RQ1c). Next, we report on additional robustness tests that were performed to validate our findings.

The results of the linear regression analyses are displayed in Table 2, with invitation rating as the dependent variable, the applicant characteristics concerning parenthood (number and age of children) as independent variables (see Subsection 3.1), and other characteristics related to the applicant, job, and recruiter as control variables (see Subsections 3.1 and 3.2). Standard errors were corrected for the clustering of the observations at the recruiter level. The complete version of Table 2, including the

coefficients and standard errors for all applicant characteristics, can be found in the Table S5.

Table 2 is divided into two panels, focusing on the analyses performed on the subsamples of female applicants (Panel I) and male applicants (Panel II), respectively. Each panel contains five models, with diverging operationalizations of the applicants' parental status. Model (1) presents the binary distinction of whether an applicant is a parent or not, with the reference group being “not a parent or unknown parental status”. Model (2) further dissects this variable by distinguishing between applicants who are not parents and those with an unknown parental status, making “not a parent” the reference group. These initial models do not consider the number or age of children; these aspects are adopted in Models (3) and (4) separately and in Model (5) jointly. In these models, the reference group for parental status remains “not a parent”, while the categories for number and age of children are referenced against “one child” and “old children”, respectively. We select Model (2) for addressing RQ1a and Model (5) for addressing RQ1b and RQ1c.

Importantly, the number and age of children were included in these models as vignette factors, representing independent characteristics of the fictitious applicants rather than interaction terms with parenthood. This does not imply perfect collinearity, as being a parent does not predict the exact number or age of children, nor does the number or age of children determine whether someone is not a parent or has an unknown parental status. This was also reflected in the Variance Inflation Factors (VIFs), with most values ranging between 1 and 2 and a maximum of 3.77 (for “parent” in Model I.5), which remained below the commonly used threshold of 4 that may indicate potential multicollinearity and well below the threshold of 10 that signals serious multicollinearity (O'Brien 2007).

To further aid interpretation, we visualized the key results of Models (2), (3), and (4) from Table 2 in Figure 1, corresponding to Panels I, II, and III, respectively. These panels depict the effects of parental status overall (RQ1a), the number of children (RQ1b), and the age of children (RQ1c). Point estimates in the figure represent mean invitation rating predictions (i.e., marginal effects) based on the linear regressions from Table 2. Predictions were calculated across a balanced grid of applicant, job, and recruiter covariates, with continuous variables fixed at their means and every combination of categorical variable levels except for the applicant variable “parental status”, which was held constant at “parent” in Panels II and III.

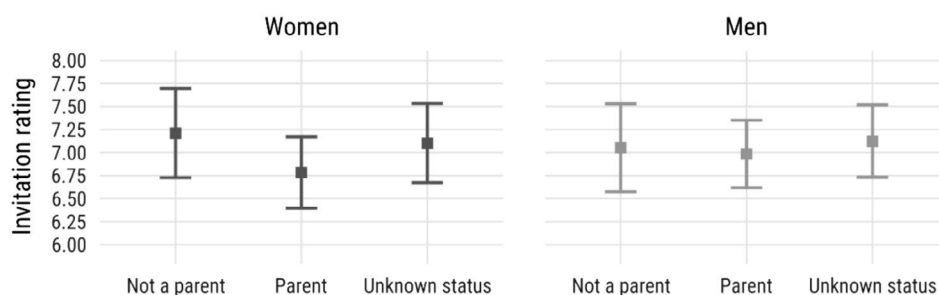
In response to RQ1a, which queries the existence of a motherhood penalty, we observed that mothers scored 0.43 ($p=0.011$) units lower on the invitation scale (ranging from 0 to 10) than non-mothers, which equates to 4.3 percentage points (pp). There were no significant differences between women with an unknown parental status and non-mothers. Moreover, we did not find statistically significant heterogeneous effects based on the number and age of children. This finding helps us address RQ1b and RQ1c, demonstrating that recruiters appeared to penalize mothers irrespective of these factors. This is also visually evident in Figure 1, where mothers experienced a penalty (Panel I), and this did not vary significantly with the number of children (Panel II) or their ages (Panel III).

TABLE 2 | Multivariate regression analyses by gender and parental status with the invitation rating as the outcome variable.

