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The STEM leaky pipeline at labor market entry in Spain: The role of job competition and social origin

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ABSTRACT

The underrepresentation of women in STEM (Science, Technology, Engineering, and Mathematics) majors is well documented. Using high-quality Spanish data, this study examines whether female STEM graduates are less likely to pursue STEM careers than their male counterparts and considers the moderating role of labor market conditions and social origin. We find a pronounced gender effect in initial and subsequent job placement (4–5 years after graduation). Notably, female STEM graduates are less likely to work in STEM occupations, even if they started their careers in STEM. Exploiting the significant impact of the Great Recession on the Spanish labor market, our study reveals a significantly larger gender effect among individuals who graduated during the crisis compared to those who graduated during the subsequent economic recovery. Thus, job competition influences the magnitude of the gender effect. Finally, our intersectional analysis of gender and social origin suggests that the gender difference is larger among STEM graduates from low-SES backgrounds.

1. Introduction

The traditional male advantage in education has been reversed in recent decades, with women being now more likely than men to pursue higher education (DiPrete and Buchmann, 2013; Esteve et al., 2016). However, men are still much more likely to choose STEM (Science, Technology, Engineering, and Mathematics) programs (Cheryan et al., 2017; Mann and DiPrete, 2013; Morgan et al., 2013), which are more prestigious and, despite considerable internal heterogeneity, better paid.[1]

The process leading to women's underrepresentation in STEM fields is commonly described as a leaky pipeline, with girls and young women leaking out of the pathway to a STEM degree at each stage of the process (Berryman, 1983; Lee et al., 2015; Morgan et al., 2013; Raabe et al., 2019; Speer, 2023; van der Vleuten et al., 2018): they are less likely to engage in science-related activities during childhood and adolescence (Legewie and DiPrete, 2014), to form expectations about a career in science (Alm, 2015), to choose

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[1] STEM-related occupations typically score higher on the ISEI scale than non-STEM occupations with equivalent educational requirements, indicating their higher socioeconomic status (Ganzeboom et al., 1992). In Spain, 84 percent of graduates in "Engineering and Architecture" are employed four years after graduation, with an average annual salary of 31,751€; these figures drop to 76 percent and 27,942€ for graduates in "Social Sciences and Law", and further down to 66 percent and 26,723€ for graduates in "Arts and Humanities" (information for 2022, retrieved from the Spanish Ministry of Universities: https://www.universidades.gob.es/indicadores-de-afiliacion-a-la-seguridad-social-de-los-egresados-universitarios/).

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science subjects in high school (Jacob et al., 2020), to enroll in STEM fields at university (Morgan et al., 2013), and to graduate after enrolling in STEM programs (Speer, 2023). More formally, even after taking a step towards STEM, the probability of taking the next step is always lower for women than for men. This gendered attrition contributes to the marked underrepresentation of women among STEM graduates (Cheryan et al., 2017), which has led to policy measures aimed at encouraging women to study and graduate in STEM fields. But how successful is this in ultimately increasing women's representation in STEM occupations?

Previous research has shown that the leaky pipeline does not stop after graduation in STEM fields. Studies from the US (Cech and Blair-Loy, 2019; Speer, 2023; Xu, 2015), the UK (Delaney and Devereux, 2022), Poland (Jasko et al., 2020), or Germany (Schwerter and Ilg, 2023) report that female STEM graduates are less likely to find a degree-related job after graduation, and that women's attrition from STEM occupations continues gradually over their careers. We join this research effort and examine gender differences in the transition from graduating with a STEM degree to employment in a STEM occupation in Spain.

We use high-quality Spanish data on about 20,000 STEM graduates. The data come from two waves of the *Survey on Labour Market Insertion of University Graduates*, conducted by the Spanish Statistical Office. They contain retrospective information about their career in the 4/5 years after graduation, together with relevant data on their education and background. The 2014 wave includes individuals who graduated from university at the end of the 2009-10 academic year (i.e., during the worst of the economic crisis), while the 2019 wave includes individuals who graduated at the end of the 2013-14 academic year (i.e., during the economic recovery).

Our study extends existing knowledge in four respects. First, we examine the gender effect for transitions immediately after graduation and 4/5 years into the labor market, which allows us to determine whether there is further attrition even after starting a career in a STEM occupation. Second, previous studies have investigated whether economic conditions at graduation affect individuals' careers. We follow this line of research to examine whether changes in job competition induced by economic downturns moderate the attrition of women from STEM after graduation. Third, we incorporate an intersectional perspective and consider the interplay of gender and social background (SES) by exploring whether the gender effect on STEM persistence differs by SES. Finally, we conduct our analysis for the Spanish case, an interesting yet unexplored context to study (see below).

We find a remarkable gender difference among STEM graduates in the transition to their first job, with women being notably less likely to work in a STEM occupation. We also observe a sizeable gender effect for the current job conditional on starting the career in the STEM sector. Moreover, the gender difference in the probability of being employed in the STEM sector is substantially larger for graduates during the economic crisis and for individuals from low-SES backgrounds.

The paper is structured as follows. We begin by presenting some information on the Spanish context, including information on other countries to contextualize the Spanish case and understand why it is particularly interesting for our research questions. Our theoretical considerations follow, alongside the description of the data source, the main variables, and the method used. We then present the results, their discussion, and the main conclusions of our study.

2. The Spanish case

Akin to the general trend, women in Spain are much more likely than men to obtain a university degree: 60 percent of all Bachelor graduates are women. However, they are significantly underrepresented among STEM graduates. Women account for only 14 percent of all graduates in Computer Science, 28 percent in Engineering, and 40 percent in Mathematics and Statistics. Nonetheless, not all STEM fields are male dominated. For example, around two-thirds of graduates in biology-related degrees are women.[2]

Compared to other countries, the female share among tertiary STEM graduates in Spain in 2013–14 was lower than in the US, the UK, or Poland, but higher than in Finland, Norway, Germany, or the Netherlands (see Table 1). Furthermore, while the female share decreased in Spain (similar to Norway and Finland) between 2009–10 and 2013–14, it increased in Poland, the UK, and the Netherlands.

Importantly for our work, Spain not only has one of the lowest fertility rates in Europe but also a comparatively high mean age at first birth for women, which increased from 29.8 in 2010 to 31.1 in 2019.[3] Spanish women's reproductive behavior also varies considerably by educational level, with university-educated women being significantly more likely to remain childless and to become mothers later in life (Compans et al., 2023; Lozano et al., 2024).

Nevertheless, the employment rate of Spanish women (around 42% in 2009 and 40% in 2014)[4] is the lowest of all the countries presented in Table 1. In contrast, and this time consistent with the low fertility rate, the share of part-time work among Spanish women is comparatively low (41% in 2009 and 42% in 2014) – compared to the Netherlands (78% in both years), Norway (61%–60%), the UK (58%–59%) or Germany (56%–58%). Only in Poland (30%–32%) and the US (39%–35%), part-time work is lower than in Spain.[5]

Finally, Spain was hit very hard by the Great Recession (2008–2014) caused by the 2007–2008 global financial crisis. Fig. 1 shows that economic activity collapsed in2008 and did not recover until 2014. The unemployment rate skyrocketed during the crisis, especially among young people, and then gradually declined during the economic recovery.

Overall, the Spanish case provides a particularly interesting context for addressing our research questions. On the one hand, the risk

[2] Data for the 2021–2022 academic year coming from the Ministry of University statistics database (https://www.universidades.gob.es/estadistica-de-estudiantes/).

[3] Data from UNECE (https://w3.unece.org/PXWeb/en/Table?IndicatorCode=34). As comparison, the mean age in 2019 was 29.8 in Germany, 27.6 in Poland, 27.0 in the US, and 29.0 in the UK (in 2018).

[4] World Bank, Gender Statistics, retrieved 12/15/2023.

[5] World Bank, Gender Statistics, retrieved 12/15/2023.

Table 1
Average share of female graduates in tertiary STEM programs, Spain and selected countries (%).

Country	2009–2010	2013–2014
Netherlands	20.9	25.0
Norway	31.3	25.7
Germany	–	26.8
Finland	28.7	27.4
Spain	**31.1**	**29.3**
United States (US)	31.4	31.7
United Kingdom (UK)	30.6	37.6
Poland	39.2	42.2

Notes: Countries selected for the purpose of comparison. Years are chosen to match our study years. For Germany, data are only available for 2015.
Source: World Bank, Gender Statistics, retrieved 12/15/2023.

