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Essais sur les normes et les inégalités de genre

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Essays on gender norms and inequality

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À la mémoire de Sarah Andrieux

Summary

This dissertation examines the role of gender norms and institutions on human capital formation, labor supply, and political preferences.

In the first chapter, I use both theoretical and empirical analysis to study the impact of offspring's gender on their parental political beliefs toward gender issues. I examine the hypothesis that men's political attitudes toward abortion do respond to the presence of a daughter, but differently according to their general political beliefs. This *polarization effect* of daughters means that the presence of a daughter is associated with more anti-abortion (respectively pro-abortion) views for right-wing (respectively left-wing) fathers. This argument is investigated in a simple economic model and its implications are studied empirically using two original datasets. The model predicts that fathers with paternalistic preferences adopt more extreme political positions when they have a daughter than when they have a son. The empirical investigation provides evidence of a polarization effect of daughters on fathers' views on abortion. The magnitude of the effect corresponds to around 30% of the impact of right-wing political affiliation on abortion support.

In the second chapter, in collaboration with Emma Duchini, we investigate women's employment decisions when institutions limit their chances of having a regular working schedule. We exploit the peculiarity of the French school schedule - and a recent reform as a natural experiment - to show that women do value flexibility when their children demand it. Prior to the introduction of the reform, women whose youngest child was of primary school age

were twice as likely as men not to work on Wednesdays and thus adapt their labor supply to the presence of children. We also find out that the possibility to attain a flexible working schedule hinges on the interplay between the cost that this imposes at work, the bargaining power that women have vis-à-vis their employer, and the role they have in the household. To measure mothers' response we exploit variation in the implementation of this policy over time and across the age of the youngest child. Our results show that, although mothers do not increase their total weekly hours of work, they do take advantage of the fall in the value of flexibility to close 1/3 of their initial gap in the probability of working on Wednesday with respect to the control group. This response seems to be driven by mothers who are more rewarded for a regular presence at work, such as those working in managerial positions. This paper formulates an innovative approach to test the theory of the *cost of flexibility*, according to which certain women are more heavily penalized for less continuous presence at work.

The third chapter reports the results of a large scale randomized experiment showing that a light-touch, in-class intervention of external female role models, can influence students' attitudes and contribute to a significant change in their choice of field of study. While the impact of peers and "horizontal exposure" on aspirations gained greater attention in the recent literature, surprisingly little is known about the impact of exposure to role models on students' attitudes and schooling decisions. Together with Thomas Breda, Julien Grenet and Marion Monnet, we implemented and monitored a large-scale experiment in randomly selected high-school classes in France from September 2015 to February 2016. We first document gender differences in attitudes toward science, as well as the prevalence of stereotypical opinions with respect to women in science among high school students. Using random assignment of students to a one-hour intervention, we investigate the causal impact of role models on aspirations, attitudes, and educational investment. External female role models significantly reduce the prevalence of stereotypes associated to jobs in science, both for female and male students. Using exhaustive administrative data, we do not find significant effect of the treatment on the choices of year 10-students, but we show that the proportion of female students enrolled

in selective science programs after high school graduation increases by 3 percentage points, which corresponds to a 30 percent-increase with respect to the baseline mean. These effects are essentially driven by high-achieving students.

Field: Economics

Key words: Gender gap ; Educational choices ; Labor supply ; Political preferences

Résumé

Cette thèse étudie l'impact des normes de genre et des institutions sur les choix éducatifs, les décisions d'offre de travail et les préférences politiques.

Dans le premier chapitre, nous nous intéressons à l'influence du genre des enfants sur les opinions de leurs pères en matière de droits des femmes. En particulier, nous montrons que la présence d'au moins une fille parmi les enfants est associée à des attitudes plus marquées contre l'avortement pour les pères de droite et inversement, plus favorables à l'avortement pour les pères de gauche. Nous développons un modèle théorique dans lequel les pères, qui ont des préférences paternalistes, ont tendance à adopter des positions politiques plus extrêmes lorsqu'ils ont une fille plutôt qu'un garçon. La partie empirique de l'analyse repose sur l'utilisation de deux nouvelles sources de données : une base biographique des députés français, et une enquête post-électorale au niveau européen. Nos résultats suggèrent que les filles *polarisent* les attitudes de leur père en matière de droit à l'avortement. Ces résultats réconcilient en partie les conclusions contradictoires des travaux récents sur l'influence des filles sur les opinions politiques de leurs pères. La principale contribution de ce chapitre est de montrer que les modèles théoriques décrivant les processus de socialisation genrée gagneraient à intégrer les préférences politiques dans leur cadre d'analyse.

Le deuxième chapitre est issu d'un travail commun avec Emma Duchini. Nous étudions les décisions d'offre de travail des femmes dans un contexte institutionnel qui limitait jusqu'à récemment leur capacité à bénéficier d'un emploi du temps régulier. Nous nous concentrons sur

le cas particulier de la France, où jusqu'en 2013 les enfants en âge d'aller à l'école maternelle et primaire n'avaient pas classe le mercredi. Nous utilisons la réforme dites des *rythmes scolaires* de 2013 comme "expérience naturelle" pour mettre en évidence le fait que les femmes accordent de la valeur à la flexibilité horaire en raison de l'emploi du temps de leurs enfants. Avant l'introduction de la réforme des rythmes scolaires, les femmes dont le plus jeune enfant était en âge d'aller à l'école élémentaire étaient deux fois plus nombreuses que les hommes à ne pas travailler le mercredi, et donc à adapter leur activité professionnelle à la présence des enfants. Nous montrons également que, pour ces femmes, pouvoir bénéficier d'un emploi du temps flexible avant la réforme dépendait à la fois des contraintes propres à leur activité économique, de leur pouvoir de négociation vis-à-vis de leur employeur et de leur rôle économique au sein du couple. Afin de mesurer la réaction de l'offre de travail des mères à la réforme, nous utilisons la variation de son application dans le temps et en fonction de l'âge du plus jeune enfant. Nos résultats montrent que, bien que les mères n'augmentent pas leurs heures de travail hebdomadaires totales, la réforme a permis à un plus grand nombre de femmes de travailler le mercredi, entraînant, en moins de deux ans, une réduction d'un tiers de leur différentiel de participation ce jour de la semaine par rapport aux femmes du groupe de contrôle. Cet effet est essentiellement attribuable aux mères pour qui une présence régulière au travail est particulièrement profitable, comme celles qui travaillent à des postes d'encadrement. Cet article contribue donc à tester la théorie du *coût de la flexibilité*, selon laquelle certaines femmes sont plus pénalisées que d'autres parce qu'elles ont une présence moins continue sur leur lieu de travail.

Le troisième chapitre présente les résultats d'une expérimentation avec assignation aléatoire conduite dans plusieurs lycées de septembre 2015 à février 2016 avec Thomas Breda, Julien Grenet et Marion Monnet. Cette expérimentation montre que l'intervention courte d'un modèle positif d'identification féminin (*role model*) peut influencer les attitudes des apprenants, et contribuer ensuite à modifier leur choix d'orientation. Contrairement à l'étude de l'impact des "pairs" et de l'exposition à des modèles "horizontaux" de socialisation qui a

connu un essor particulier dans les travaux récents en économie de l'éducation, rares sont les travaux qui se sont intéressées à l'impact des modèles positifs d'identification. Dans un premier temps, nous présentons des éléments descriptifs sur les attitudes différenciées des filles et des garçons vis-à-vis des sciences, et sur l'importance des stéréotypes vis-à-vis des femmes dans les sciences chez les lycéens. A l'aide d'une assignation aléatoire des élèves dans un groupe traité et dans un groupe contrôle, nous étudions l'impact causal des modèles positifs d'identification sur les aspirations, les attitudes et les choix éducatifs. Ces modèles féminins extérieurs font baisser de manière significative la prévalence des visions stéréotypées associées aux métiers dans les sciences, tant chez les élèves filles que garçons. L'usage de données administratives exhaustives révèle que le traitement n'a pas d'effet significatif sur le choix d'orientation des élèves de seconde, mais nous montrons que la proportion de filles qui s'orientent et sont admises en classe préparatoire scientifique après le lycée augmente de 3 points de pourcentage dans le groupe traité par rapport au groupe de contrôle. Cet effet correspond à une augmentation de 30% par rapport à la moyenne du groupe de contrôle. Ces changements sont principalement attribuables aux élèves ayant les meilleurs résultats scolaires en mathématiques.

Discipline : Sciences économiques

Mots-clés : Inégalités de genre ; Choix éducatifs ; Offre de travail ; Préférences politiques

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Main Introduction

Women and work: convergence and recent trends

In most advanced economies, the economic landscape of women has dramatically changed over the twentieth century. Initiated in the late nineteenth century, a slow convergence occurred between the economic roles of men and women, which is, until today, one of the most remarkable transformations of the economy of developed countries (Goldin 2006). The gender gap shrank considerably in terms of labor force participation, [1] working hours, and attachment to the labor market, in the US and in all developed countries (Blau and Kahn 2013). Furthermore in most OECD countries, women are more likely to complete college than men (OECD 2016a, Goldin, Katz, and Kuziemko 2006).