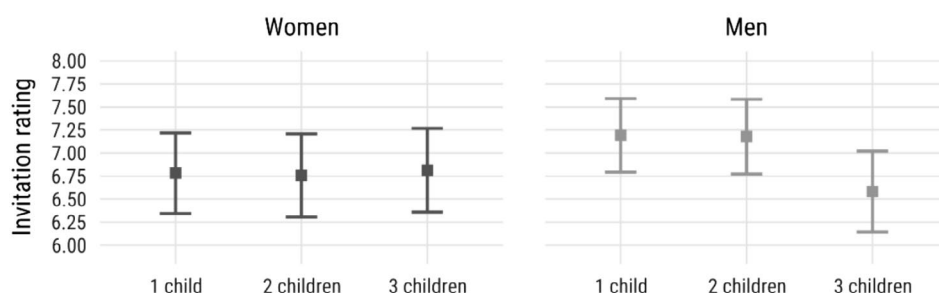
	I. Subsample of female applicants [<i>N</i> = 1116]					II. Subsample of male applicants [<i>N</i> = 1144]				
	(I.1)	(I.2)	(I.3)	(I.4)	(I.5)	(II.1)	(II.2)	(II.3)	(II.4)	(II.5)
Parent (ref. = Not a parent or unknown parental status)	−0.36** (0.13)					−0.11 (0.13)				
Parental status (ref. = Not a parent)										
Parent		−0.43* (0.17)	−0.43* (0.21)	−0.58** (0.22)	−0.58* (0.25)		−0.07 (0.18)	0.14 (0.20)	−0.34 (0.23)	−0.17 (0.23)
Unknown parental status		−0.11 (0.19)	−0.11 (0.19)	−0.11 (0.19)	−0.11 (0.19)		0.07 (0.20)	0.08 (0.20)	0.07 (0.20)	0.08 (0.20)
Parent: Number of children (ref. = 1 child)										
2 children			−0.03 (0.19)		−0.03 (0.19)			−0.01 (0.17)		−0.01 (0.17)
3 children			0.03 (0.20)		0.02 (0.20)			−0.61** (0.18)		−0.65*** (0.19)
Parent: Age of children (ref. = Old children)										
Young children				0.18 (0.24)	0.18 (0.24)				0.34 (0.20)	0.40* (0.20)
Unknown age				0.26 (0.23)	0.26 (0.23)				0.46* (0.19)	0.52** (0.19)
Other applicant, job and recruiter characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The following abbreviations are used: ref. (reference category). All other applicant, job, and recruiter characteristics are included. The applicant characteristics are described in Subsection 3.1 and presented in Table 1, the job characteristics in Subsection 3.1 and Table S2, and the recruiter characteristics in Subsection 3.2 and Table S4. The outcome variable ranges from 0 (i.e., definitely no interview) to 10 (i.e., definitely an interview). The presented statistics are coefficient estimates with standard errors presented in parentheses for the linear regression analyses discussed in Subsection 4.1. Standard errors are corrected for the clustering of the observations at the recruiter level. Intercepts are not presented. Significances are indicated as when **p* < 0.05, ***p* < 0.01, ****p* < 0.001.

I. By parental status



II. By number of children



III. By age of children

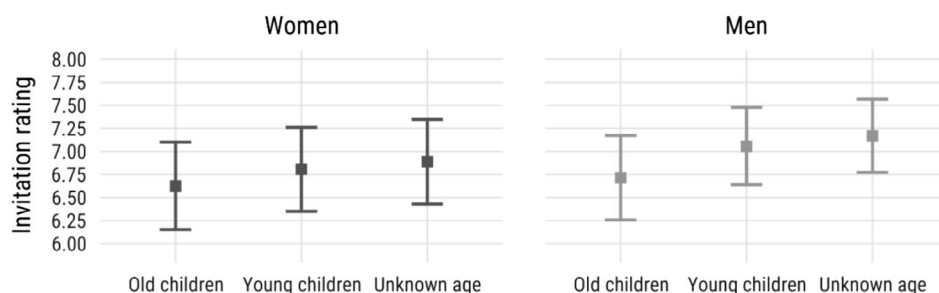


FIGURE 1 | Marginal effects of invitation rating by different parenthood variable. I. By parental status; II. By number of children; III. By age of children. *Note:* Point estimates represent mean invitation rating predictions (i.e., marginal effects) based on linear regressions (see Table 2; Models 2, 3, and 4). Predictions are calculated across a balanced grid of applicant, job, and recruiter covariates, with continuous variables fixed at their means and every combination of categorical variable levels except for the applicant variable ‘parental status’, which is held constant at ‘parent’ in Panels II and III. Error bars indicate 95% confidence intervals. Predictions are estimated separately for each gender. Invitation ratings are measured on a 0–10 scale.

Examining male applicants reveals that overall, fathers appeared not to be treated differently than non-fathers. There was also no significant difference between men with an unknown parental status and non-fathers. However, delving into the number and age of children to address RQ1b and RQ1c revealed a more nuanced picture, with some significant effects in this respect. In particular, when a father has three children, the outcome was significantly more adverse ($\beta = -0.65$, $p < 0.001$). A similar trend was observed in the context of the children's age, with fathers with old children incurring a larger penalty compared to both young children ($\beta = -0.40$, $p = 0.048$) and children with an unknown age ($\beta = -0.52$, $p = 0.006$). These trends are evident in Figure 1, which shows that fathers initially appeared to face no penalty (Panel I), but further analysis revealed

a penalty associated with having three children (Panel II) and older children (Panel III).

To verify the robustness of the results, we performed three additional analyses on Models (2) and (5) from Table 2. First, we replicated the results with hireability rating as the outcome variable; these results can be found in Table S6. We found similar results to those from the benchmark analyses; however, the significant effect with respect to the age of the children became weaker. Second, we re-estimated our models for only a subset of recruiters under a certain level of socially desirable responses, i.e., with the top 5% of scores on the ERT and MRT scales excluded, as detailed in Table S7. These findings aligned closely with the benchmark analyses. Third, ordered logistic models led

TABLE 3 | Multivariate regression analyses with the signals as outcome variables.