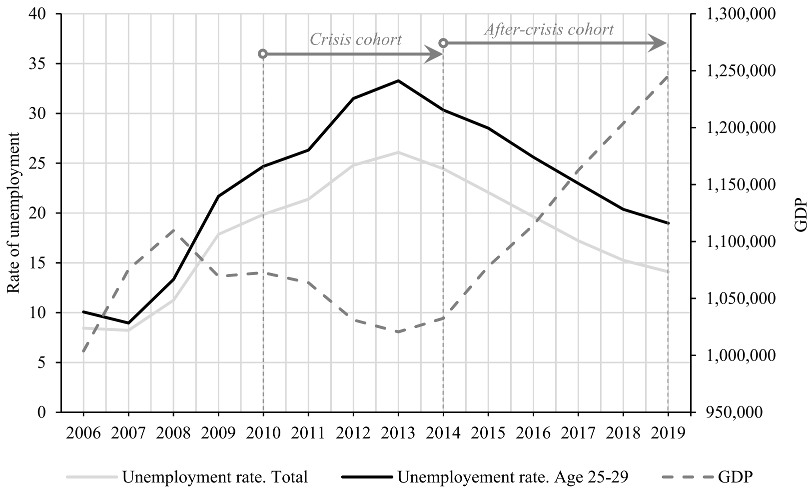

Fig. 1. Unemployment rate and GDP in Spain, 2006–2019.
Source: Unemployment data from the Labour Force Survey collected by the Spanish Statistical Office. GDP data from National Accounts provided by the Spanish Statistical Office. Authors' own elaboration.

of female university graduates being disadvantaged due to first birth and children at labor market entry (as shown by Cech and Blair-Loy 2019; Xu 2015 for the US) is comparatively low in Spain, given their low and late fertility rates. As a result, gender differences in STEM persistence will be less affected by selective parenthood. On the other hand, job competition in Spain was very high during the crisis and decreased significantly afterward. As previous research has established the consequential career impact of graduating in times of economic downturn (Altonji et al., 2016; Del Bono and Morando, 2022; Kahn, 2010; Oreopoulos et al., 2012), this period of extreme economic struggle in the Spanish history provides a highly relevant context to test whether the economic conditions at graduation (and thus differences in job competition) moderate the gender effect in STEM persistence.

3. Theoretical considerations

As with any labor market placement, gender differences in STEM employment among STEM graduates may result from supply- and demand-side decision processes. On the supply side, women with STEM degrees may opt out of STEM jobs more often than their male counterparts. On the demand side, STEM employers may prefer to hire men for the male-dominated work environment of STEM jobs. Like other studies based on observational data (Cech and Blair-Loy, 2019; Delaney and Devereux, 2022; Jasko et al., 2020; Schwerter and Ilg, 2023; Speer, 2023; Xu, 2015), we are only able to examine the joint outcome of both forces. However, we will provide some indirect evidence about the underlying mechanisms.

3.1. *Gender effect in the transition from STEM degrees to STEM occupations*

Previous research has shown that women are less likely to be employed in STEM occupations, contributing significantly to the gender pay gap (Breda et al., 2023; Delaney and Devereux, 2022). The question, however, is whether women are still less likely to be employed in STEM occupations even when they graduate with a STEM degree.

Two scenarios are possible. On the one hand, the gender effect may be reversed in the transition from STEM degrees to STEM occupations. Due to the greater attrition among women on the path to a STEM degree, female STEM graduates may be more selected than their male counterparts and, on average, stronger candidates for STEM jobs ("survivor bias"; cf. Auspurg et al., 2017, p. 284). Thus, proportionally more female STEM graduates should get STEM jobs, reversing the gender effect in favor of women.

On the other hand, most existing research examining the labor market transition and subsequent career outcomes of STEM graduates has found evidence that female STEM graduates are less likely to work in STEM occupations than their male counterparts (Cech and Blair-Loy, 2019; Delaney and Devereux, 2022; Jasko et al., 2020; Schwerter and Ilg, 2023; Speer, 2023; Xu, 2015). Supply-side explanations for this lower persistence of female STEM graduates are that they may opt out of STEM careers more often than men. In the same way that women tend to drift away from STEM fields during their educational journey, they may also be more likely to prefer other occupational destinations after completing their STEM education (self-selection mechanism) (Correll, 2001; Friedmann, 2018). On the demand side, and given the fact that the STEM workforce is heavily male-dominated, STEM employers (mostly men themselves) may prefer to hire male candidates (discrimination mechanism), either because employers prefer to preserve this male-dominated work environment or because they expect men to fit better and faster into these environments (Friedmann and Efrat-Treister, 2023; Funk and Parker, 2018). The combination of these processes leads to the following hypothesis:

Hypothesis 1. Female STEM graduates are less likely to work in a STEM occupation than their male counterparts.

Indeed, many scholars have reported that female STEM graduates are substantially less likely to work in the STEM sector, both immediately after graduation (Jasko et al., 2020; Schwerter and Ilg, 2023) and later in their careers (Delaney and Devereux, 2022; Speer, 2023). If anything, the initial gender effect at labor market entry increases over the life course (Delaney and Devereux, 2022). Interestingly, parenthood has been found to play a major role in women's persistence in the STEM sector, which may partly explain the reported gender difference in STEM persistence (Cech and Blair-Loy, 2019; Xu, 2015). Extending this research, we examine whether the gender effect persists also among STEM graduates who have started their careers in the STEM sector. Given the low fertility rate and late transition to first motherhood in Spain, this would be mainly due to women's experiences with the work culture, promotion structures, work-family norms, and so on in the male-dominated work environments of STEM occupations. Female STEM graduates who started their careers in STEM may then decide to change their career paths and opt for employment in other sectors. Moreover, female STEM graduates who try to change jobs within the STEM sector may again face discriminatory hiring practices by STEM employers and end up in non-STEM occupations or unemployed. Therefore, we hypothesize that:

Hypothesis 2. Female STEM graduates are less likely to be employed in a STEM occupation 4–5 years after graduation, even when they start their career in a STEM occupation.

3.2. Economic conditions as a moderator of the gender effect in STEM

Research has shown that occupational mismatch (such as STEM graduates working in non-STEM jobs) is higher the greater the job competition (Borgna et al., 2019). According to the job competition model, labor market outcomes are determined by two factors: the individual's position in the labor queue and the length of the queue of job vacancies (Thurow, 1979). Stronger candidates (more educated and skilled) are at the higher ranks of the labor queue, so they are the first to seize the opportunities offered by the economy. In turn, lower-skilled candidates face greater difficulties in finding jobs, especially during economic downturns when job opportunities become scarce, and the supply-demand ratio increases.

Importantly, due to the aforementioned discrimination mechanism, the labor queue is likely to be gendered (Reskin and Ross, 1990), with men placed ahead of equally educated and skilled women. Empirical evidence suggests that employers practice such gendered queuing, even for identically qualified male and female candidates (Barron et al., 2022). In that case, the gender difference in STEM persistence would be larger during economic downturns, as the economic crisis shortens the queue of job vacancies, and the cut-off point for the last applicant in the labor queue to get a STEM job moves to higher ranks. If women are indeed underrepresented at these higher ranks, a larger number of female STEM graduates would be forced to look outside the STEM sector compared to times of economic prosperity and lower job competition, increasing their presence in non-STEM occupations and unemployment. In support of these considerations, we expect to find that:

Hypothesis 3a. The gender effect in the transition from STEM degrees to STEM occupations is larger during economic downturns.

However, we might also argue that the prevailing mechanism in generating the gender difference in STEM persistence is the self-selection mechanism described above. In this case, that gender difference would be smaller during economic downturns, as the crisis may reduce the opportunities for female STEM graduates to work in (and to compete for) non-STEM jobs. This may force them to make the most of their education and to take full advantage of their studies, that is, to seek or stay in STEM occupations (as much as possible) to avoid unemployment. If so, we expect to observe that:

Hypothesis 3b. The gender effect is smaller during economic downturns.

Note that while Hypothesis 3a emphasizes the impact of demand-side forces and the discrimination mechanism discussed earlier, Hypothesis 3b stresses the role of supply-side forces and women's withdrawal from the STEM sector. Thus, support for one of these two competing hypotheses provides indirect evidence of the importance of either mechanism in generating the gender effect in the transition from STEM degrees to STEM occupations.