Numerous factors apart from increasing educational attainment have been found to be key in explaining women's increasing labor force participation. These include the greater availability of market substitutes for domestic work and improvements in household technology (Greenwood, Seshadri, and Yorukoglu 2005), but also structural transformations of modern economies that shifted the demand towards certain occupations where women were well represented, such as clerical work. Access to new reproductive technologies in the late 1960s importantly changed women's fertility decisions (Goldin and Katz 2002), and consequently altered their time horizon with respect to life-time labor force participation (Goldin 2006). Finally, the evolution of property rights also contributed to redefine women's modern economic

1. The labor force participation of married women in the US aged between 35 and 44 almost doubled from 1950 to 1970 (from 25 to 46 percent), see Goldin (2006).

and political role (Fernández 2014).

Despite these substantial gains for women, there is still considerable gender inequality in labor market outcomes in all developed countries. Since the early 1990s, two stylized facts have led economists to pursue investigations of the disparities observed in the labor market: first, the slowing increase in female labor force participation, and secondly, the persistence of a glass ceiling for women working in high paying occupations. The convergence in earnings has stalled: while women's relative wages sharply rose in the 1980s, the rate of increase was more uneven thereafter. In the US in 2014, female full-time workers earned about 79% of what men did on an annual basis (Blau and Kahn 2016). The fact that we can still observe differences between men and women from the decision to participate in the labor market to earnings dynamics at the top of the income distribution confirms the relevance of the gender factor in the labor market equation. [2] This dissertation builds upon this recent evidence and includes three studies that focus on the role of gender norms in explaining these stylized facts.

After a dramatic increase over the last century, in the late 1990s female labor force participation has leveled-off in the US. This evolution is not confined to the US, as similar trends have been observed in other OECD countries such as Canada, Finland, Norway, Sweden, and the United Kingdom (Fortin 2005). [3]

On the other hand, working women have still on average significantly lower earnings than their male counterparts. Convergence in earnings has occured, but has remained confined to the bottom and middle of the income distribution. According to recent work by Piketty, Saez, and Zucman (2016), using tax returns above the 90th percentile, 25% women are present in

2. On top of these two trends that are particularly salient in the US, in European countries women have been particularly affected by the development of alternative working arrangements such as part-time work and low-hours jobs (Blau and Kahn 2013). These authors find a positive relationship between maternity leave policies (implemented mostly in European countries) and labor force participation, but they also emphasize that they are also correlated with low-hours jobs, part-time work and employment in lower level positions.

3. The *opting-out* phenomena in the early 2000s has raised a lot of skepticism among economists (Boushey et al. 2005, Goldin and Katz 2009). According to recent evidence from Goldin and Mitchell (2017), this reflects essentially a "misinterpretation of the changes in the life cycle of work." In that respect, the US stands out compare to other developed countries, with recent cohorts of women working a lower fraction of their life at the age 25-54 years old.

top 10 incomes in the US, and further weakening of the share of women is observed as we move on to the top of the income distribution. Similarly in France, the female share among top 0.1% earners was only 12% in 2012, compared to 7% in 1994 and 5% in 1970 (Garbinti, Goupille-Lebret, and Piketty 2016). Also using French data, Gobillon, Meurs, and Roux (2015) show that gender difference in the probability of getting a job increases along the wage ladder from 9% to 50%: women have significantly lower access to high-paid jobs than to low-paid jobs.

Segregation across occupations is a crucial factor of this stalled convergence in earnings: women remain under-represented in professions associated with high status and high earnings. Differences in human capital accumulation pre-labor market entry remains an attractive explanation: women are not choosing the same fields of study than men, and in particular professional degrees. According to Bertrand, Goldin, and Katz (2010) looking at cohort of students in the 2000s, women are barely at 50% in medical schools, dental schools, law schools, and MBA programs. Three sources of gender segregation across occupations have traditionally been put forward: differences in abilities (innate or acquired), discrimination, or differences in preferences. My dissertation fits into this last line of research, by looking at the interaction between gender norms and preferences.

Recently, a number of studies have shown that differences in abilities tend to be small and do not predispose a gender more than the other for any type of studies, including fields yielding the highest wages. Moreover, students' test scores and past achievements can only explain a negligible part of the large gender gap in choosing a science major (Eagly 1995, Halpern 2013, Spelke 2005, Hyde 2005). As noted by Bertrand (2011), when Altonji and Blank reviewed existing work on gender gap in earnings in 1999 (Altonji and Blank 1999), occupational segregation by gender was mostly attributed to discrimination (taste-based or statistical) being more pronounced in some occupations than others. While discrimination is still acknowledged as a relevant factor for economists today, its popularity has decreased (Azmat and Petrongolo 2014). Given these trends, an increasing number of studies have therefore focussed on differences in preferences.

In the recent years, economists started to focus on new types of explanations to gender segregation among occupations, including differences in psychological attributes. Psychology and social-psychology literatures have gained greater influence in economic research. They have been used by economists in order to provide micro-foundations to the differences between men and women in terms of choices, commitment to their career and progress in jobs (Bertrand 2011). The main findings of this literature on gender differences in psychological attitudes are that women are more risk averse (Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner 2011), perform more poorly under pressure (Gneezy, Niederle, and Rustichini 2003), do not negotiate as much (Exley, Niederle, and Vesterlund 2016), are more likely to accept and receive tasks that do not affect their career advancement (Babcock, Recalde, Vesterlund, and Weingart 2017), and lack self-confidence (Niederle and Vesterlund 2007). Differences in attitudes toward risk can be crucial given that gender gap in earning is correlated with the second moment in earning (high variance): occupations with higher earnings are those with higher risk. Over the last five years, several other studies have provided evidence outside the lab suggesting that psychological attributes explain a significant share of gender differences in terms of educational choice (Buser, Niederle, and Oosterbeek 2014), job entry decision (Flory, Leibbrandt, and List 2015), and labor market earnings (Reuben, Sapienza, and Zingales 2015).

All in all, the relative contribution of these psychological attributes or non-cognitive skills to the gender gap is still the subject of discussions. It is particularly difficult to assess the precise magnitude of the effect, as these differences might both cause and be reinforced by educational choices and labor supply decisions made beforehand. Establishing causality is particularly challenging. Moreover, field-based studies have shown how context and framing affect the measurement of these psychological traits (Bohnet 2016). Finally, another important question is whether these psychological attributes are a pure reflection of socially constructed gender norms and identities, and therefore whether they can evolve with time, in particular given the trend of women's increasing educational attainments. Here again, causality can go both ways, with individuals adjusting their attitudes in light of their labor force decisions and outcomes. This dissertation will try to address this last challenge in chapter 3 by looking at the causal impact of external female role models on students' attitudes and choices.

However, even when women are present in these high paying occupations, they remain under-paid. The gender gap in earnings increases as we move towards higher paid professions.[4] Bertrand, Goldin, and Katz (2010) followed earning trajectories over time of former MBA students, and show that starting with a fairly small gender gap at the time of exit, the gender gap in earning, conditional on working, amounts to 50 percent 10 years after graduation. Differences in labor supply are the main driver: there are huge wage penalties associated to any career interruptions.[5] This is consistent with findings regarding the "child penalty" that remains high for women, even in countries with a long tradition of family-friendly policies. Recent studies on Sweden (Angelov, Johansson, and Lindahl 2016) and Denmark (Kleven, Landais, and Sogaard 2015) using micro data and event studies reveal that there is a clear divergence in earnings dynamics of men and women at the time of the first child. Moreover, this "child penalty" has been remarkably stable over time and across generations. While the biological differences associated with child birth cannot be ruled out, the price in labor market associated to having children that women have to pay, especially the higher educated ones, is still puzzling.

One of the potential explanations is that temporal flexibility associated to the presence of children has a particularly high cost in certain workplaces (Goldin 2014). Certain firms and industries might disproportionately reward workers for working long hours, and often impose inflexible working schedules. Precisely because women remain the first providers of childcare

4. Similar trends have been observed in academia, especially in the economics profession. The Committee on the Status of Women in the Economics Profession (CSWEP) study shows slow progress in the share of female full time professors.

5. A subsequent question is whether women are less paid compare to men within the same firm, or because they work in different firms. The most recent studies have investigated persistent differences in earnings *between* and *within* firms (Card, Cardoso, and Kline 2015). Women are less likely to enter high-paying occupations and high-paying firms. Selection into different firms reflects both employers' choice and workers' decisions, therefore establishing causation in this relationship is challenging. A recent series of study using longitudinal data from the US (Goldin, Kerr, Olivetti, Barth, et al. 2017 and Barth, Kerr, and Olivetti 2017) found that more than 40% of the increased gender gap in earnings is due to the fact that men disproportionately shift into higher paying establishments. Around 60 percent can be attributed to women's lesser capability to advance their earnings within firms.

and other non-market work, they have a greater demand for temporal flexibility (Wiswall and Zafar 2016, Mas and Pallais 2016), and this flexibility can be particularly detrimental to them.[6] Finally, the presence of institutional constraints combined with the persistence of social norms might be particularly challenging for the career prospects of women. Using a natural experiment, chapter 2 of this dissertation will try to address precisely this issue by investigating women's employment in a context where institutions limit their chances of having a regular schedule.