I. Subsample of female applicants [N=1,116]								
I.1. Perceived general productivity drivers								
I.1.a. Ambition		I.1.b. Commitment		I.1.c. Flexibility		I.1.d. Maturity		
(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)	
Parental status (ref. = Not a parent)								
Parent	−0.82*** (0.16)	−0.88*** (0.22)	−0.47** (0.16)	−0.60** (0.22)	−2.13*** (0.17)	−1.86*** (0.22)	0.01 (0.16)	−0.23 (0.22)
Unknown parental status	−0.36* (0.18)	−0.36* (0.18)	−0.20 (0.18)	−0.20 (0.18)	−0.37* (0.17)	−0.37* (0.17)	0.10 (0.17)	0.09 (0.17)
Parent: Number of children (ref. = 1 child)								
2 children		−0.03 (0.15)		0.10 (0.15)		−0.22 (0.16)		−0.06 (0.15)
3 children		−0.15 (0.16)		0.01 (0.16)		−0.30 (0.16)		0.19 (0.16)
Parent: Age of children (ref. = Old children)								
Young children		0.16 (0.17)		0.10 (0.17)		−0.18 (0.19)		0.26 (0.19)
Unknown age		0.19 (0.17)		0.15 (0.16)		−0.08 (0.17)		0.28 (0.17)
Other characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
I.2. Perceived time trade-off-related productivity drivers								
I.2.a. Absenteeism risk		I.2.b. Career break risk		I.2.c. Overtime willingness		I.2.d. Recent loss of skills		
(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)	
Parental status (ref. = Not a parent)								
Parent	1.72*** (0.17)	1.73*** (0.22)	1.20*** (0.17)	1.25*** (0.23)	−2.15*** (0.17)	0.76*** (0.17)	0.73*** (0.21)	
Unknown parental status	0.64*** (0.17)	0.64*** (0.17)	0.50** (0.17)	0.50** (0.17)	−0.55** (0.18)	0.40* (0.17)	0.40* (0.17)	
Parent: Number of children (ref. = 1 child)								
2 children		0.17 (0.15)		0.18 (0.15)		−0.13 (0.15)		0.22 (0.15)
3 children		0.11 (0.15)		0.17 (0.15)		−0.20 (0.14)		0.18 (0.15)
Parent: Age of children (ref. = Old children)								
Young children		−0.01 (0.17)		−0.16 (0.18)		−0.24 (0.17)		−0.08 (0.18)
Unknown age		−0.30 (0.16)		−0.32 (0.17)		−0.08 (0.16)		−0.23 (0.15)
Other characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 3 | (Continued)

	I.3. Perceived gender-typical productivity drivers							
	I.3.a. Assertiveness		I.3.b. Dominance		I.3.c. Nurturance		I.3.d. Warmth	
	(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)
Parental status (ref. = Not a parent)								
Parent	−0.26 (0.14)	−0.44* (0.18)	−0.45** (0.13)	−0.60** (0.17)	0.69*** (0.14)	0.52** (0.20)	0.39** (0.14)	0.23 (0.20)
Unknown parental status	−0.24 (0.15)	−0.24 (0.15)	−0.24 (0.15)	−0.24 (0.15)	−0.03 (0.15)	−0.03 (0.15)	0.02 (0.14)	0.02 (0.14)
Parent: Number of children (ref. = 1 child)								
2 children		0.05 (0.12)		0.10 (0.13)		0.00 (0.14)		0.06 (0.14)
3 children		0.05 (0.13)		0.16 (0.13)		0.18 (0.15)		0.11 (0.14)
Parent: Age of children (ref. = Old children)								
Young children		0.16 (0.15)		0.07 (0.15)		0.18 (0.17)		0.15 (0.17)
Unknown age		0.28 (0.15)		0.11 (0.14)		0.12 (0.15)		0.14 (0.15)
Other characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
I.4. Perceived attitudes towards collaboration								
	I.4.a. With employer		I.4.b. With colleagues		I.4.c. With customers		I.4.d. Social network	
	(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)	(I.1)	(I.2)
Parental status (ref. = Not a parent)								
Parent	−0.58*** (0.16)	−0.64** (0.20)	−0.15 (0.15)	−0.40* (0.20)	−0.15 (0.15)	−0.32 (0.20)	−0.40* (0.16)	−0.55* (0.21)
Unknown parental status	−0.30 (0.16)	−0.30 (0.16)	−0.13 (0.15)	−0.14 (0.15)	−0.22 (0.16)	−0.22 (0.16)	−0.26 (0.17)	−0.26 (0.17)
Parent: Number of children (ref. = 1 child)								
2 children		−0.10 (0.13)		0.08 (0.13)		0.08 (0.14)		0.04 (0.15)
3 children		−0.03 (0.13)		0.16 (0.13)		0.07 (0.13)		0.11 (0.14)
Parent: Age of children (ref. = Old children)								
Young children		0.11 (0.15)		0.25 (0.15)		0.14 (0.16)		0.20 (0.17)
Unknown age		0.17 (0.14)		0.24 (0.14)		0.23 (0.15)		0.06 (0.16)
Other characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