3.3. Interplay between social origin and gender

The concept of intersectionality refers to the fact that individual characteristics may interact to produce specific forms of dis/advantage, such as being a black low-SES woman (Crenshaw, 1991; McCall, 2005). The interaction between social origin and gender is commonly considered when analyzing educational outcomes, mostly reporting that the negative effect of being male on educational expectations (Ortiz-Gervasi, 2020) and attainment (Combet and Oesch, 2021) is larger among students from low-SES families. This interaction has also been investigated when studying the transition from education to the labor market (Zimmermann and Seiler, 2019). Applied to our research topic, gender may interact with social origin in STEM persistence, such that being female is a (more) salient factor depending on women's social background. Specifically, we argue that the disadvantage of female STEM graduates in finding STEM jobs may be greater for women from low-SES families.

To substantiate our expectation, we draw on England's (2010) argument that men and women tend to choose gender-typical or gender-neutral jobs. To engage in jobs where their gender is a minority, they need additional incentives such as the motivation to secure their social position of origin. As the STEM sector is heavily male-dominated and consist mostly of high-paying occupations – both important motives for men's career choices regardless of social background (Montmarquette et al., 2002; Zafar, 2013) – we expect a high probability of STEM persistence for both low- and high-SES men. We also anticipate a high probability of STEM persistence for high-SES female STEM graduates because they may need a job that matches their STEM degree to maintain their social position of origin. In turn, low-SES female STEM graduates can be employed outside the STEM sector without risking intergenerational downward mobility. Therefore, we predict for them a lower probability of STEM persistence. As support for these theoretical considerations, we expect to observe that:

Hypothesis 4. The gender effect in the transition to STEM occupations is larger for low-SES graduates than for high-SES graduates.

4. Data and method

4.1. Data

To test our hypotheses, we use data from two waves of the *Encuesta de Inserción Laboral de titulados Universitarios* (EILU, Survey on Labor Market Insertion of University Graduates). The first EILU wave was conducted in 2014, in which 30,379 individuals who graduated with a Bachelor's degree at the end of the 2009-10 academic year were interviewed about their educational and employment trajectories in the four years after graduation. We refer to this wave as the crisis cohort because they made their labor market transition during the economic crisis. The second EILU wave – our post-crisis cohort – was conducted in 2019, in which 31,561 Bachelor graduates from the 2013-14 academic were interviewed about their educational and employment trajectories in the five years following graduation.

Our analysis is restricted to STEM graduates. As in previous research, we define STEM as those fields related to science (such as biology, chemistry, or physics), technology (such as computer science or information technology), engineering (such as civil engineering or architecture), and mathematics (such as mathematics or statistics). Our analytical sample consists of 19,230 individuals, of which 11,640 are men and 7,590 (39.4%) are women (see Table 2).[6] While technology and engineering are clearly male-dominated fields, science and mathematics are rather gender-neutral fields (but have become less attractive to women in the post-crisis cohort). As the gender distribution differs across the STEM subfields, we test the robustness of our findings by reruning the analyses separately for each of the four subfields and including STEM subfields as a control variable. Moreover, we also examine an additional sample of 3,173 STEM Master's graduates surveyed only in the second EILU wave.

4.2. Variables in the study

In both EILU waves, participants reported their first occupation after graduation and their occupation at the time of the survey (hereinafter, current occupation). For the first occupation, we create a variable indicating whether STEM graduates were employed in a STEM occupation, employed in a non-STEM occupation, or had never been employed. For the current occupation, the variable distinguishes between employment in a STEM occupation at the time of the survey, employment in a non-STEM occupation, or unemployment (including inactive persons, if not otherwise specified). The definition of STEM occupation follows the same criteria as used for the field of study (see above). Information on first and current jobs allows to examine both whether female STEM graduates are less likely than their male counterparts to start their careers in STEM occupations, and whether female STEM graduates whose first job was in STEM are less likely to remain in that sector.

To further qualify our findings related to Hypothesis 1 and 2, we use information on how long it took for participants to get their first job after graduation, whether they changed jobs between their first and current jobs, and the salary of their first job. Salaries are only available for the second EILU wave, and only as a categorical variable with seven levels for net monthly salary (and no continuous hourly wages).[7] We use the class marks of these wage intervals to estimate a linear model. We reran the analysis by calculating the

[6] The proportion of women among all graduates (i.e., including STEM and non-STEM programmes) is 58.4 percent.

[7] In the 2019 wave of the study, individuals reported their net monthly salary in intervals: (1) less than 700€; (2) 700–999€; (3) 1,000–1,499€; (4) 1,500–1,999€; (5) 2,000–2,499€; (6) 2,500–2,999€; (6) more than 3,000€.

Table 2
Analytical sample by STEM field and gender (%).

	Total		Crisis cohort		Post-crisis cohort	
	N	% women	N	% women	N	% women
Science	6,082	54.4	2,975	57.7	3,107	51.1
Technology	3,901	28.4	2,110	29.4	1,791	27.1
Engineering	8,455	32.7	4,282	31.1	4,173	34.4
Mathematics	792	52.0	381	58.8	411	45.7
Total	19,230	39.4	9,748	39.9	9,482	39.0

logarithm of these values and the results remain mostly the same (not shown).

We use the cohort difference in labor market entry conditions to examine whether the gender effect varies with job competition (Hypotheses 3a/3b). First-wave participants entered the labor market during years of intense economic struggle, while second-wave participants did so in a context of economic recovery (see Fig. 1 above).

To test whether the gender effect varies with the individual's social origin (Hypothesis 4), we use information from the second-wave participants on their parents' educational attainment (first-wave participants were not asked about this). We distinguish individuals with no (low-SES), one (int-SES), and two university-educated parents (high-SES).

As we intend to examine the gender effect between equivalent male and female STEM graduates, we adjust for a number of controls. First, we include the individual's age as it affects the search time available and the employability of the candidate. Note that the age information is at the time of the survey, so individuals were younger at graduation and most likely also younger at their first job. Moreover, differences in performance and qualifications may influence STEM employers' assessment of male and female applicants. As we do not have direct measures (such as grades), we include four proxy indicators: whether individuals received an excellence award at the end of the degree, whether they went abroad during their studies, whether they went abroad after graduation, and whether they had obtained a Master's degree. Third, we test Hypotheses 1–3a/b controlling for individual's social origin. We use three proxies for social origin available for both cohorts (parental education is only provided in the second cohort, see above): whether individuals received a grant during their university studies, whether they attended a public or private university, and whether they studied part of their studies abroad. The correlations between these variables and parental education for the post-crisis cohort justify their inclusion as proxies for social origin (see Online Supplement, Table S1). To avoid overcontrol bias (Grätz, 2022), we do not include these variables when testing Hypothesis 4 on the moderating role of social origin (as we use the direct measure of parental education here, see above).

We do not have information on the presence of children or the age at first birth, both of which may contribute to gender differences in STEM employment (Cech and Blair-Loy, 2019; Xu, 2015). However, as discussed above, the transition to motherhood in Spain is late, especially for university graduates. Therefore, we do not expect that motherhood plays a large role in explaining our findings on labor market entry. In the supplementary analysis on salaries in the first job (see above), we include part-time work as a control. This variable can be interpreted as indicative of the impact of motherhood to some extent.[8]

Table 3 shows descriptive statistics for all variables by graduation cohort for the full sample and for the STEM graduate subsample. The two cohorts are very similar, except that the post-crisis cohort is notably older than the crisis cohort. This age difference is consistent with the decisions of many Spaniards to return to education during the economic crisis (Valdés, 2020). Moreover, a higher proportion of graduates in the post-crisis cohort received a grant during their studies, reflecting the economic hardship experienced by many families during the crisis. Regarding our outcome variables, the share of STEM graduates who were unemployed or never employed at the time of survey is notably lower in the post-crisis cohort, mainly due to non-STEM employment. Crucially, the gender composition of the STEM graduate sample is the same in both cohorts: around 60 percent men and 40 percent women. This allays concerns that women or men were disproportionately discouraged/encouraged from choosing STEM fields during the crisis. If anything, women were less likely to graduate in more gender-neutral STEM subfields (as shown in Table 2 above).