Gender norms and inequality: an economic approach

Gender norms have long been considered as the omitted variable in the gender inequality equation, the residual which remains after accounting for the usual factors. Several economic papers do use indistinctly the terms "norms", "identity" or "culture" in order to define the set of context-specific and time-varying preferences and beliefs of individuals. In the early 1990s, several scholars tried to incorporate insights from sociology and social psychology in order to elaborate a richer conception of human understanding and human identity. In particular, drawing on feminist scholarship regarding the social construction of gender categories[7] and of the academic disciplines, several researchers started accounting for individuals' social identity and how it can influence behaviors and choices in markets (Ferber and Nelson 2003).[8] The concept of the *separative* and *soluble* selves developed by England (2005) is one example: economists have traditionally had one notion of the self for market behavior, in which individuals are atomized, self-interested, and have fixed ex-ante preferences. There is a tacit other definition of the self when it comes to family, essentially altruistic, in which preferences

6. Recent studies that have shown that time spent on parenting, especially among highly educated has increased over the last decades (Guryan, Hurst, and Kearney 2008, Ramey and Ramey 2009), and that despite technological innovations and greater opportunities of outsourcing domestic work, certain studies have shown that the "double-shift" has not disappeared, in particular for high educated women with high earnings (Bertrand, Kamenica, and Pan 2015, Lippmann, Georgieff, and Senik 2016).

7. These studies have contributed to establish the definition of *gender* as a "social organization of the relationship between the sexes" (Scott 1986).

8. Feminist scholars starting in the 1980s have conducted important research on the links between modern western social beliefs about gender and about science, see for example Bordo (1987) or Harding (1986).

are formed without frictions and internal conflict. England challenges this separation of the two spheres, stating "individuation and connection are not necessarily at war with each other". In a way, the notions of gender identity and norms contribute to bridge the gap between the two separate notions of self. In chapter 1 of this dissertation, I will show how a father's altruistic behavior toward his daughter's welfare is not necessarily univocal and straightforward, but can be thought as embedded in his own political views.

Influential papers by Akerlof and Kranton (Akerlof and Kranton 2000, Akerlof and Kranton 2010) have also proposed to incorporate one's sense of self as an important element of the utility function. Their definition of social identity partially overlap social norms: in their model, "agents follow prescriptions, for the most part, to maintain their self-concepts" (Akerlof and Kranton 2000). This theory helps understanding behaviors that appear detrimental: individuals might behave in ways that would be considered inappropriate or even self-destructive by those with other identities, just in order to reinforce a sense of self. It has had important applications in studies on occupational sorting, but also labor force participation and the allocation of work within the household.

Finally, dynamic models of culture (Fernández 2013) propose to analyze the evolution of beliefs and attitudes toward gender roles using intergenerational learning process, which is an alternative to changing preferences. From an economist's point of view, this learning mechanism has the advantage that it does not preclude a standard welfare analysis unlike mechanisms in which preferences themselves change. These approaches call for a confrontation of gender norms and gender inequality: gender roles might also endogenously respond to labor market changes and new educational landscapes. [9]

9. Interestingly, similar debates occurred among economic historians in the 1990s about the causes and consequences of women's declining labour force participation during the industrial revolution. Horrell and Humphries (1995) argue that economic variables (wages and incomes, and household characteristics) are not sufficient to capture the changes in female labor force participation occurring during the industrial revolution in the UK. According to them, the transition to the male-breadwinner family was due to changing institutional and ideological factors. See also Creighton (1996).

This dissertation

This dissertation builds upon these theoretical insights and presents three empirical investigations of the connection between gender norms and inequality. Incorporating gender norms in the economic approach aims at defining a more reliable model of behavior, which is crucial in order to make economics "a more useful tool for improving institutions and society" (Akerlof and Kranton 2010, p.8). My work fits in the stream of research arguing that gender norms are a crucial factor that explains the persistence of gender inequality. But it also aims at contributing to a better understanding of the reciprocal relations between norms and inequality. Using theoretical and empirical evidence, I will show that gender norms are not only a set of prescribed behaviors assigned to a specific group, but that they materialize within social relations, and they come to play in socialisation processes within the family, in the workplace or at school. I will examine the role of gender norms and institutions on political preferences, labor supply, and human capital formation, and I will look at how gender norms not only affect women's own choices, but also the behavior of other individuals, especially those whom women interact with in different social settings. This in turn influences their preferences and choices: gender roles might endogenously respond to political context, institutional changes or external role models.

Outline and contribution

In chapter 1, **Papa does preach: daughters and polarization of attitudes toward abortion**, I use both theoretical and empirical analysis to study the impact of offspring's gender on their parental political beliefs toward gender issues. I examine the hypothesis that men's political attitudes toward abortion do respond to the presence of a daughter, but differently according to their general political beliefs. While the literature previously focuses on private benefits to individuals associated with reproductive rights, in my article, I explore how this perceived gain/loss in welfare might translate back into individuals' moral beliefs and political preferences. The intuition behind the model is that individuals' world views shape the way a policy - like the legalization of abortion - might affect their welfare, because the introduction of a new birth control technology or new reproductive, as any technical change, can create both winners and losers. The second key assumption is the existence of a "paternalist" altruism within family. Fathers' altruistic behavior is embedded in their own political preferences: while maximizing the welfare of their offspring, they indirectly impose their political views. Therefore in this model, the way individuals perceive gender inequality (and the most appropriate policies to address it) endogenously determines their norms. This goes beyond the definition of gender norms as prescription associated to a specific group (Akerlof and Kranton 2000): gender norms are a reflection of a political representation of gender relations. The empirical investigation provides evidence of a polarization effect of daughters on fathers' views on abortion. The magnitude of the effect corresponds to around 30% of the impact of right-wing political affiliation on abortion support.

In chapter 2, **Do women want to work more or more regularly? Evidence from a natural experiment**, a joint work with Emma Duchini, we investigate women's employment decisions when institutions limit their chances of having a regular working schedule. Our results suggest that gender norms foster gender inequality, because they are imbedded in a given social and historical context. It is the combination of social norms and institutional constraint - in our context, the fact that in France, children did not have class on Wednesday before 2013 - that explains why over 40% of mothers whose youngest child were of primary school age used to stay at home on Wednesday before 2013. First, we document the fact that before the reform, the possibility to adopt a flexible working schedule greatly hinges on the interplay between the cost of flexibility associated to women's occupation and their bargaining power at work. The relaxation of institutional constraints suggests that women's demand for flexibility is clearly related to the presence of children, and to the persistence of traditional gender norms, while it does not depend on an intrinsic taste for it. Our results show that, although mothers do not increase their total weekly hours of work, they do take advantage of the fall in the value of flexibility to close 1/3 of their initial gap in the probability of working on Wednesday with respect to the control group. This response seems to be driven by mothers who are more rewarded for regular presence at work, such as those working in managerial positions. This paper therefore contributes to test the theory of the cost flexibility, according to which certain women are more heavily penalized for less continuous presence at work.

Chapter 3, **The impact of female role models on the gender gap in science: Evidence from the "Girls in Science" Initiative**, reports the results of a large scale randomized experiment showing that a light-touch, in-class intervention of external female role models can influence students' attitudes and contribute to a significant change in their choice of field of study. This work was conducted with Thomas Breda, Julien Grenet and Marion Monnet. While the impact of peers on aspirations has been studied extensively in recent years, there is surprisingly little evidence on the impact of exposure to role models on students' attitudes and schooling decisions. Behind the idea of role models as policy tool, there is the assumption that today's distribution of opportunities will endogenously affect tomorrow's distribution of perceived expected opportunities. Disruption in the perpetuation of norms - such as the prevalence of stereotypical views related to women in science - can lead female students to potentially change their choice, and in turn can contribute to change gender norms. We show that interventions of external role models reduce the prevalence of stereotypes associated to jobs in science, both for female and male students. Moreover, the proportion of female students enrolled in selective science programs after high school graduation increases by about 3 percentage points, which corresponds to a 30 percent-increase with respect to the baseline.

Methodologies

This dissertation builds upon several empirical methods. In the three chapters, three different identification strategies aim at establishing causal relations between a dependent variable (the gender composition of children in chapter 1, institutional constraints and social norms in chapter 2 and interventions of role models in chapter 3) and the outcome of interest (respectively, political attitudes, labor supply decisions and educational choices).

The first chapter contains both a theoretical and an empirical analysis. The theoretical analysis builds upon a simple model of choice of optimal policy assuming paternalist preferences and gender differences in cost/gain with respect to a policy. The empirical analysis relies essentially on the hypothesis that for a given family size, the gender of a child is a random variable.[10] By making use of this assumption, I hope to provide an estimate of the causal effect of daughters on their father's political beliefs towards abortion.