II. Subsample of male applicants [N=1,144]

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TABLE 3 | (Continued)

	II.3. Perceived gender-typical productivity drivers							
	II.3.a. Assertiveness		II.3.b. Dominance		II.3.c. Nurturance		II.3.d. Warmth	
	(II.1)	(II.2)	(II.1)	(II.2)	(II.1)	(II.2)	(II.1)	(II.2)
Parental status (ref. = Not a parent)								
Parent	0.15 (0.14)	0.24 (0.19)	0.20 (0.13)	0.44* (0.17)	0.76*** (0.14)	0.56** (0.18)	0.62*** (0.13)	0.48** (0.17)
Unknown parental status	0.43** (0.16)	0.43** (0.16)	0.41** (0.15)	0.41** (0.15)	0.50** (0.16)	0.50** (0.16)	0.48** (0.15)	0.48** (0.15)
Parent: Number of children (ref. = 1 child)								
2 children		0.09 (0.12)		−0.09 (0.12)		0.22 (0.13)		0.03 (0.12)
3 children		0.06 (0.14)		−0.12 (0.14)		0.32* (0.13)		0.13 (0.13)
Parent: Age of children (ref. = Old children)								
Young children		−0.31* (0.14)		−0.34* (0.14)		−0.05 (0.14)		0.05 (0.13)
Unknown age		−0.07 (0.13)		−0.14 (0.13)		0.13 (0.14)		0.20 (0.13)
Other characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
II.4. Perceived attitudes towards collaboration								
	II.4.a. With employer		II.4.b. With colleagues		II.4.c. With customers		II.4.d. Social network	
	(II.1)	(II.2)	(II.1)	(II.2)	(II.1)	(II.2)	(II.1)	(II.2)
	(II.1)	(II.2)	(II.1)	(II.2)	(II.1)	(II.2)	(II.1)	(II.2)
Parental status (ref. = Not a parent)								
Parent	0.21 (0.16)	0.08 (0.20)	0.31* (0.15)	0.25 (0.20)	0.28 (0.14)	0.23 (0.19)	0.11 (0.15)	0.19 (0.20)
Unknown parental status	0.39* (0.18)	0.39* (0.18)	0.45** (0.17)	0.45** (0.17)	0.46** (0.16)	0.46** (0.17)	0.08 (0.18)	0.08 (0.18)
Parent: Number of children (ref. = 1 child)								
2 children		0.11 (0.11)		−0.01 (0.11)		0.13 (0.11)		−0.05 (0.13)
3 children		−0.03 (0.13)		−0.01 (0.13)		−0.06 (0.13)		−0.13 (0.15)
Parent: Age of children (ref. = Old children)								
Young children		0.02 (0.14)		0.07 (0.14)		−0.06 (0.13)		−0.09 (0.15)
Unknown age		0.28* (0.13)		0.13 (0.13)		0.14 (0.13)		0.06 (0.15)
Other characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The following abbreviations are used: ref. (reference category). The results are based on Models (2) and (5) from Table 2, but with the outcome variable adjusted to the signals. All other applicant, job, and recruiter characteristics are included. The presented statistics are coefficient estimates with standard errors presented in parentheses for the linear regression analyses discussed in Subsection 4.2. Standard errors are corrected for the clustering of the observations at the recruiter level. Intercepts are not presented. Significances are indicated as when * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

to the same conclusions as linear regression models; results are available upon request.

Age and marital status may interact with a job applicant's parental status, as indicated in Subsection 3.1. While the penalty was expected to be higher for younger or divorced applicants, we found no statistically significant interaction effects of these characteristics for parents on the invitation rating. Results of both analyses are available upon request. However, since these analyses involved three-way interactions, which were not specified in the D-efficient design, these findings should be interpreted as exploratory. It is also worth noting that the estimate regarding marital status showed that married male applicants were rated more favorably than their unmarried counterparts ($\beta = 0.35, p = 0.041$), while we observed no difference among female applicants (see Table S5).

4.2 | Signals of Revealing Parenthood

In this subsection, we present the results of our evaluation of the signals triggered by revealing parenthood during the hiring process among recruiters (RQ2a) and assessment of the extent to which this impact is moderated by the number of children (RQ2b) and their age (RQ2c). It provides insights into the reasons behind the results reported in Subsection 4.1.

Table 3 is based on the parenthood variables from Models (2) and (5) in Table 2. This table presents the estimation results of the regression of the signals on all applicant, job, and recruiter characteristics. Thereby, the specifications are the same as those of the regression analyses, the results of which are discussed in Subsection 4.1, with the exception of the dependent variables. As discussed in Section 2, the signals were organized into four clusters: (i) perceived general productivity drivers, (ii) perceived time trade-off-related productivity drivers, (iii) perceived gender-typical productivity drivers, and (iv) perceived attitudes toward collaboration.