4.3. Method

Our two dependent variables are the three-category nominal variables *first occupation* and *current occupation*. To assess the effect of gender on these two variables after adjusting for a well-defined set of controls, we employ the following multinomial model:

$$\ln\left(\frac{P(Y=j)}{P(Y=b)}\right)=\alpha_b+\beta_j X+\gamma_j \boldsymbol{Z} \quad j=1,\ldots k \textit{ and } j\neq b \tag{1}$$

where Y is the dependent variable, j represents the categories in Y, b represents the reference category against which the rest of the alternatives are compared (STEM-occupation), α is a constant, X is the gender of the individual, β_j are the coefficients of gender for alternative j, and Z is a vector of controls. All models include robust standard errors.

[8] According to European statistics from the Labour Force Survey, European women aged 25 to 54 are significantly more likely to work part-time if they have children (32%) compared to childless women (20%). See: https://ec.europa.eu/eurostat/databrowser/view/lfst_hhptety_custom_12992737/default/table?lang=en&page=time:2023).

Table 3
Descriptive statistics (column percentages).

	Full sample		STEM graduates (Bachelor)	
	Graduated 2010 (crisis cohort)	Graduated 2014 (post-crisis cohort)	Graduated 2010 (crisis cohort)	Graduated 2014 (post-crisis cohort)
Field of study (Bachelor)				
Non-STEM	67.9%	70.0%	–	–
STEM	32.1%	30.0%	–	–
First occupation				
Non-STEM occupation	72.1%	80.3%	33.2%	48.6%
STEM occupation	22.0%	17.5%	61.5%	50.1%
Never worked	5.9%	2.2%	5.3%	1.4%
Current occupational situation				
Employed: Non-STEM	55.6%	67.6%	23.5%	39.3%
Employed: STEM	19.0%	18.1%	53.3%	50.4%
Unemployed	25.4%	14.3%	23.2%	10.3%
Gender				
Men	40.3%	43.0%	60.1%	61.0%
Women	59.7%	57.1%	39.9%	39.0%
Age at survey				
Less than 30	59.0%	49.6%	49.1%	39.7%
30-34	25.1%	27.9%	35.2%	33.4%
35 or more	15.9%	22.5%	15.7%	27.0%
Type of university				
Public	86.1%	85.2%	85.7%	90.3%
Private	14.0%	14.8%	14.3%	9.7%
Excellence award				
No	97.8%	95.6%	97.3%	95.2%
Yes	2.3%	4.4%	2.7%	4.8%
Grant during studies				
No	65.4%	61.9%	68.0%	64.7%
Yes	34.6%	38.2%	32.0%	35.3%
Went abroad during studies				
No	86.5%	83.3%	85.6%	81.6%
Yes	13.5%	16.7%	14.4%	18.4%
Went abroad after graduation				
No	83.8%	82.5%	81.7%	81.0%
Yes	16.2%	17.6%	18.3%	19.0%
Completed a Master's degree				
No	69.7%	56.3%	66.7%	55.6%
Yes	30.3%	43.8%	33.3%	44.4%
Parental education				
No university-educated parent	–	58.6%	–	55.9%
One university-educated parent	–	20.3%	–	22.0%
Two university-educated parents	–	17.8%	–	19.1%
Total	30,379	31,651	9,748	9,482

Source: EILU (waves 1 and 2).

The model is adjusted for STEM graduates from the two EILU waves, including the year of graduation as a fixed effect. To test Hypothesis 2, we further restrict the analytical sample to STEM graduates whose first job was in STEM or who changed jobs between their first and current occupation.

The results are presented in the form of Average Marginal Effects (AME) of gender on the predicted probability of working in a STEM occupation, in a non-STEM occupation, or being unemployed. As we will consider interaction effects in a non-linear model, examining the results in terms of predicted probabilities entails a significant advantage (Mize, 2019).

5. Results

5.1. *Gender effect in the transition to the first job*

We start by testing the gender effect on the transition from graduation in a STEM field to the first job. The results are shown graphically in the left-hand panel of Fig. 2. As is evident, the gender effect in this transition is remarkable: female STEM graduates are 11.3 percentage points (pp) less likely to have a first job in STEM than their male counterparts (p-value $\leq$0.001). Conversely, female STEM graduates are substantially more likely than men to find their first job outside the STEM sector (AME = 0.106; p-value $\leq$0.001), but they are equally likely to have never been employed after graduation until the time of the survey (AME = 0.007; p-value = 0.016).

Thus, despite a potentially stronger selectivity in obtaining a STEM Bachelor's degree among women, female STEM graduates are notably less likely than their male counterparts to start their careers in a STEM occupation, consistent with Hypothesis 1.[9]

To test the robustness of this finding, we rerun the analysis for the sample of Master's graduates (only available for the post-crisis cohort). Again, women with a STEM Master's degree are 8.1 pp (p-value $\leq$0.001) less likely than men to find their first job in a STEM occupation (see Online Supplement, Table S2, Model 1).

Importantly, women's participation is heterogeneous across STEM subfields, and in some specific programs, such as biology, women are actually in the majority. To assess how this heterogeneity may affect our findings, we stratify the analysis by STEM subfield, distinguishing graduates in Science, Technology, Engineering, and Mathematics (left-hand panel of Fig. 3). The gender effect on the probability of starting the career in STEM is substantial and statistically significant in all subfields, but there is a notable degree of heterogeneity. The gender effect is largest among Bachelor's graduates in technology programs (AME = −0.147; p-value = 0.000) and smallest among graduates in engineering (AME = −0.037; p-value = 0.001), both male-dominated fields (see Table 2 above). Interestingly, there is no correlation between the size of the gender effect and the percentage of women in the subfields.

To qualify our results, we examine two additional pieces of information: the time after graduation until finding the first job and the salary of the first job (see Appendix, Table A2). First, female STEM graduates whose first job was in a STEM occupation take almost 2 months longer than men to find this job (p-value $\leq$0.001). However, half of this difference is due to the fact that female STEM graduates are more likely to continue their education and complete their STEM degrees at a younger age. After including all controls, it takes 3 weeks longer for female than male STEM graduates than male graduates (p-value $\leq$0.001).[10] In relative terms, women take 16.6 percent longer than equivalent men to find their first job if it is a STEM occupation.

Second, we also calculate the gender difference in the net monthly salary of the first job among those who started in a STEM occupation (only available for the post-crisis cohort; see Appendix, Table A2). Given data limitations (see Section 4.2), this analysis is merely exploratory. Female STEM graduates whose first job was in STEM earn almost 100€ less than their male counterparts (p-value $\leq$0.001). After adjusting for all controls (including working hours, i.e., part-time or full-time), this difference is reduced to 80€ (p-value $\leq$0.001). This means that female STEM graduates starting their careers in STEM are paid around 7.8 percent less than equivalent males.

We also estimated the effect of working outside the STEM sector on the starting salary of female STEM graduates (see Appendix, Table A3). Women with a first job in STEM earn 120€ more than women with a non-STEM job (14.7 % higher salary).[11] Controlling for working hours significantly reduces this difference to only 26€, because only 15.5 percent of female STEM graduates with a first job in STEM worked part-time, while this figure more than doubles (35.6 %) among their counterparts with a non-STEM job. This difference suggests that motherhood is associated with working outside the STEM field.

5.2. Gender effect in the current occupation

Next, we focus on the occupational situation at the time of the survey (i.e., current occupation). To test whether the leaky pipeline continues to leak even after STEM graduates took their first job in the STEM sector (Hypothesis 2), we restrict the analysis to STEM graduates that started their career in a STEM job (Fig. 2 (Model 2). Female STEM graduates whose first job was in STEM are 5.3 pp less likely than men to be currently employed in a STEM job (p-value $\leq$0.001). Thus, not only are female STEM graduates less likely to find a first job in STEM, but they are also less likely to stay in STEM after starting their career in a STEM job (consistent with Hypothesis 2). This holds for all subfields but, again, the gender effect is largest for technology and mathematics graduates and smaller for science and engineering graduates (see Fig. 3 above).

To qualify these findings, we further condition the analysis on having changed jobs (see Online Supplement, Table S4, Model 1). The analytical sample now includes only those STEM graduates whose first job was in a STEM occupation, but who had left that job by the time of the survey. Importantly, women are not more likely than men to leave their first job. However, women who changed jobs are 7.6 pp less likely than men to be currently employed in a STEM occupation (p-value $\leq$0.001) and 3.6 pp more likely to be currently employed in a non-STEM occupation (p-value $\leq$0.001). Thus, job changes increase the gender effect in the current occupation conditional on having started in a STEM occupation.