In chapter 2, the empirical method is a difference-in-difference approach exploiting variations over time and across the age of the youngest child of respondents with respect to the implementation of the 2013 reform. The identification assumption is that in the absence of the reform, labor supply dynamics would have been comparable in trend in the treated group (mothers whose youngest child is of primary school age) and in the control group (mothers whose youngest child is slightly older).

Finally, chapter 3 uses the methodology of randomized control trials. Under the Stable Unit Treatment Value Assumption that selected students in control classes remain unaffected by the intervention of the ambassador, the comparison between treated and control students provides an estimate of the average-treatment-effect parameter of the impact of the female role model on both stereotypes, and high school track and college major choices.

Data

This dissertation investigates features of the "last chapter of the grand convergence" between men's and women's economic roles (Goldin 2014) from a European perspective. Most results are derived from French data. I make use of several original datasets. In chapter 1, data

10. This hypothesis is discussed in greater length in section 1.5.2.3.

comes from an original biographical dataset on French congresspersons collected from *Who's Who* books from 1962 to 2002. The second dataset is derived from a recent post-electoral survey (CED-EU14, Sauger, Dehousse, and Gougou 2015). This survey was conducted through the Internet in the days following the European elections of 2014, in seven different countries, with national representative samples of 4,000 people in each country in Austria, France, Germany, Italy, and Spain, and 1,000 people in Greece and Portugal. To my knowledge, this is the first international survey that contains both a specific question on abortion and on the gender composition of children in the household, two critical sets of information for the empirical investigation.

In chapter 2, the analysis is conducted using several databases. First, we use the 2009-2015 waves of the French Labor Force Survey (*Enquête Emploi en Continu*) with information on the municipality of residence, the number of children women have, and their age. We also use the Enrysco database, an administrative data set that has been created by the French Ministry of Education that provides a precise description of the weekly teaching schedule for each school, in each municipality. We also work with the *Déclarations Annuelles de Données Sociales*, a large-scale administrative data set of matched employer-employee information, which is based upon mandatory employers' reports of their workers' gross earnings. Finally, we exploit the United States Department of Labor Occupational Information Network, or O*NET. This database, available online, classifies occupations on the base of the activities performed and skills used at work.

Results presented in chapter 3 are derived from both original and administrative data. At the end of the experiment, we conducted in-class surveys for students from both the treated and the control groups. The surveys were matched to students' administrative information, their past achievement, and their position one year after treatment. Additionally, for students in their final year in high school, we used the exhaustive list of choices for higher education as reported in the centralized application platform launched by the Ministry for Secondary

Education. This dataset contains the comprehensive list of choices for secondary education made by high school graduates, their admission outcomes, as well as information on their academic performance during year 11 and year 12, and final grades at the *baccalauréat* (BAC) national exam.

Introduction générale

L'activité des femmes :

convergence et évolutions récentes

Dans la plupart des économies avancées, la situation économique des femmes a profondément évolué au cours du XXème siècle. La lente convergence entre les rôles économiques des hommes et des femmes, initiée dès la fin du XIXème siècle, est l'un des faits économiques et sociaux les plus marquants ayant transformé les pays développés (Goldin 2006). Les écarts entre hommes et femmes se sont considérablement réduits en termes de participation au marché [11], d'heures travaillées et d'années d'expérience sur le marché du travail, aux États-Unis comme dans la majorité des économies développées (Blau and Kahn 2013). Dans la plupart des pays de l'OCDE, les femmes sont aujourd'hui en moyenne plus diplômées que les hommes (OECD 2016a, Goldin, Katz, and Kuziemko 2006).

Au-delà du rattrapage éducatif, de nombreux facteurs expliquent l'augmentation spectaculaire du taux d'activité des femmes. On y trouve par exemple l'augmentation de l'offre de substituts marchands au travail domestique et l'amélioration des technologies disponibles au sein du ménage, qui ont permis aux femmes de libérer du temps (Greenwood, Seshadri, and Yorukoglu 2005), mais également les transformations structurelles des économies modernes comme la croissance des emplois administratifs intermédiaires, dans lesquels les femmes sont traditionnellement sur-représentées. La légalisation de l'accès à la contraception et plus

11. Aux États-Unis, le taux d'activité des femmes mariées âgées de 35 à 44 ans a presque doublé de 1950 à 1970 (de 25 à 46%), voir Goldin (2006).

généralement le contrôle accru que les femmes ont eu sur leur fertilité à partir de la fin des années 1960 (Goldin and Katz 2002) ont modifié la durée qu'elles consacrent à l'activité productive marchande au cours de leur cycle de vie (Goldin 2006). Enfin, l'évolution des droits de propriété a également contribué à redéfinir le rôle économique et politique des femmes (Fernández 2014).

Mais malgré ces avancées importantes, les inégalités femmes-hommes restent un fait structurant des sociétés modernes. Deux faits stylisés ont appelé l'attention des économistes : d'une part le ralentissement de la croissance du taux d'activité des femmes, d'autre part le maintien d'un plafond de verre limitant la progression salariale des femmes travaillant dans les professions pourtant les mieux rémunérées. La résorption des écarts de salaire s'est ralentie : alors que les salaires relatifs des femmes ont nettement augmenté dans les années 1980, le taux de croissance a été plus irrégulier depuis. Aux États-Unis en 2014, le salaire annuel moyen des femmes actives travaillant à plein temps ne représente toujours que 79% de celui des hommes (Blau and Kahn 2016).

Nous continuons donc d'observer des différences marquées entre hommes et femmes sur le marché du travail, qui vont de la décision d'entrée sur le marché du travail jusqu'à la dynamique des inégalités de revenu parmi les très hauts salaires. Ce continuum semble confirmer la pertinence du facteur de genre pour comprendre la dynamique des disparités à l'oeuvre sur le marché du travail [12]. Cette thèse s'appuie sur ces développements récents et présente trois études qui mettent l'accent sur la pertinence des normes de genre pour expliquer ces faits stylisés.

S'agissant tout d'abord de la participation des femmes au marché du travail, celle-ci s'est stabilisée aux États-Unis à la fin des années 1990 après une augmentation spectaculaire au

12. En plus de ces deux tendances particulièrement marquées aux États-Unis, les femmes dans les pays européens ont été particulièrement touchées par le développement d'arrangements de travail dits alternatifs, tels que la généralisation du travail à temps partiel et le développement des petits temps partiels (Blau and Kahn 2013). Ces auteurs trouvent d'ailleurs une corrélation positive entre la mise en place de politiques de congé de maternité (principalement dans les pays européens) et le taux d'activité des femmes. Ils soulignent cependant que ces politiques s'accompagnent également d'une fréquence accrue de l'emploi à temps partiel.

cours du siècle dernier. Cette évolution ne se limite pas aux États-Unis, car des tendances similaires ont été observées dans d'autres pays de l'OCDE, comme le Canada, la Finlande, la Norvège, la Suède et le Royaume-Uni (Fortin 2005) [13].

D'autre part, les femmes qui travaillent ont encore en moyenne des salaires nettement inférieurs à ceux des hommes. Si les écarts de salaire se sont réduits de manière importante, la convergence s'est vraisemblablement limitée aux salaires dans les emplois situés dans le bas et au milieu de l'échelle salariale. Selon une étude récente de Piketty, Saez, and Zucman (2016), en utilisant des déclarations de revenus supérieures au 90ème percentile, 25% des femmes sont présentes dans le top 10 des revenus aux États-Unis. Cette proportion diminue encore davantage à mesure que l'on monte dans le haut de la distribution des revenus. De même, en France, la part des femmes parmi le top 0,1% n'était que de 12% en 2012, contre 7% en 1994 et 5% en 1970 (Garbinti, Goupille-Lebret, and Piketty 2016). En utilisant également des données françaises, Gobillon, Meurs, and Roux (2015) montrent que la différence de genre dans la probabilité d'accéder à un emploi augmente le long de l'échelle des salaires de 9% à 50% : les femmes ont un accès nettement inférieur aux emplois hautement rémunérés par rapport aux emplois plus faiblement rémunérés.

Le manque de mixité professionnelle est l'un des freins principaux à la réduction des écarts de salaire : les femmes restent sous-représentées dans les professions qui offrent les meilleurs salaires. Les différences en matière de choix éducatifs précédant l'entrée sur le marché du travail en sont encore aujourd'hui la cause principale : les femmes ne font pas les mêmes choix d'orientation pour leurs études que les hommes. Bertrand, Goldin, and Katz (2010) ont suivi une cohorte d'étudiants dans les années 2000 aux États-Unis, et montré que les femmes représentent à peine 50% des étudiants dans les écoles de médecine, dentaires, les facultés de

13. Le phénomène de sortie du marché du travail (*opting-out*) au début des années 2000 a suscité de nombreux débats parmi les économistes (Boushey et al. 2005, Goldin and Katz 2009). Selon des travaux récents de Goldin and Mitchell (2017), ces débats reflètent essentiellement une "mauvaise interprétation des changements dans le cycle de vie des femmes" en particulier la durée de la vie active. À cet égard, les États-Unis se distinguent par rapport aux autres pays développés, les cohortes récentes de femmes travaillant en moyenne moins durant la période de 25 à 54 ans qu'à d'autres âges de la vie.

droit et les programmes de MBA. Les économistes ont traditionnellement mis en avant trois facteurs expliquant le manque de mixité des emplois : les différences de talents (innées ou acquises), le rôle de la discrimination et les différences en matière de préférences. Cette thèse s'inscrit dans ce dernier champ de recherche, en s'intéressant à l'impact des normes de genre sur les préférences.