Motherhood came with significant signals across each cluster of signals (RQ2a). Specifically, mothers were perceived as less ambitious ($\beta = -0.82, p < 0.001$), less committed ($\beta = -0.47, p = 0.004$), less flexible ($\beta = -2.13, p < 0.001$), having a higher absenteeism risk ($\beta = 1.72, p < 0.001$), having a higher career break risk ($\beta = 1.20, p < 0.001$), less willing to work overtime ($\beta = -2.38, p < 0.001$), more likely to have experienced recent loss of skills ($\beta = 0.76, p < 0.001$), less dominant ($\beta = -0.45, p = 0.001$), more nurturant ($\beta = 0.69, p < 0.001$), warmer ($\beta = 0.39, p = 0.006$), less pleasant for the employer to collaborate with ($\beta = -0.58, p < 0.001$), and having a weaker social network ($\beta = -0.40, p = 0.010$) than non-mothers. In other words, mothers received many negative signals, except for being perceived as more nurturant and warm.

When comparing women with an unknown parental status to non-mothers, the former group experienced some signals similar to those experienced by mothers. Specifically, women with an unknown parental status were perceived as less ambitious ($\beta = -0.36, p = 0.040$), less flexible ($\beta = -0.37, p = 0.033$), having a higher absenteeism risk ($\beta = 0.64, p < 0.001$), having a higher career break risk ($\beta = 0.50, p = 0.003$), less willing to work

overtime ($\beta = -0.55, p = 0.002$), and more likely to experience recent loss of skills ($\beta = 0.40, p = 0.019$).

When examining the signals based on the number and age of children (RQ2b and RQ2c), no significant heterogeneity was found, which is consistent with the findings in Subsection 4.1.

Fatherhood also entailed certain significant signals in each cluster of signals (RQ2a). In contrast to non-fathers, fathers were perceived as less flexible ($\beta = -1.08, p < 0.001$), more mature ($\beta = 0.60, p < 0.001$), less willing to work overtime ($\beta = -1.03, p < 0.001$), more nurturant ($\beta = 0.76, p < 0.001$), warmer ($\beta = 0.62, p < 0.001$), and more pleasant for colleagues to collaborate with ($\beta = 0.31, p = 0.042$). In other words, fathers were associated with both positive and negative signals.

When comparing men with an unknown parental status to non-fathers, the former also experienced some of the same signals as fathers, such as being perceived as more mature ($\beta = 0.57, p = 0.001$), more nurturant ($\beta = 0.50, p = 0.002$), warmer ($\beta = 0.48, p = 0.002$), more pleasant for colleagues to collaborate with ($\beta = 0.45, p = 0.007$), and more pleasant for customers to collaborate with ($\beta = 0.46, p = 0.005$). Furthermore, men with an unknown parental status were also perceived as more committed ($\beta = 0.39, p = 0.033$), having a lower absenteeism risk ($\beta = -0.49, p = 0.008$), having a lower career break risk ($\beta = -0.49, p = 0.008$), more assertive ($\beta = 0.43, p = 0.008$), more dominant ($\beta = 0.41, p = 0.008$), and more pleasant for the employer to collaborate with ($\beta = 0.39, p = 0.030$).

When examining the signals based on the number of children to address RQ2b, we again found results that can elucidate the findings from Subsection 4.1 on the fatherhood effect. Specifically, when fathers have three children, they are seen as less ambitious ($\beta = -0.34, p = 0.022$), less flexible ($\beta = -0.58, p < 0.001$), less likely to work overtime ($\beta = -0.58, p < 0.001$), more likely to have experienced recent loss of skills ($\beta = 0.35, p = 0.025$), and more nurturant ($\beta = 0.32, p = 0.017$) than fathers with one child.

When examining the signals based on the age of children to address RQ2c, the findings were more nuanced. Distinct signals emerged for fathers with old children, young children, and children of unknown age. Compared to fathers with children of unknown age, those with old children were perceived as less flexible ($\beta = -0.31, p = 0.047$), less willing to work overtime ($\beta = -0.30, p = 0.045$), and less pleasant for the employer to collaborate with ($\beta = -0.28, p = 0.034$). These results correspond with the outcomes described in Subsection 4.1, indicating that fathers with old children faced a lower invitation rating. In contrast, compared to fathers with young children, those with old children were perceived as having a lower absenteeism risk ($\beta = -0.30, p = 0.049$), more willing to work overtime ($\beta = 0.34, p = 0.032$), more assertive ($\beta = 0.31, p = 0.031$), and more dominant ($\beta = 0.34, p = 0.018$).

To ensure the robustness of the results for RQ2, we conducted additional analyses. Full results of these checks are available upon request. Specifically, we replicated the results excluding recruiters with the top 5% of scores on the social desirability scales (i.e., ERT and MRT) and re-estimated the models using ordered logistic regressions. Both robustness checks produced

findings that are consistent with our main analyses presented in Table 3.