Additionally, women with job changes are more likely than men to be currently unemployed (AME = 0.050; p-value $\leq$0.001). This means that women who have left their first job in STEM may still want to work in the STEM sector but are less likely to find a STEM job because employers prefer to hire men. To clarify this point, we rerun the previous model but divide the unemployed group into two categories: inactive and looking for a job (see Online Supplement, Table S4, Model 2). We find that female STEM graduates who started their career in a STEM occupation but then changed jobs are significantly more likely than men to be looking for a job (AME = 0.034; p-value $\leq$0.001) and only slightly more likely to be inactive (AME = 0.015; p-value = 0.009). So, indeed, women who have left their first job may still be searching for a new STEM job, but as with the first occupation after graduation, it is more difficult for them than for their male counterparts. This again may suggest discriminatory hiring practices by STEM employers.

Finally, the right-hand panel of Fig. 2 (Model 3) reports the gender effect in the current occupation without conditioning on the first job, that is, the gender effect on the probability of being employed in a STEM job at the time of the survey among individuals who

[9] Descriptive analyses show that the most common jobs for female STEM graduates working outside the STEM sector were teaching-related occupations, health-related occupations, and sales clerks.

[10] For STEM graduates with a first job in STEM, the average time taken to find their first job is 7.5 months.

[11] The average salary of female graduates in their first job is 916€.

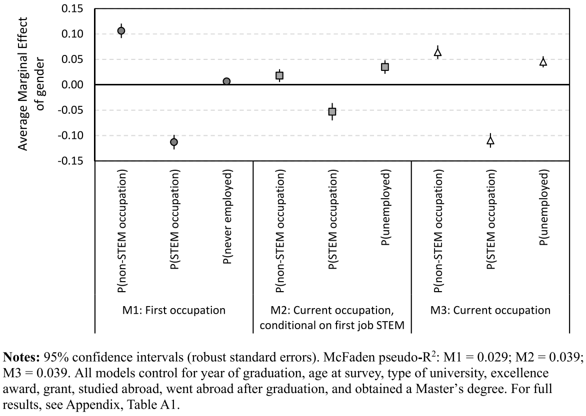

Fig. 2. Average marginal effect (AME) of being female on the probability of placement in first and current occupation
Notes: 95% confidence intervals (robust standard errors). McFaden pseudo-R^2: M1 = 0.029; M2 = 0.039; M3 = 0.039. All models control for year of graduation, age at survey, type of university, excellence award, grant, studied abroad, went abroad after graduation, and obtained a Master's degree. For full results, see Appendix, Table A1.
Source: EILU (waves 1 and 2), only STEM graduates.

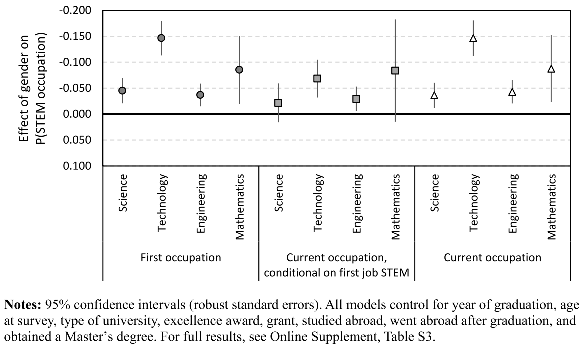

Fig. 3. Average marginal effect (AME) of being female on the probability of having the first and current occupation in the STEM sector, by subfield of study
Notes: 95% confidence intervals (robust standard errors). All models control for year of graduation, age at survey, type of university, excellence award, grant, studied abroad, went abroad after graduation, and obtained a Master's degree. For full results, see Online Supplement, Table S3.
Source: EILU (waves 1 and 2), only STEM graduates.

graduated in STEM 4–5 years before. Compared to the previous analysis, we now allow female STEM graduates to start their careers outside STEM and to enter a STEM occupation afterward. This could potentially reduce the gender difference if some of them are currently employed in STEM. However, we again observe a remarkable gender effect in current employment in STEM (AME = −0.110; p-value ≤0.001), which is almost identical to the one reported for the first occupation. This means that "returns" to STEM occupations by women who were not initially employed in STEM occupations are offset by "exits" of women who started their careers in STEM occupations.

5.3. Economic conditions as a moderating factor for the gender effect in STEM persistence

We next test Hypotheses 3a and 3b on whether the gender effect varies between the crisis and post-crisis cohorts due to differences in job competition by including the interaction between gender and the graduation year on the previous models. Fig. 4 presents graphically the average marginal effect of gender for the crisis and post-crisis cohorts on the first job, current job conditional on having a first job in STEM, and unconditional current job.

For those who graduated in STEM in 2010, in the midst of the worst economic crisis in modern Spanish history, we see a remarkable gender effect on the probability of having a first job in the STEM sector of 13.7 pp (p-value ≤0.001; see Fig. 4, Panel A). The gender difference was notably smaller for STEM graduates in 2014, at the start of the economic recovery (AME = 8.9 pp; p-value ≤0.001). The cohort difference of 4.9 pp is statistically significant (p-value ≤0.001) and sizeable as it represents one-third of the total difference observed for the crisis cohort. Importantly, this decrease is completely due to a significant increase in the gender effect on the probability of finding a first job outside STEM, while the gender difference in the probability of not having worked after graduation is

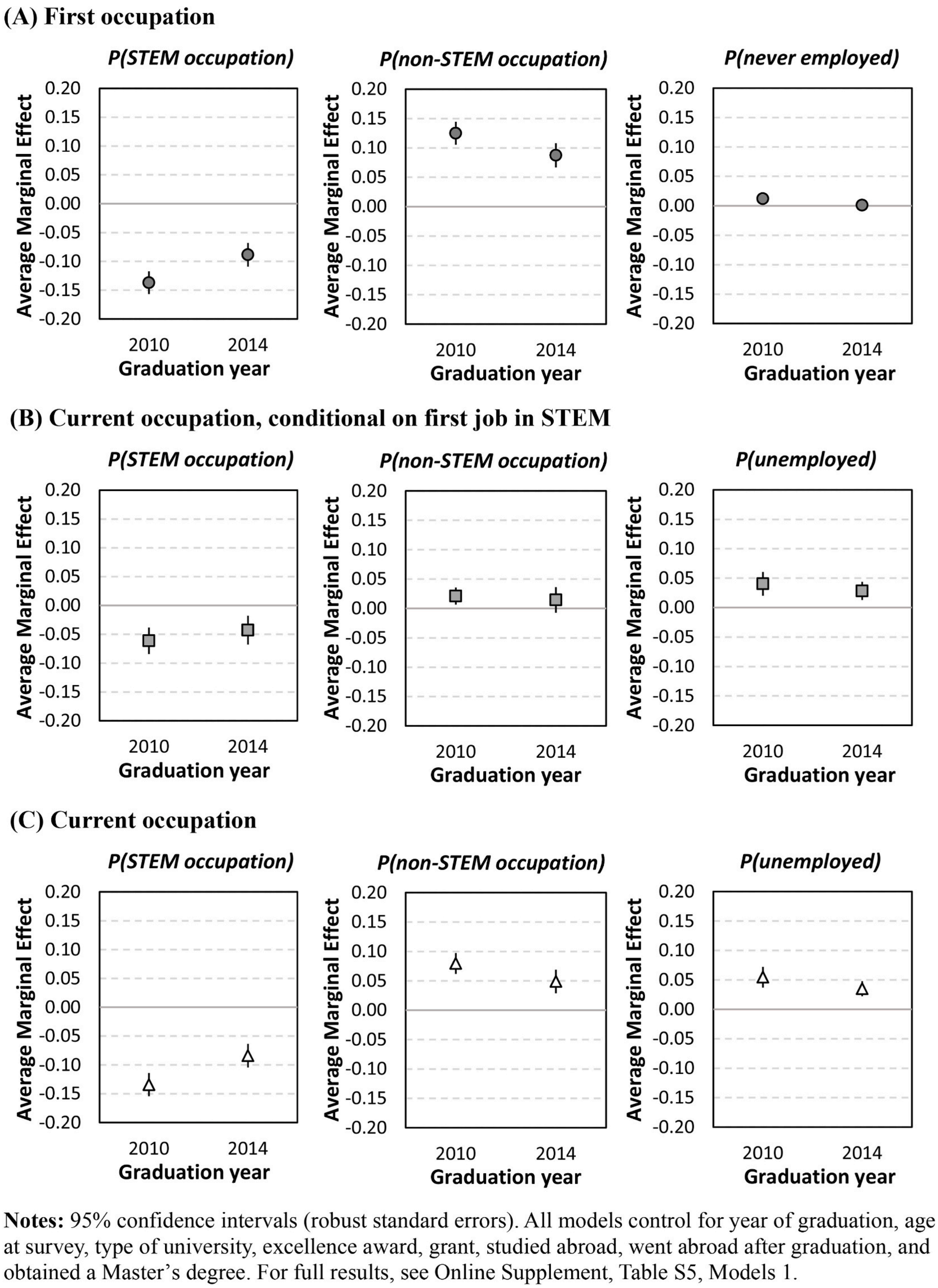

Fig. 4. Average marginal effect (AME) of being female on the probability of placement in first and current occupation among STEM graduates by year of graduation

Notes: 95% confidence intervals (robust standard errors). All models control for year of graduation, age at survey, type of university, excellence award, grant, studied abroad, went abroad after graduation, and obtained a Master's degree. For full results, see Online Supplement, Table S5, Models 1.