Récemment, un certain nombre d'études a montré que les différences de genre en matière de réussite scolaire ont tendance à être faibles et ne prédisposent pas un genre plus que l'autre à choisir une filière plutôt qu'une autre, y compris pour les filières ouvrant aux carrières proposant les salaires les plus élevés. En outre, les résultats aux examens des étudiants et leur réussite scolaire antérieure n'expliquent qu'une partie négligeable de l'écart important entre les sexes dans le choix d'une filière scientifique par exemple (Eagly 1995, Halpern 2013, Spelke 2005, Hyde 2005). Comme l'a noté Bertrand (2011), lorsqu'Altonji et Blank ont examiné les travaux existants sur l'écart entre les sexes en 1999 (Altonji and Blank 1999), la ségrégation professionnelle sexuée était surtout attribuée à la discrimination (discrimination fondée sur le goût ou discrimination statistique), qui serait plus prononcée dans certaines professions que dans d'autres. La discrimination est encore considérée comme un facteur pertinent pour les économistes aujourd'hui, mais de moins grande importance (Azmat and Petrongolo 2014). Compte tenu de ces tendances, un nombre croissant d'études s'est donc concentré sur les différences de préférences.

Les économistes ont récemment commencé à s'intéresser à de nouveaux mécanismes pouvant expliquer la persistance de la ségrégation professionnelle sexuée, en particulier les différences psychologiques entre hommes et femmes. Les travaux en psychologie et en psychologie sociale ont eu une influence importante sur cette recherche. Les économistes s'en sont saisis afin de trouver des explications microéconomiques aux différences entre les hommes et les femmes en termes de choix, d'investissement et de progression de carrière (Bertrand 2011). Les principaux résultats de cette littérature sont les suivants : les femmes sont plus averses au risque que les hommes (Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner 2011), sont moins performantes sous pression (Gneezy, Niederle, and Rustichini 2003), ne négocient pas autant que les hommes

(Exley, Niederle, and Vesterlund 2016), sont plus susceptibles d'accepter et de recevoir des tâches qui n'aident pas leur avancement professionnel (Babcock, Recalde, Vesterlund, and Weingart 2017) et ont moins confiance en elles (Niederle and Vesterlund 2007). Les différences d'attitudes à l'égard du risque peuvent être particulièrement pertinentes étant donné que l'écart de salaire entre les sexes est corrélé avec la variance des salaires. En d'autres termes, les professions dans lesquelles les écarts de salaire sont les plus élevés sont également celles dans lesquelles les salaires sont les moins prévisibles. Au cours des cinq dernières années, plusieurs autres études ont montré, en conditions réelles et non en laboratoire, que les attributs psychologiques expliquent une part importante des différences de genre en termes de choix éducatifs (Buser, Niederle, and Oosterbeek 2014), de choix d'emploi (Flory, Leibbrandt, and List 2015) et de salaires (Reuben, Sapienza, and Zingales 2015).

Dans l'ensemble, la contribution relative de ces attributs psychologiques ou des compétences non-cognitives aux inégalités femmes-hommes fait l'objet de débats. Il est particulièrement difficile d'évaluer l'ampleur précise de cet effet, car ces différences pourraient à la fois causer et être renforcées par des choix éducatifs et des décisions d'offre de travail antérieures. Établir une relation de causalité est particulièrement difficile. Par ailleurs, les études expérimentales ont montré que le contexte et la formulation (*framing*) affectent la mesure de ces traits psychologiques (Bohnet 2016). Enfin, on ne peut aujourd'hui déterminer si ces attributs psychologiques reflètent purement les normes et les identités de genre socialement construites et si elles peuvent par conséquent évoluer au cours du temps, en particulier compte tenu du rattrapage éducatif des femmes. Là encore, la causalité peut aller dans les deux sens, les individus pouvant ajuster leurs attitudes à la lumière de leurs choix et situations effectives sur le marché du travail. Cette thèse tentera d'aborder cette question dans le chapitre 3 en examinant l'impact causal des modèles d'identification positifs féminins sur les attitudes et les choix des élèves.

Cependant, même quand les femmes ont des professions proposant des rémunérations élevées, elles restent sous-payées par rapport aux hommes. Les écarts de salaire ont de plus tendance à se creuser à mesure que l'on progresse vers les professions les mieux rémunérées [14]. Bertrand, Goldin, and Katz (2010) ont suivi les dynamiques de salaires au cours du temps des anciens étudiants de MBA et montrent que si l'écart de salaire est relativement faible à l'entrée sur le marché du travail, il s'élève à 50% dix ans après l'obtention du diplôme. Les différences d'offre de travail en sont le principal moteur : il existe d'importantes pénalités salariales associées à toute interruption de carrière [15]. Ces résultats sont compatibles avec les études concernant la "pénalité liée à l'enfant", qui reste élevée pour les femmes, même dans les pays ayant une longue tradition de politiques favorisant les familles. Des études récentes sur la Suède (Angelov, Johansson, and Lindahl 2016) et le Danemark (Kleven, Landais, and Sogaard 2015) utilisant des micro-données et des *event studies* révèlent une divergence claire dans la dynamique des revenus des hommes et des femmes à l'arrivée du premier enfant. De plus, cette pénalité liée à l'enfant a été remarquablement stable au cours du temps et à travers les générations. Bien que les différences biologiques associées à la naissance de l'enfant ne puissent pas être exclues, le prix disproportionné [16] que les femmes, en particulier les plus diplômées, doivent payer sur le marché du travail à cause de la présence des enfants, reste important.

L'une des explications possibles à cette pénalité est que la flexibilité horaire associée à la présence des enfants a un coût particulièrement élevé dans certaines professions (Goldin 2014). Certaines entreprises et secteurs peuvent choisir de récompenser de manière disproportionnée les heures de travail longues et imposent plus souvent que d'autres des horaires de travail

14. Des tendances similaires ont été observées dans le milieu universitaire, en particulier dans la profession économique. L'étude du Committee on the Status of Women in the Economics Profession (CSWEP) montre une progression lente de la part de femmes parmi les professeurs employés à temps plein.

15. Une question subsidiaire est de savoir si les femmes sont moins payées par rapport aux hommes au sein d'une même entreprise ou parce qu'elles travaillent dans des entreprises différentes. Les études les plus récentes ont étudié les différences de salaires *entre* entreprises et *au sein* d'une entreprise. (Card, Cardoso, and Kline 2015). Les femmes sont moins susceptibles à la fois d'accéder à des professions à forte rémunération et d'intégrer des entreprises proposant des rémunérations élevées. La sélection dans différentes entreprises reflète à la fois le choix des employeurs et les décisions des travailleurs. En ce sens établir un lien de causalité dans cette relation s'avère difficile. Une série récente d'études utilisant des données longitudinales américaines (Goldin, Kerr, Olivetti, Barth, et al. 2017 et Barth, Kerr, and Olivetti 2017) a révélé que plus de 40% de l'écart salarial est dû au fait que les hommes intègrent de manière bien plus importante les établissements proposant les rémunérations les plus élevées. Environ 60% des écarts peuvent être attribués à la moindre capacité des femmes à faire progresser leurs salaires au sein des entreprises.

16. Relativement à leur salaire.

inflexibles. Précisément parce que les femmes restent les premières à prendre en charge la garde des enfants et d'autres travaux non marchands, leur demande de flexibilité horaire est plus grande (Wiswall and Zafar 2016, Mas and Pallais 2016) et cette flexibilité peut leur être particulièrement préjudiciable en termes de carrière et de rémunération [17]. Enfin, l'effet conjugué de la présence de contraintes institutionnelles et la persistance des normes sociales peut particulièrement nuire aux perspectives de carrière des femmes. Nous tenterons dans le chapitre 2 de cette thèse, en utilisant une réforme récente comme "expérience naturelle", d'aborder précisément cette question en étudiant les décisions d'offre de travail des femmes dans un contexte où les institutions limitent leur possibilité d'accéder à un emploi du temps régulier.

Normes et inégalités de genre : une approche économique

Les normes de genre ont longtemps été considérées comme la variable omise dans l'équation de l'inégalité entre les sexes, le résidu après avoir tenu compte des facteurs habituels. De nombreux articles économiques utilisent d'ailleurs indistinctement les termes "normes", "identité" ou "culture" pour définir l'ensemble des préférences et croyances spécifiques au contexte historique et social. Au début des années 1990, plusieurs économistes ont essayé d'intégrer les apports de la sociologie et de la psychologie sociale afin d'améliorer la compréhension des comportements et leur rapport aux questions d'identité. En particulier, en s'appuyant sur les études féministes relatives à la construction sociale des catégories de genre [18] et des disciplines scientifiques, plusieurs chercheur-e-s ont commencé à tenir compte de l'identité

17. Des études récentes qui ont montré que le temps consacré à la parentalité, en particulier chez les personnes hautement qualifiées, a augmenté au cours des dernières décennies (Guryan, Hurst, and Kearney 2008, Ramey and Ramey 2009) et que malgré les innovations technologiques et les possibilités accrues d'externaliser le travail domestique, certaines études ont montré que la "double journée" n'a pas disparu, en particulier pour les femmes diplômées et dont les salaires sont élevés (Bertrand, Kamenica, and Pan 2015, Lippmann, Georgieff, and Senik 2016).