In addition, we analyzed the relationship between the signals and invitation rating to better understand how perceptions may translate into hiring outcomes. As a first step, we conducted a correlation analysis between all 16 signals and invitation rating, separately for men and women. These results showed that nearly all signals were significantly correlated with invitation rating. For female applicants, only nurturance and warmth were not significantly associated with invitation rating.

As a second step, we estimated a multiple mediation model to investigate the causal effect of parenthood on the signals and their association with invitation rating. Specifically, the model consisted of 17 regression equations estimated simultaneously: the first 16 regressed each individual signal on the applicant, job, and recruiter characteristics, while the seventeenth regression included all 16 signals and these same characteristics to predict invitation rating. Mediation effects were then calculated using bootstrapping by multiplying the effect of parenthood on each signal with the signal's association with invitation rating. These effects indicate the shares of the total parenthood effect on invitation rating that could be, indirectly, explained by the parenthood effect on how applicants are perceived. Applying this approach to our two most salient findings, we found that, for women (Model I.2, Table 2), two negative signals mediated the negative effect of parenthood: career break risk and recent loss of skills explained approximately 36% and 20% of the total parenthood effect, respectively. For fathers with three children (Model II.5, Table 2), recent loss of skills explained about 7% of the total parenthood effect on invitation rating.

5 | Discussion

Peer-reviewed international literature has demonstrated that mothers face a penalty in terms of hiring chances, while the effects for fathers are less straightforward (Cheung et al. 2022; Correll et al. 2007; González et al. 2019; Hipp 2020). Despite this, research has largely overlooked the heterogeneity in different manifestations of parenthood regarding the number and ages of children (El Haj et al. 2024). In our study, we have addressed this gap by investigating how this heterogeneity might influence hiring decisions since having a larger number of children or younger children may result in harsher judgments. We also incorporated the withholding of parental status as an alternative control condition to better understand the unequal treatment of parents and non-parents. Furthermore, we contributed to the literature by examining a well-considered set of signals underlying these hiring biases, grounded in a solid theoretical foundation. To achieve this, we have designed a state-of-the-art vignette experiment, wherein real recruiters evaluated fictional job applicants.

We found that mothers faced a penalty compared to non-mothers and that this penalty did not change with the number and age of children. These results align with the expectations derived from the literature indicating the existence of a motherhood penalty (Cheung et al. 2022; Correll et al. 2007; Hipp 2020). This motherhood penalty can be understood by the large number of negative

signals. More specifically, our evidence indicated that mothers were seen as less ambitious, less committed, less flexible, having a higher absenteeism risk, having a higher career break risk, less willing to work overtime, more likely to have experienced recent loss of skills, less dominant, less pleasant for the employer to collaborate with, and having a weaker social network than non-mothers. In addition, mothers were perceived as more nurturant and warm than non-mothers. Notably, however, these stereotypically female qualities were not significantly associated with invitation ratings for female applicants. This suggests that such characteristics perceived by recruiters as inherently associated with women may not provide additional value to employer perceptions in hiring decisions.

Interestingly, the absence of variation by number of children may reflect broader theoretical frameworks. The theory of the ideal worker posits that the labor market expects workers to prioritize work fully and continuously, without interruptions for family responsibilities (Acker 1990; Williams 2001). Motherhood, regardless of the number of children, fundamentally conflicts with these expectations (Eagly and Karau 2002; Hays 1996). As a result, merely being a mother may already be sufficient to trigger penalties, making the specific number of children less relevant in recruiters' evaluations. This interpretation is also consistent with social role theory (Eagly 1987), which argues that societal expectations link women to caregiving roles. As a result, recruiters may penalize mothers immediately based on this role expectation, irrespective of the actual number of children.

Our findings further revealed that women with an unknown parental status did not receive significantly different invitation ratings than non-mothers. However, they were associated with some signals akin to those observed for mothers, which may stem from the perception that they might already have children without disclosing this information. This interpretation aligns with the theory of statistical discrimination, which suggests that in the absence of explicit information, recruiters rely on observable characteristics, such as gender and age, to make assumptions about an applicant's parental status (Aigner and Cain 1977; Arrow 1973; Becker et al. 2019; Gloor et al. 2021; Phelps 1972). It should be noted that the effect sizes of the signals associated with women with an unknown parental status were smaller than those observed for mothers. This might explain why these signals did not translate into the same lower invitation ratings as seen for mothers. Concretely, assumptions based on an unknown parental status may be less pronounced than those based on explicit disclosures of parenthood, precisely due to the absence of clear information (El Haj et al. 2024). As a result, the link between these signals and hiring behavior may be too weak to lead to differential treatment for women with an unknown parental status.

Regarding fatherhood, the literature presents mixed findings, with some studies reporting no effect on hiring chances (Bygren et al. 2017; Hipp 2020), while others suggest a positive effect (Correll et al. 2007). Our overall findings align with the former, indicating no adverse effect for fathers. This absence of a significant effect may be explained by the interplay of both positive and negative signals associated with fatherhood, which could counterbalance each other in the hiring decision process. Nonetheless, this overall pattern did not hold for all fathers,

as our results demonstrated that the number and age of children played a crucial role in shaping employer decisions and perceptions.