Source: EILU (waves 1 and 2), only STEM graduates.

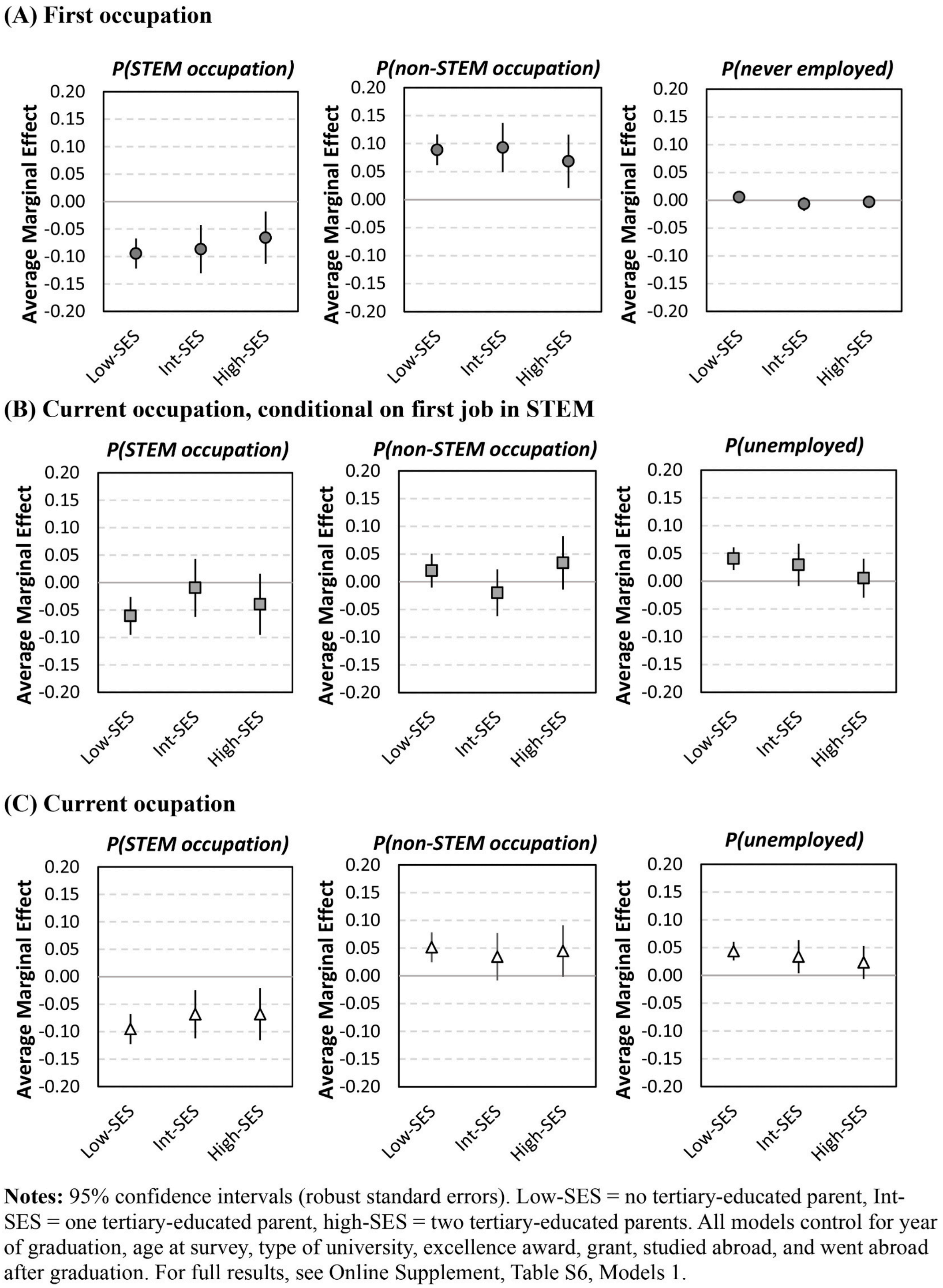

Fig. 5. Average marginal effect (AME) of being female on the probability of placement in first and current occupation among STEM graduates by parental educational attainment

Notes: 95% confidence intervals (robust standard errors). Low-SES = no tertiary-educated parent, Int-SES = one tertiary-educated parent, high-SES = two tertiary-educated parents. All models control for year of graduation, age at survey, type of university, excellence award, grant, studied abroad, and went abroad after graduation. For full results, see Online Supplement, Table S6, Models 1.

Source: EILU (wave 2), only STEM graduates.

virtually zero in both cohorts.

Panel B of Fig. 4 reports the results for the occupation at the time of the survey, conditional on having started in STEM. Here we do not observe any significant cohort difference in the gender effect. We elaborate on this finding in the Discussion section. If we do not restrict the analysis to those with a first job in STEM, the gender effect in the current occupation is again notably and significantly larger in the crisis cohort (AME = −0.134; p-value ≤0.001) than in the post-crisis cohort (AME = −0.084; p-value ≤0.001).

Overall, these findings support Hypothesis 3a and contradict Hypothesis 3b. However, it is possible that changes in the gender composition within the STEM subfield over time explain (at least in part) the cohort difference in the gender effect. We therefore rerun the analysis controlling for STEM subfield (see Online Supplement, Table S5). The conclusion remains the same: the gender effect is larger in the crisis cohort.

5.4. *Intersection of gender and social origin*

Finally, we test Hypothesis 4 by examining the interaction between the gender effect and parental educational attainment. Fig. 5 reports the average marginal effect of being female by parental education on the probability of job placement. As before, we rerun all analyses adding the four STEM subfields as control and, again, the results remain the same (see Online Supplement, Table S6).

For the first occupation after graduation, the gender effect on the probability of finding a STEM job is largest for graduates with no university-educated parents (AME = −0.097; p-value ≤0.001) and decreases for graduates with one (AME = −0.086; p-value ≤0.001) and especially two university-educated parents (AME = −0.065; p-value ≤0.001). The difference in the gender effect for low- and high-SES graduates is remarkable, as it represents one-third of the effect observed for low-SES graduates. Nonetheless, the interaction is not estimated with enough precision to confirm the statistical significance of this difference (p-value = 0.248).

For the current occupation conditional on having a first job in STEM (Fig. 5, Panel B), the gender effect is again largest among graduates with no university-educated parents (AME = −0.062; p-value ≤0.001) and disappears completely for those with one university-educated parent (although the effect reappears for those with two university-educated parents).

Finally, Panel C reports the interaction for the unconditional current occupation. The gender effect is again substantially larger among low-SES individuals (AME = −0.097; p-value ≤0.001) than among their high-SES counterparts (AME = −0.067; p-value ≤0.001), but again the difference does not reach statistical significance.

These findings tentatively support Hypothesis 4. The gender effect in the transition from STEM degrees to STEM occupations seems to be largest for individuals from low-SES families, although we lack statistical power to affirm the significance of the result.

6. Discussion

We report a remarkable difference of 13 pp in the probability of female and male STEM graduates of finding their first job after graduation in the STEM sector. Our finding strongly supports Hypothesis 1 and is very close to the 10 pp gender difference in the transition to the first job in the UK (Delaney and Devereux, 2022) or the 7 pp effect in Germany (Schwerter and Ilg, 2023). It contradicts the idea that a potentially greater selection among female STEM graduates in terms of motivation and school performance could reverse the gender effect at labor market entry.