18. Ces études ont fait émergé la définition de *genre* comme "organisation sociale de la relation entre les sexes" (Scott 1986).

sociale des individus et de la façon dont elle peut influencer les comportements et les décisions marchandes (Ferber and Nelson 2003) [19]. Le concept du *soi séparé* et *soluble* développé par England (2005) en est un exemple : les économistes ont traditionnellement adopté une notion du *soi* pour qualifier les comportements sur le marché, dans lequel les individus sont atomisés, égoïstes et ont des préférences fixées *ex ante*. Il existe une autre définition tacite du *soi* en ce qui concerne le domaine familial, essentiellement altruiste, dans laquelle les préférences sont formées sans frictions et conflits internes. Paula England conteste cette séparation des deux sphères : "l'individuation et la connexion ne sont pas nécessairement en guerre l'une contre l'autre". D'une certaine manière, les notions d'identité et de normes de genre contribuent à combler l'écart entre les deux notions distinctes du *soi*. Dans le chapitre 1 de cette dissertation, nous montrerons comment le comportement altruiste d'un père vis-à-vis du bien-être de sa fille n'est pas forcément univoque et direct, mais peut être pensé comme encastré dans ses propres opinions politiques.

Les articles fondateurs d'Akerlof et Kranton (Akerlof and Kranton 2000, Akerlof and Kranton 2010) ont également proposé d'intégrer le sens de soi comme un élément important de la fonction d'utilité des individus. Leur définition de l'identité sociale et des normes sociales se recoupent partiellement : dans leur modèle, "un individu suit des prescriptions essentiellement pour préserver son image de soi" (Akerlof and Kranton 2000). Cette théorie aide à trouver du sens aux comportements qui semblent *a priori* préjudiciables aux individus : les individus peuvent choisir de se comporter d'une manière qui serait jugée inappropriée ou même autodestructrice par ceux ne partageant pas leur identité, uniquement pour renforcer leur identité. Cette théorie a eu des applications importantes dans les études sur la ségrégation professionnelle, mais aussi sur la participation au marché du travail et sur la répartition du travail domestique au sein du ménage.

Enfin, les modèles culturels dynamiques (Fernández 2013) proposent d'analyser l'évolution des croyances et des attitudes à l'égard des rôles genrés en utilisant un processus d'apprentissage

19. Plusieurs universitaires féministes ont d'ailleurs mené des travaux importants au début des années 1980 sur les liens entre les croyances sociales occidentales modernes relatives au genre et à la science, voir par exemple Bordo (1987) ou Harding (1986).

inter-générationnel, ce qui est une alternative à l'hypothèse des préférences endogènes. Du point de vue de l'économiste, ce mécanisme d'apprentissage présente l'avantage de permettre une analyse standard en termes de bien-être, contrairement aux modèles dans lesquels les préférences elles-mêmes changent. Ces approches invitent à une confrontation entre les normes de genre d'une part et les inégalités entre les sexes d'autre part : les rôles genrés pourraient en théorie également évoluer de manière endogène en réponse aux transformations à l'oeuvre sur le marché du travail et à la nouvelle donne éducative [20].

Problématique et plan de thèse

Cette thèse s'appuie sur l'ensemble de ces apports théoriques et propose trois contributions empiriques sur le lien entre les normes de genre et les inégalités. L'intégration des normes de genre dans l'approche économique vise à définir un modèle de comportement plus réaliste, un défi majeur pour faire de l'économie "un outil plus pertinent pour améliorer les institutions et la société" (Akerlof and Kranton 2010, p.8). Ce travail de thèse s'inscrit dans cette perspective, en faisant l'hypothèse que les normes de genre sont un facteur crucial de la persistance des inégalités femmes-hommes. Mais cette thèse vise également à permettre une meilleure compréhension des relations réciproques entre les normes et les inégalités de genre. En s'appuyant sur des résultats théoriques et empiriques, nous montrerons que les normes de genre ne constituent pas seulement un ensemble de comportements prescrits assignés à un groupe spécifique d'individus, mais qu'elles se matérialisent au sein des relations sociales et opèrent à l'intérieur de processus de socialisation au sein de la famille, sur le lieu de travail ou à l'école. Nous étudierons le rôle des normes et des institutions sur les préférences politiques, les décisions d'offre de travail et les choix éducatifs et nous montrerons que les normes de

20. Il est intéressant de noter que des débats similaires ont eu lieu entre les historiens économiques dans les années 1990 à propos des causes et des conséquences de la baisse du taux d'activité des femmes pendant la révolution industrielle. Horrell and Humphries (1995) démontrent que les variables économiques (salaires, revenus et caractéristiques du ménage) ne suffisent pas à expliquer les évolutions du taux d'activité des femmes au cours de la révolution industrielle au Royaume-Uni. Selon elles, la transition vers le modèle familial du *breadwinner* est également due à l'évolution de facteurs institutionnels et idéologiques. Voir aussi Creighton (1996).

genre affectent non seulement les choix des femmes, mais aussi le comportement des individus avec lesquelles elles interagissent dans différents contextes sociaux. Cet environnement externe influence à son tour les préférences et les choix des femmes. En d'autres termes, les rôles genrés peuvent évoluer de manière endogène en réponse au contexte politique, aux changements institutionnels ou aux modèles positifs d'identification.

Plan et contribution

Dans le chapitre 1, **Papa does preach: daughters and polarization of attitudes toward abortion**, nous proposerons à la fois une analyse théorique et empirique afin d'étudier l'influence du genre des enfants sur les opinions de leurs pères en matière de droits des femmes. En particulier, nous montrons que le fait d'avoir une fille plutôt qu'un garçon affecte l'opinion des hommes en matière de droit à l'avortement, mais que cet effet varie selon les convictions politiques plus générales de ces derniers. Alors que jusqu'à présent la littérature se concentrait sur les gains privés en termes de bien-être associés aux droits reproductifs, nous tenterons d'expliquer comment la perception de ces gains/pertes peut se traduire dans les croyances morales et les préférences politiques des individus. L'intuition clé du modèle est que la vision du monde des individus définit la manière dont une politique - comme la légalisation de l'avortement - peut affecter leur bien-être. En effet, l'introduction d'une nouvelle technique de contraception ou d'un nouveau droit ayant trait à la santé reproductive, comme toute innovation technologique, peut créer à la fois des gagnants et des perdants. La deuxième hypothèse clé est l'existence d'un altruisme "paternaliste" au sein de la famille. Le comportement altruiste des pères est enraciné dans leurs propres préférences politiques : tout en maximisant le bien-être de leurs enfants, ils leur imposent indirectement leurs opinions politiques dans leur fonction d'utilité. Par conséquent, dans ce modèle, la façon dont les individus perçoivent les inégalités de genre (et les politiques les plus appropriées pour y remédier) détermine de façon endogène leurs normes. Ce résultat permet de dépasser la définition des normes de genre comme prescription associée à un groupe spécifique (Akerlof and Kranton 2000): les normes de genre reflètent une représentation politique des relations de genre. L'analyse empirique permet d'établir que les filles *polarisent* les opinions de leurs pères en matière de droit à l'avortement. L'effet de *polarisation* correspond à environ 30% de l'effet de l'affiliation politique à droite sur les attitudes vis-à-vis de l'avortement.

Dans le chapitre 2, **Do women want to work more or more regularly? Evidence from a natural experiment**, travail réalisé conjointement avec Emma Duchini, nous étudions les décisions d'offre de travail des femmes dans un contexte où les institutions limitent leur possibilité d'accéder à un emploi du temps régulier. Nos résultats suggèrent que les normes de genre contribuent aux inégalités de genre, parce qu'elles sont encastrées dans un contexte social et historique donné. C'est le rôle conjoint des normes sociales et des contraintes institutionnelles - dans notre contexte, le fait qu'en France, les enfants n'avaient pas classe le mercredi avant 2013 - qui explique pourquoi plus de 40% des mères dont le plus jeune enfant était en âge d'aller à l'école primaire ne travaillaient pas le mercredi avant 2013. Avant l'introduction de la réforme des rythmes scolaires en 2013, les femmes dont le plus jeune enfant était en âge d'aller à l'école primaire étaient deux fois plus nombreuses que les hommes à ne pas travailler le mercredi et donc à adapter leur activité professionnelle à la présence des enfants. Par ailleurs, la décision de travailler ou non le mercredi était positivement corrélée au niveau de diplôme, les femmes diplômées du supérieur étant moins nombreuses à travailler le mercredi que les femmes non diplômées, alors même qu'elles travaillent en moyenne davantage d'heures par semaine. Dans un deuxième temps, nous montrons que la réorganisation des temps scolaires prévue par la réforme de 2013 a aussi entraîné une réorganisation du temps de travail des femmes : sans augmenter leurs heures travaillées par semaine, elles sont aujourd'hui plus nombreuses à travailler le mercredi, rattrapant 1/3 de leur écart de participation avec les femmes du groupe de contrôle. Cet effet est essentiellement attribuable aux mères pour qui une présence régulière au travail est particulièrement profitable, comme celles qui travaillent à des postes de direction. Cet article contribue donc à tester la théorie du *coût de la flexibilité*, selon laquelle certaines femmes sont plus pénalisées que d'autres parce qu'elles ont une présence moins continue sur leur lieu de travail.