In fact, when men revealed having three children, they were perceived as less hireable. This penalty can be attributed to the perception that fathers with three children were seen as less ambitious, less flexible, less likely to work overtime, more likely to have experienced recent loss of skills, and more nurturant than fathers with one child. These perceptions may stem from many couples considering two children ideal (Beaujouan and Berghammer 2019), leading employers to view one or two children as manageable, while additional children may indicate greater caregiving responsibilities. Additionally, within the traditional breadwinner-caregiver model, fathers are expected to prioritize their careers, while mothers are assumed to handle the majority of childcare tasks (Eagly 1987). When the number of children increases, the perceived caregiving burden may surpass what is considered manageable for the mother alone, leading employers to believe that the father must take on a greater share of caregiving responsibilities (Kamo 1991). This shifting expectation could explain why penalties based on family size emerge specifically for fathers with three children, but not for mothers.

Nevertheless, our findings highlight the importance of marital status in mitigating the fatherhood penalty. While fathers with three children faced a substantial penalty—one that even surpasses the motherhood penalty—this effect was primarily observed among unmarried fathers. In our analysis, marital status was included as a control variable, with “unmarried” serving as the reference category. Married fathers with three children, who are far more common than their unmarried counterparts (Statistics Flanders 2024), experienced a significantly lower penalty due to the positive effect of marriage ($\beta = 0.35$), suggesting that marriage serves as a buffer against employer concerns. This aligns with the breadwinner-caregiver model (Eagly 1987), where mothers are perceived as the primary caregivers, while unmarried fathers may face harsher penalties due to assumptions that they bear greater caregiving responsibilities, conflicting with their expected breadwinner role (Steffens et al. 2019). Moreover, divorced fathers seemed not to face similar penalties as unmarried fathers, possibly because custody arrangements often place primary caregiving responsibilities on mothers, thereby mitigating the perceived burden on fathers (Cancian and Meyer 1998; Meyer et al. 2017).

Next, the age of children also influenced fathers' invitation ratings, with fathers with older children incurring a larger penalty. This pattern may be linked to shifting caregiving expectations as children grow up. When children reach school age, mothers often return to work, requiring fathers to step in more frequently for caregiving tasks (Wang and Bianchi 2008). Concretely, research from the Bureau of Labor Statistics (2023) shows a 13% higher labor force participation among mothers whose youngest child is over six compared to mothers whose youngest child is under six. This shift in perceived caregiving responsibilities may thus lead to lower invitation ratings for fathers with older children. It is, however, somewhat surprising that this difference in invitation ratings was not fully mirrored in the signal evaluations. In particular, fathers with older children were rated

more negatively on several signals than those with children of unknown age, yet not more negatively—and in some cases even more favorably—than fathers with younger children. This apparent contradiction may be less puzzling when considering the size and strength of the effects. The invitation rating difference between fathers with older children and fathers with children of unknown age was relatively large and clearly significant ($\beta = -0.52$, $p = 0.006$), whereas the difference between fathers with older and younger children was smaller and just reached conventional significance ($\beta = -0.40$, $p = 0.048$). This suggests that although some positive signal evaluations may exist for fathers with older children compared to fathers with children of unknown age, they may not be strong enough to offset the general penalty. We also must note that the signals included in our study were selected based on general theories of parenthood discrimination and may not fully capture perceptions tied to the age of children. As a result, specific concerns about parenting older children may still influence hiring decisions but remain unobserved in our signal framework.

Finally, our findings revealed additional positive significant signals for men with an unknown parental status. These findings suggest that recruiters may not employ the reasoning regarding the risk of (future) parenthood—a distinction that is often more pronounced for women (Becker et al. 2019; Gloor et al. 2021). Another explanation could be that omitting any mention of children may cause the recruiter to overlook the applicant's parental status, whereas explicitly stating the absence of children may still lead the recruiter to assume a desire for children. In other words, simply mentioning the word “children” may lead recruiters to form assumptions they might not have made otherwise.

This study is characterized by several methodological strengths. A key strength is the use of a D-efficient design and a large sample (452 recruiters evaluating 2260 vignettes). Concretely, the balanced distribution of observations across key categorical variables (i.e., gender, number of children and age of children) ensures adequate statistical power, as detailed in Tables S8 and S9. The consistency of our findings further suggests that the null results are not due to insufficient statistical power or overly small cell sizes. For mothers, significant differences in invitation ratings were observed in the overall analysis compared to non-mothers, but these became non-significant when broken down by the number and age of children. This pattern aligns with the signals, indicating that these null findings likely represent true non-effects. For fathers, significant effects emerged for specific subgroups, such as those with three children or older children, even in cases with smaller cell sizes. Again, this pattern is consistent with both the invitation ratings and signals. These observations reinforce the reliability of the results, supported by the balanced design and robust sample.