Our explorative analyses of search duration and salaries show that female STEM graduates who start their careers in STEM take longer to find that job and earn lower starting salaries than men. These results are highly consistent with findings from Poland (Jasko et al., 2020) and the US (Xu, 2015). The longer job search may point to discrimination by STEM employers, who prefer to hire men and, as a result delay women's entry into the labor market. We also find that female STEM graduates working in the STEM sector tend to earn more than female STEM graduates working outside of STEM, which is partly explained by differences in part-time work. The latter suggests that female STEM graduates with children are more likely to work in non-STEM occupations (Cech and Blair-Loy, 2019).

The reported gender difference of 11 pp in the unconditional probability of working in STEM 4–5 years after graduation is also consistent with previous studies. For Germany, Schwerter and Ilg (2023) found a gender effect of 4.4 pp in the relatedness of computer science and engineering degrees to the job five years later.[12] For the UK, Delaney and Devereux (2022) reported that the gender effect in STEM persistence gradually increased over the first 15 years after graduation.

Crucially, we find a 5.3 pp gender effect among STEM graduates with a first job in STEM to be employed in STEM 4–5 years after graduation. These findings confirm Hypothesis 2 and strongly support the more general claim that women are consistently less likely to persist in STEM. They are less likely to choose STEM programs (Morgan et al., 2013), less likely to graduate in STEM upon enrolment (Speer, 2023), and, as shown here, less likely to start the career in the STEM sector after graduation and less likely to stay in the STEM workforce after starting the career in a STEM job.

The significantly larger gender difference in the crisis cohort, both for the first job and for the job 4–5 years after graduation, is consistent with Hypothesis 3a (and contradicts Hypothesis 3b), indicating a moderating role of economic conditions and job competition. Interestingly, there is no difference between the two cohorts when assessing the gender effect on the current occupation of those who started their career in a STEM occupation. It is important to keep in mind that both graduation cohorts were interviewed about their current occupation during the economic recovery (in 2014 and 2019, respectively). Therefore, if female STEM graduates

[12] We rerun the analyses for the alternative outcome "self-declared relatedness of the first/current job to field of study at university". The results are very similar, with a gender effect of 5 pp on the probability of reporting having a related first/current job, and an additional 2.5 pp gender effect on the probability of reporting having a related current job conditional on having a related first job (results available upon request).

were able to start their careers in the STEM sector, then there should not be large differences in the gender effect on the current occupation between the two cohorts. This is exactly what we find. Overall, our STEM results align with previous research documenting the relevance of graduating during economic downturns for early and late labor market outcomes (Altonji et al., 2016; Del Bono and Morando, 2022; Kahn, 2010; Oreopoulos et al., 2012; Schwandt and Von Wachter, 2019).

Finally, our analyses show that male STEM graduates have a high probability of working in STEM regardless of their social origin. In contrast, female STEM graduates tend to have a lower probability of finding a STEM job if neither parent has a university degree, leading to a larger (but not statistically significant) gender effect among low SES graduates (in line with Hypothesis 4).

All estimations control for potential differences in the observed characteristics of male and female STEM graduates in terms of their performance at university, potential productivity, and social background because our aim was to examine the gender effect between (as far as possible) equivalent male and female STEM graduates. We used multinomial logit models to adjust for these observed characteristics. Alternatively, we could have used matching or weighting techniques to balance the distribution of covariates across genders. As Table A1 in the Appendix clearly shows, adjusting for the observed characteristics of graduates is quite inconsequential for the gender effect. Therefore, there is no need to use more sophisticated techniques to address this issue.

Our study has some limitations that also suggest avenues for future research. First, we were only able to compare two graduation cohorts. Future research with data from several consecutive cohorts is needed to examine in more depth the impact of economic conditions at graduation on the gender effect on STEM persistence. Relatedly, while the first EILU wave was conducted 4 years after graduation, the second wave took place after 5 years. As the gender effect grows over the career (Delaney and Devereux, 2022), that might affect our conclusions on the moderating role of job competition. If anything, however, this issue would not drive our conclusions but make us underestimate the larger gender effect on STEM persistence during economic downturns.

Third, we only have information at the beginning of the career. Detailed information for a longer period would allow for more refined analyses that control for unobserved fixed heterogeneity. Fourth, we provide evidence that female STEM graduates who find their first jobs in the STEM sector earn lower starting salaries than their male counterparts. However, limitations in our salary data prevent us from making a stronger statement about it. Specifically, we use class marks of 7 salary intervals as our independent variable, which may not adequately represent the actual distribution of salaries within each category. Future research with better data on wages should try to replicate our findings. Fifth, although we conducted the analysis separately for graduates in Science, Technology, Engineering and Mathematics, we lack fine-grained data on field of study, which limits our ability to properly examine the well-known higher female participation in specific STEM fields such as Biology, which in our analysis is in the same category as Physics (i.e., Science). Sixth, although the interaction between gender and social origin is notable and consistent with our theoretical reasoning, our estimates did not reach statistical significance. Future research needs to validate this finding with larger samples.

Finally, and importantly, we cannot directly examine the role of supply- and demand-side factors in explaining the gender effect, although we provide indirect evidence pointing towards discriminatory hiring practices among STEM employers. Future research should seek to directly test for the contribution of specific supply- and demand-side mechanisms. Thus, studies for alternative contexts and cross-country comparisons are needed to better understand the drivers of the gender difference in STEM persistence.

7. Summary and conclusions

The aim of this study was to investigate the gender effect in the transition from attaining a STEM degree to performing a STEM occupation and the moderating role of economic conditions and social origin for this difference. Our work is based on Spanish data, not only an understudied case, but also particularly suited to our research interests. Given the strong impact of the Great Recession, Spain provides a highly informative context for studying the role of job competition. Moreover, the fact that Spanish university-educated women significantly delay entry into motherhood and are more likely to remain childless allows to conclude that the observed gender effect in STEM persistence at labor market entry is not (solely) due to the impact of children on STEM careers. For countries with a less pronounced educational gradient in fertility and a generally earlier age at first motherhood (such as the Scandinavian countries), it would be difficult to disentangle (selectivity into) motherhood and non-motherhood factors for the gender effect.

We found a strong negative effect of being female on the probability of having a first job in the STEM sector after obtaining a Bachelor's degree in a STEM field. Although there is considerable heterogeneity across STEM subfields (the gender effect is larger for graduates in technology and mathematics programs than for graduates in science and engineering programs), the gender difference is significant in all subfields and does not correlate with the female share in each subfield.

Female STEM graduates who start their careers in STEM are also less likely than their male counterparts to be employed in STEM 4–5 years after graduation. Crucially, these women are not more likely than men to leave that first job. However, when they do so, they are less likely to be currently employed in STEM, increasing the gender difference. They are more likely to move into non-STEM occupations and, importantly, to be unemployed and looking for work.

Overall, our findings suggest that the gender effect on STEM persistence is more likely due to demand-side mechanisms rather than women's self-selection into non-STEM occupations. A motherhood penalty may be a crucial factor contributing to the underrepresentation of female STEM graduates in STEM occupations (Cech and Blair-Loy, 2019). However, given the late transition to motherhood in Spain, our findings are more consistent with theoretical accounts of discriminatory hiring practices by STEM employers: the preference of STEM employers of hiring men for the male-dominated workforce of the STEM sector would channel female STEM graduates into non-STEM occupations or unemployment. This would also explain why female STEM graduates take longer to find their first job in the STEM sector, earn lower starting salaries, and are less likely to find a second job in STEM if they leave the first one.

Additionally, we report that the gender effect is larger for STEM graduates who entered the labor market during the economic crisis than for those who entered during the recovery. This finding again suggests discriminatory hiring practices, which would gender the labor queue so that equally qualified women are systematically below men. As women would be underrepresented at higher ranks of the labor queue, an economic crisis would enlarge the gender difference in STEM persistence as observed in our study.

Finally, we observed a larger gender difference among low-SES graduates. This finding is tentative as we cannot confirm its statistical significance. However, it is consistent with the idea that high-SES female graduates are more likely than low-SES women to enter gender-atypical (male-dominated) STEM occupations because of their intergenerational status maintenance "incentive" (England, 2010).