Le chapitre 3, **The impact of female role models on the gender gap in science: Evidence from the "Girls in Science" Initiative**, présente les résultats d'une expérimentation avec assignation aléatoire conduite de septembre 2015 à février 2016 avec Thomas Breda, Julien Grenet et Marion Monnet. Cette expérimentation a été conçue afin de savoir si l'intervention courte d'un modèle positif d'identification féminin (*role model*) peut influencer les attitudes des apprenants et contribuer ensuite à modifier leur choix d'orientation. Contrairement à l'étude de l'impact des "pairs" et de l'exposition à des modèles "horizontaux" de socialisation qui a connu un essor particulier dans les travaux récents en économie de l'éducation, rares sont les travaux qui se sont intéressés à l'impact des modèles positifs d'identification sur les attitudes et les choix éducatifs des apprenants. Derrière la volonté de faire des modèles positifs d'identification une politique publique, il y a l'idée que la répartition des opportunités d'aujourd'hui affectera de manière endogène la répartition perçue des opportunités de demain. Perturber la perpétuation des normes - en intervenant par exemple sur les stéréotypes liés aux femmes en sciences - peut pousser les étudiantes à changer leur choix et contribuer à modifier les normes de genre. Dans ce chapitre, nous montrons que les interventions de modèles positifs d'identification féminins réduisent la prévalence des stéréotypes associés aux emplois dans les sciences, tant pour les élèves filles que garçons. Par ailleurs, la proportion d'élèves filles inscrites dans des programmes scientifiques sélectifs (CPGE scientifiques) après le baccalauréat augmente d'environ 3 points de pourcentage suite à l'intervention, ce qui correspond à une augmentation de 30% par rapport à la moyenne sans intervention.

Méthodologies

Cette thèse s'appuie sur plusieurs méthodes empiriques. Dans les trois chapitres, trois stratégies d'identification différentes visent à établir des relations de causalité entre d'une part une variable dépendante (la composition du genre des enfants dans le chapitre 1, les contraintes institutionnelles et les normes sociales dans le chapitre 2 et les interventions des *role models* dans le chapitre 3), et une variable d'intérêt d'autre part (respectivement, attitudes politiques, décisions d'offre de travail et choix éducatifs).

Le premier chapitre contient à la fois une contribution théorique et une analyse empirique. L'analyse théorique s'appuie sur un modèle simple de choix de politique optimale qui fait l'hypothèse que les préférences des pères sont "paternalistes" et que le gain/coût associé à une politique varie selon le genre. La stratégie d'identification de l'analyse empirique repose sur l'hypothèse selon laquelle, à taille de famille donnée, le genre d'un enfant est une variable aléatoire [21]. Cette hypothèse peut nous permettre de fournir une estimation de l'effet causal des filles sur les croyances politiques de leur père vis-à-vis de l'avortement.

Dans le chapitre 2, la méthode empirique adoptée est une approche de double différence qui utilise les variations au cours du temps et selon l'âge du plus jeune enfant des répondantes par rapport à la mise en oeuvre de la réforme de 2013. L'hypothèse d'identification est qu'en l'absence de la réforme, la dynamique d'offre de travail aurait été comparable en tendance dans le groupe traité (les mères dont le plus jeune enfant est en âge d'aller à l'école primaire) et dans le groupe témoin (les mères dont le plus jeune est légèrement plus âgé) .

Enfin, le chapitre 3 utilise la méthodologie des expériences avec assignation aléatoire. Selon l'hypothèse de non-interaction (SUTVA) selon laquelle les élèves sélectionnés dans les classes de contrôle ne sont pas affectés par l'intervention de l'ambassadrice, la comparaison entre les élèves traités et contrôlés fournit une estimation du paramètre de l'effet moyen du traitement (ATE) de l'impact du modèle positif d'identification féminin sur à la fois les stéréotypes et les choix d'orientation au lycée et dans le supérieur.

Données

Cette thèse étudie plusieurs faits caractéristiques du "dernier chapitre de la grande convergence" entre les rôles économiques des femmes et des hommes (Goldin 2014) en

21. Cette hypothèse est discutée plus en détail dans la section 1.5.2.3.

proposant une perspective européenne. La plupart des résultats sont issus de l'exploitation de données françaises et nous faisons l'usage de plusieurs bases de données originales. Dans le chapitre 1, les données proviennent d'une base de données biographique originale des députés français collectée à partir du *Who's Who* de 1962 à 2002. La deuxième base de données utilisée provient d'une enquête post-électorale récente (CED-EU14, Sauger, Dehousse, and Gougou 2015). Cette enquête a été menée par internet au cours des élections européennes de 2014, dans sept pays différents, avec des échantillons représentatifs nationaux de 4000 personnes dans chaque pays pour l'Autriche, la France, Allemagne, l'Italie et l'Espagne et de 1000 personnes pour la Grèce et le Portugal. À notre connaissance, il s'agit de la première enquête internationale qui contient à la fois une question spécifique sur les attitudes vis-à-vis de l'avortement et sur la composition du genre des enfants dans le ménage, deux questions essentielles à la conduite de l'analyse empirique.

Dans le chapitre 2, l'analyse est effectuée à l'aide de plusieurs bases de données. Tout d'abord, nous utilisons les vagues 2009-2015 de l'Enquête Emploi contenant en particulier le code commune, ainsi que le nombre et l'âge des enfants des répondantes. Nous utilisons également la base de données Enrysco, une base administrative créé par le ministère de l'Éducation Nationale, qui fournit une description précise de l'emploi du temps hebdomadaire pour chaque école, dans chaque municipalité. Nous utilisons également les Déclarations Annuelles de Données Sociales, qui contiennent des informations détaillées sur les employeurs et employés sur la base des déclarations obligatoires des employeurs. Enfin, nous utilisons la base de données O*NET du département du travail américain. Cette base de données, disponible en ligne, offre une classification des professions sur la base des tâches réalisées et des compétences nécessaires à chacune d'entre elles.

Chapter 1

Papa does preach: daughters and polarization of attitudes toward abortion [1]

1. This paper greatly benefited from discussions and helpful comments from Douglas Almond, Julien Combe, Dalton Conley, Lena Edlund, Raquel Fernandez, Ilyana Kuziemko, Andrew Oswald, Nattavudh Powdthavee, Claudia Senik, Avner Seror, Ebonya Washington, Ekaterina Zhuravskaya, and one anonymous referee. I am also indebted to Nicolas Sauger, who gave me access to the CED-EU14 dataset. All errors are mine.

Abstract

This article examines the hypothesis that having daughters polarizes fathers' political attitudes toward abortion right. I derive a simple economic model which predicts that fathers with paternalistic preferences adopt a more polarized political position on abortion when they have a daughter than when they have a son. The empirical investigation relies on two original sources of data: a biographical dataset on French congresspersons in 1974 and a post-electoral survey conducted in 2014 in seven European countries. Both sources provide evidence of a polarization effect of daughters on fathers' views on abortion.

JEL codes: D72, D83, J16

Keywords: voting; polarization; gender; political behavior; attitudes; abortion.

Introduction

In the late 1970s, reproductive rights laws were enacted in the majority of Western countries. Several generations of women have been exposed to greater availability of reproductive technologies, such as medical abortion. This long exposure would suggest that abortion right is not controversial anymore. So why is abortion still a contentious issue today? Recent polls suggest that US opinion is still divided over whether abortion is morally acceptable, [2] and recently, ban proposals triggered protests in some European countries.

The positive impact of reproductive rights on women's choices and economic opportunities has been extensively studied (Goldin and Katz 2002, Goldin 2006, Chiappori and Oreffice 2008). However, there is evidence that some women do not necessarily benefit from an increase in welfare after the introduction of new reproductive technologies because they refuse or fail to adopt them (Akerlof, Yellen, and Katz 1996, Pezzini 2005). If the introduction of these technologies has a direct - and contrasted - effect on women's welfare, little is known on how their male relatives form opinion on this issue.

This question is important because even if women's political movements played a considerable role in putting reproductive rights in the forefront, these laws were eventually voted mostly by men. [3] In her groundbreaking article, Washington (2008) explores the relationship between family environment and voting behavior of members of Congress. She finds that, for a given number of children, an additional daughter increases the propensity of US Congress members to vote liberally, particularly on matters of reproductive rights. She concludes that "for those voting on reproductive rights, the females in their lives would be particularly salient."