Next, Flanders offers a compelling context for studying the effects of parenthood on hiring decisions due to its similarities with the broader European labor market. Labor force participation rates differ by only a few percentage points, with Flanders performing slightly better (Eurostat 2024a). Similarly, employment rates by number of children are slightly higher in Flanders compared to the European average (Eurostat 2024b). Further, individuals in Flanders have about the same number of children as the European average (1.54 compared to 1.46;

Eurostat 2023b) and tend to have them at about the same age (30.9 years versus 31.1 years; Eurostat 2023a). Part-time work rates also align broadly, with Flanders exhibiting slightly higher rates overall. However, Flemish women stand out, as 34.2% work part-time compared to 25.6% in the EU (Eurostat 2024c). This disparity may be attributed to childcare policies, as Flanders performs moderately in terms of childcare provision compared to other European countries (United Nations Children's Fund [UNICEF] 2021). In other words, the observed patterns in Flanders are broadly consistent with European trends, suggesting that the results may be generalisable to other EU countries with similar demographic and socio-economic contexts. However, regions with significantly higher childcare provision, which can vary considerably by location, may exhibit different patterns of parenthood discrimination (Arena et al. 2023; El Haj et al. 2024; UNICEF 2021).

However, this study is not without limitations. First, our experimental setup allows us to claim causality regarding the effects of revealing parenthood on the applicant's hiring chances and the accompanying signals. However, we cannot claim causality regarding the effects of these signals on hiring chances, as the former were not experimentally manipulated (Gerber and Green 2012). We still conducted a correlation analysis and a mediation analysis to gain preliminary insights, but it is important to note that the mediation effects should be interpreted with caution. Although we refer to them as mediation effects, following common practice in the literature, these estimates do not imply causal mediation.

Second, there is a risk of receiving socially desirable responses, which may be elevated in a laboratory setting. Acknowledging this potential risk, we implemented several measures to mitigate its impact: recruiters were forced to make trade-offs akin to real-life hiring decisions, we introduced unknown parental statuses and ages of children and presented the number and ages of children under a combined factor labeled "family situation", an attention check was incorporated to filter out inaccurate recruiters, and a social desirability scale was employed to assess the robustness of results.

Third, we acknowledge that the years of relevant working experience may send different signals depending on the applicant's age and the skill level of the job. While this nuance was partially accounted for in our analysis through the focus on relevant rather than total working experience, the issue may remain salient in certain highly skilled jobs, particularly for older applicants. However, our examination revealed that this scenario is relatively uncommon in our sample, with only a few older candidates having limited relevant working experience in highly skilled jobs. Additionally, the prevalence of retraining programs in fields such as nursing in Flanders helps mitigate the potential bias associated with late-career transitions. Thus, we expect the overall influence of this factor on our results to be limited.

A fourth and final limitation is the artificial nature of the vignette experiment, which does not fully replicate real-life hiring processes despite our efforts to make the design as realistic as possible. Nonetheless, we believe this design offers significant added value. It is one of the only approaches that allows for the systematic manipulation of key variables, such as the number

and ages of children, enabling causal interpretation of their effects on hireability. Moreover, it provides unique insights into the underlying signals that drive discrimination, which are difficult to disentangle in other designs.

These findings hold several practical implications beyond their academic relevance. Understanding how parenthood is perceived in hiring processes is a fundamental prerequisite for crafting policies to mitigate this form of discrimination in the workplace in the long term. First, our results indicate that statistical discrimination plays a role, with employers relying on stereotypes due to a lack of accurate information. Implementing structured and standardized hiring processes can help ensure that hiring decisions are based on individual competencies rather than stereotypes. Examples include structured interviews, standardized CV formats, and thorough reference checks (Arena et al. 2023; Bragger et al. 2002; El Haj et al. 2024). Additionally, the penalties faced by mothers and fathers with multiple children highlight the need for policies that address caregiving responsibilities (Arena et al. 2023). On the one hand, expanding access to flexible and affordable childcare options, such as extended hours or more subsidized places, can help alleviate employer concerns regarding work-family conflicts (El Haj et al. 2024; Huber and Rolvering 2023; Wang and Ackerman 2020). On the other hand, encouraging fathers to take on caregiving roles through more equal parental leave policies can further challenge traditional gender norms and reduce the disproportionate burden placed on mothers (Castro-García and Pazos-Moran 2015; El Haj et al. 2024; Wang and Ackerman 2020). Finally, based on our results, we would not recommend that job applicants disclose their parental status in the early stages of the hiring process, regardless of gender.

To conclude, we encourage researchers to continue evaluating the effects of parenthood on the labor market situation in different contexts. While hiring opportunities are critical, they are not the sole factor determining an individual's career. After being hired, many individuals often seek promotion as the next step, in which they can also experience barriers due to their parental status (Brüggemann 2023). Emphasizing the number and age of children is essential, considering the evident heterogeneity for fathers, who face specific stigma associated with having many children. Gaining insights into these penalties is a crucial step, enabling future research to strategically address and overcome them.

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Consent

Due to the nature of the experiment, participants could not be a priori informed about the study's exact objective. However, they were informed about the general aim of the study. Consent to use the participants' data for research purposes was obtained prior to the start of the experiment.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.