These findings have important policy implications, as they entail the loss of highly skilled people from a sector that is crucial for future economic growth. They suggest that policies aimed at reducing the gender difference in STEM should focus not only on attracting women into STEM fields of study, but also on preventing female STEM graduates from being excluded from the STEM sector. Such efforts are particularly important in times of economic downturn and for women from lower social backgrounds. Moreover, our finding that female STEM graduates working in non-STEM occupations earn lower salaries implies that the gender effect on STEM persistence after graduation contributes to the gender pay gap. Thus, policies aimed at retaining these women in the STEM sector would also be an effective way to reduce the gender pay gap.

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CRediT authorship contribution statement

Manuel T. Valdés: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Heike Solga:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors have no conflict of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssresearch.2024.103092.

Appendix

Table A1
Multinomial models (adjusted and unadjusted) for first occupation, current occupation conditional on first job in STEM, and current occupation, sample of Bachelor's graduates in STEM.

	Model 1: First occupation (n = 19,230)					
	P(STEM occupation)		P (non-STEM occupation)		P (never employed)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Female (Ref: Male)	−0.115 (0.007)**	−0.113 (0.007)**	0.108 (0.007)**	0.106 (0.007)**	0.007 (0.003)**	0.007 (0.003)*
Graduation 2014 (Ref: 2010)	−0.115 (0.007)**	−0.104 (0.007)**	0.155 (0.007)**	0.144 (0.007)**	−0.039 (0.003)**	−0.040 (0.003)**
Age 30–34 (Ref: <30)		−0.019 (0.008)*		0.031 (0.008)**		−0.012 (0.003)**
Age 35+ (Ref: <30)		−0.062 (0.010)**		0.061 (0.010)**		0.002 (0.004)
Private university (Ref: Public)		0.062 (0.011)**		−0.046 (0.011)**		−0.016 (0.003)**
Excellence award (Ref: No award)		0.116 (0.018)**		−0.101 (0.017)**		−0.015 (0.006)*
Grant (Ref: No grant)		−0.050 (0.008)**		0.043 (0.008)**		0.007 (0.003)*
Went abroad during studies (Ref: Did not)		0.061 (0.010)**		−0.048 (0.009)**		−0.013 (0.003)**
Went abroad after graduation (Ref: Did not)		0.011 (0.009)		−0.011 (0.009)		−0.001 (0.003)

(continued on next page)

Table A1 (*continued*)

	Model 1: First occupation (n = 19,230)					
	P(STEM occupation)		P (non-STEM occupation)		P (never employed)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Obtained a master's degree (Ref: Did not)		−0.044 (0.008)**		0.046 (0.008)**		−0.002 (0.003)
Model 2: Current occupation, conditional on first job in STEM (n = 10,741)						
Female (Ref: Male)	−0.059 (0.009)**	−0.053 (0.009)**	0.020 (0.006)**	0.018 (0.006)*	0.039 (0.007)**	0.035 (0.007)**
Graduation 2014 (Ref: 2010)	−0.005 (0.008)**	0.005 (0.008)	0.085 (0.006)**	0.083 (0.006)**	−0.081 (0.006)**	−0.088 (0.006)**
Age 30–34 (Ref: <30)		−0.059 (0.009)**		0.041 (0.007)**		0.018 (0.007)*
Age 35+ (Ref: <30)		−0.040 (0.012)**		0.002 (0.008)		0.038 (0.010)**
Private university (Ref: Public)		0.016 (0.012)		−0.002 (0.009)		−0.015 (0.009) x
Excellence award (Ref: No award)		0.057 (0.018)**		−0.021 (0.013)		−0.037 (0.013)*
Grant (Ref: No grant)		−0.013 (0.009)		−0.008 (0.007)		0.021 (0.007)*
Went abroad during studies (Ref: Did not)		0.009 (0.010)		0.003 (0.008)		−0.012 (0.008)
Went abroad after graduation (Ref: Did not)		−0.075 (0.011)**		0.020 (0.008)*		0.055 (0.009)**
Obtained a master's degree (Ref: Did not)		−0.069 (0.009)**		0.031 (0.007)**		0.038 (0.007)**
Model 3: Current occupation (n = 19,230)						
Female (Ref: Male)	−0.110 (0.007)**	−0.110 (0.007)**	0.061 (0.007)**	0.064 (0.007)**	0.050 (0.006)**	0.045 (0.006)**
Graduation 2014 (Ref: 2010)	−0.030 (0.007)**	−0.012 (0.007)	0.158 (0.007)**	0.147 (0.007)**	−0.129 (0.005)**	−0.136 (0.005)**
Age 30–34 (Ref: <30)		−0.045 (0.008)**		0.035 (0.008)**		0.009 (0.006)
Age 35+ (Ref: <30)		−0.106 (0.010)**		0.082 (0.010)**		0.024 (0.008)*
Private university (Ref: Public)		0.044 (0.011)**		−0.008 (0.010)		−0.036 (0.008)**
Excellence award (Ref: No award)		0.098 (0.019)**		−0.038 (0.017)*		−0.060 (0.012)**
Grant (Ref: No grant)		−0.027 (0.008)**		−0.008 (0.007)		0.034 (0.006)**
Went abroad during studies (Ref: Did not)		0.061 (0.010)**		−0.039 (0.009)**		−0.022 (0.007)*
Went abroad after graduation (Ref: Did not)		−0.022 (0.010)*		−0.040 (0.008)**		0.061 (0.008)**
Obtained a master's degree (Ref: Did not)		−0.072 (0.008)**		0.041 (0.007)**		0.031 (0.006)**

Notes: Average Marginal Effects (AME). Robust standard errors in brackets. Age at time of the survey. **p-value ≤0.001; *p-value ≤0.05; †p-value ≤0.10.
Source: EILU (waves 1 and 2), only STEM graduates.

Table A2
Regressions on time to first job and net monthly salary of first job.

	Time to the first job (months)[a]		Salary of the first job[b]	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Women (Ref: Men)	1.802 (0.22)**	0.765 (0.21)**	−98.172 (17.34)**	−80.506 (15.76)**
Graduation 2014 (Ref: 2010)	1.097 (0.21)**	1.330 (0.20)**	–	–
Age 30–34 (Ref: <30)		−2.758 (0.23)**		−54.703 (18.70)*
Age 35+ (Ref: <30)		−6.245 (0.25)**		220.967 (22.37)**
Private university (Ref: Public)		−0.506 (0.28)†		30.686 (25.57)
Excellence award (Ref: No award)		−1.653 (0.50)**		125.307 (34.24)**
Grant (Ref: No grant)		0.049 (0.22)		−60.605 (16.32)**
Went abroad during studies (Ref: Did not)		−0.917 (0.26)**		115.838 (20.72)**
Went abroad after graduation (Ref: Did not)		1.560 (0.27)**		132.099 (21.93)**
Obtained a master's degree (Ref: Did not)		4.018 (0.23)**		−18.627 (17.23)
Full-time job (Ref: Part-time job)				513.121 (18.83)**
N	10,723		4,553	

Notes:**p-value ≤0.001; *p-value ≤0.05; †p-value ≤0.10.
[a] OLS model for both cohorts.
[b] OLS model only for the post-crisis cohort. Robust standard errors in brackets. Age at time of the survey.
Source: EILU (waves 1 and 2), only STEM graduates whose first job was in a STEM occupation.

Table A3
OLS regressions: Effect of first job in a STEM vs. non-STEM occupation on net monthly salary in first job among women.

	Model 1	Model 2
STEM occupation (Ref: non-STEM)	120.5 (18.0)**	26.0 (16.9)
Age 30–34 (Ref: <30)	−73.3 (21.1)**	−48.6 (19.2)*
Age 35+ (Ref: <30)	221.8 (26.3)**	189.9 (23.6)**
Private university (Ref: Public)	50.2 (33.0)	19.9 (29.9)
Excellence award (Ref: No award)	82.2 (39.3)*	78.5 (34.5)*
Grant (Ref: No grant)	−98.6 (18.4)**	−89.1 (16.6)**
Went abroad during studies (Ref: Did not)	62.7 (24.5)*	62.6 (22.5)*
Went abroad after graduation (Ref: Did not)	92.3 (25.2)**	86.5 (23.0)**
Obtained a master's degree (Ref: Did not)	−29.5 (19.5)	−11.8 (17.6)
Full-time job (Ref: Part-time job)		518.3 (16.5)**
N	3,494	3,494

Note: Only female STEM graduates of the post-crisis cohort. Robust standard errors in brackets. Age at the time of the survey. **p-value ≤0.001; *p-value ≤0.05; †p-value ≤0.10.
Source: EILU (wave 2), only female STEM graduates.

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