Following the seminal work of Warner (1991) and Washington (2008), several articles have found conflicting results on the effect of offspring's gender on political opinions and on support for traditional gender roles. In a recent contribution, Lee and Conley (2016a) and Lee and Conley (2016b) conclude that contextual differences, heterogeneous treatment effects,

2. According to a recent Gallup poll (Saad 2014), 43% of respondents interviewed in May 4-8, 2016 considered that abortion was morally acceptable.

3. In France in 1974, women represented 2% of the French National Assembly. In the American 105th Congress, they composed 11% of members.

and publication bias might explain these mixed results. Such an apparent divide in empirical findings across datasets is scientifically unattractive.

The present article examines the hypothesis that men's political attitudes toward abortion do respond to the presence of a daughter, but differently according to their general political beliefs. This *polarization effect* of daughters means that the presence of a daughter is associated with more anti-abortion (respectively pro-abortion) views for right-wing (respectively left-wing) fathers. This argument is examined in a simple economic model and its implications are studied empirically using two original datasets.

In the theoretical model, I consider fathers' choices on policies that have a direct impact on women's welfare, such as abortion right. In this model, fathers have a certain taste for the policy - their *ideology* -, and they also care about the utility of their offspring, daughter or son. Fathers take into account the ideology of their offspring, but they have paternalistic preferences: they use their own ideology to value the *direct* impact of the policy on their daughter's welfare. One prediction of this model is that fathers with paternalistic preferences adopt a more polarized position on abortion when they have a daughter than when they have a son. This model sheds light on a mechanism that could explain why fathers do not necessarily become more socially progressive when they have daughters. It can also explain the heterogeneity of treatment effects across periods and across cultural contexts.

To test this prediction, I make use of two original sources of data. With the exception of the papers by Oswald and Powdthavee (2010) and Lee and Conley (2016a), most previous studies focused on one specific population (the elite versus the general public), or one specific country. This paper adds to the literature by looking at the specific issue of attitudes toward abortion in different countries, and at different points in time in the case of France. First, I built an exhaustive biographical dataset of French congresspersons in 1974, the year abortion was legalized in France; second, I consider a post-electoral survey conducted in 2014 in seven European countries (CED-EU14, Sauger, Dehousse, and Gougou 2015). Both data sources provide evidence of a polarization effect of daughters on their fathers' views on abortion. Depending on the sample, this polarization effect corresponds to about 30% to 50% of the effect of political affiliation on support for abortion.

This paper explores variations of the polarization effect across different cultural contexts, and addresses several endogeneity issues that could potentially bias the results. First, one might argue that the polarization effect I identify could be driven by a more general shift toward more conservative or progressive views. More precisely, if daughters had an effect on their fathers' political affiliation, it would be coherent to observe a shift in attitudes toward a specific issue such as abortion. I test this hypothesis of endogenous political leaning. Secondly, the existence of a stopping rule of fertility pattern might threaten the validity of the results, so I also address the issue of endogenous family composition.

Overall, my findings suggest that when individuals form opinions about a complex societal issue, they might do so in a way that preserves their cultural and political identity. [4]

The rest of the paper proceeds as follows. The first section gives an overview of the related literature. The second section presents the model. The third section describes the data and the identification strategy. The main results are discussed in the fourth section. The fifth section concludes.

1.1 Related literature

The economic literature has focused on abortion right as an issue intricately related to the expansion of women's role in the political and economic spheres.

One strand of the literature explores the welfare-enhancing role of reproductive rights, both from a theoretical and from an empirical point of view, arguing that the introduction of a new technology of birth control shifts the frontier of available choices for women. Goldin and Katz (2002) and Goldin (2006) provide empirical support to this hypothesis. With a theoretical perspective, Chiappori and Oreffice (2008) show that after the introduction of a new reproductive technology, such as contraceptives, every woman at the equilibrium receives a larger share of household resources, even those who do not actually use the technology. [5] On

4. This is in line with recent evidence by Kahan (2015) on climate-science communication.
5. Studying the impact of abortion availability on child development, Bitler and Zavodny (2002) and Bitler

the other hand, an other strand of the literature highlights that the diffusion of birth control technologies can have contrasted effects on women's welfare. Akerlof, Yellen, and Katz (1996) argue that the legalization of abortion, as any technical change, can create both winners and losers. They show in a theoretical model that the introduction of a new technology of birth control can be detrimental to certain women, through a decline in the incentive to obtain a promise of marriage. Women who welcome these new reproductive technologies no longer find it necessary to condition sexual relations on such promises. On the other hand, women who want children, or who do not want an abortion for moral or religious reasons find themselves pressured to participate in premarital sexual relations without marriage guarantees. Pezzini (2005) uses a difference-in-difference framework exploiting the variation in the introduction of birth control rights over time in different countries to provide empirical evidence of the effect of an extension of abortion rights on women's welfare. Women's life satisfaction increases on average following the extension of birth control rights, but not for women who define themselves as religious. Pezzini (2005) focuses on private benefits to individuals associated with reproductive rights. With respect to this literature, my article explores how this perceived gain/loss in welfare might translate back into individuals' moral beliefs and political preferences.

Since Washington (2008) article, many studies have sought to identify the effect of daughters on the political opinions of their parents. Shafer and Malhotra (2011) found that having a daughter reduced men's support for traditional gender roles, based on an analysis of the National Longitudinal Study of Youth. Using nationally representative longitudinal data for the UK and the German Socioeconomic Panel, Oswald and Powdthavee (2010) show that having daughters makes people more likely to declare that they vote for left-wing political parties. In a recent paper, Glynn and Sen (2015) focus on U.S. Courts of Appeals judges and suggest that judges with daughters consistently vote in a more feminist fashion on gender issues than judges who only have sons. The number of additional daughters has a small but

and Zavodny (2004) also find that legalized abortion is associated with an improvement in child heath and a decrease in the number of unwanted children.

positive impact. An exception to this literature is the recent contribution by Conley and Rauscher (2013), who found the opposite effect. Using nationally representative data from the General Social survey (GSS) in the U.S., they conclude that female offspring have an effect of partisanship, with fathers being more likely to identify with the Republican Party. They also investigate the issue of abortion, assuming that daughters are associated with more progressive views (I discuss this perspective in section 1.2), and find no clear significant result on their measure of pro-choice views. However, the measure of pro-choice attitudes they use is a composite sum of several indicators.[6] I argue that this measure is unlikely to capture the polarized political views on abortion properly, as it is always conditioned on women's situations of distress. Finally, Lee and Conley (2016a) look at cross-country variations using data from the GSS and the European Social Survey, and find no evidence that the sex of a first child has any effect on party identification or political ideology. They suggest three plausible explanations to account for these results: contextual differences, heterogeneous treatment effects, and publication bias. In the following section, I will suggest a mechanism that could explain why children's gender does not affect political affiliation in every context, but why it does impact parents' political attitudes for policies that affect men and women differently, such as abortion right.

1.2 Theoretical framework

The recent literature has not reached a consensus on the impact of children's gender on fathers' decisions. Some empirical contributions find liberal-leaning, conservative-leaning, or zero effect, depending on the population and the political issue considered. This variety of effects leads some scholars to question the very validity of children's gender as an instrument for studying the variability of political views (Lee and Conley 2016a). The present article argues that reproductive rights differ from other more general political issues, as it is both a

6. "Abortion OK if poor" (abortion should be legal if the family has very low income and cannot afford more children), "Abortion OK if single" (if the woman is single and does not want to marry the man), "Abortion OK for health" (if the woman's health is seriously endangered by the pregnancy). I discuss why I choose an alternative specification in paragraph 1.4.

gender issue and a moral issue. The model aims at clarifying this assumption and at motivating the empirical results.

Abortion becomes a salient issue for fathers of daughters, because they anticipate the direct impact that abortion would have on their daughter's welfare. Moreover, I argue that fathers frame the welfare impact of abortion using their own political beliefs. This is equivalent to assuming altruistic and paternalistic behavior, i.e., what fathers think is right or wrong for their daughters is not independent from their personal political beliefs. Having a daughter might not necessarily cause them to change their view of the world, but it could reinforce their beliefs on morality. The model presented thereafter builds on altruism and paternalistic preferences to describe the polarization effect daughters might have on their fathers' beliefs. Finally, it accounts for the importance of heterogeneous treatment effects and the cultural context in interpreting the impact of children's gender on their parents' political orientation, as pointed out by Lee and Conley (2016a).

1.2.1 Setting

In this model, I assume that individuals have single-dimensional preferences over a specific policy x distributed over [0,1]. In the present case, this policy is access to abortion. In the following, I focus on the utility of fathers. I assume that they have altruistic preferences, i.e., children's utilities are arguments of their parents' utility functions (Becker 1981). I focus on the simplest case where each couple has only one child. I want to characterize their optimal choice of x.

The father's utility is given by:

$$u_F(x) = \begin{cases} -(a-x)^2 + \beta u_M(x) & \text{if the child is a son} \\ -(a-x)^2 + \beta u_W(x) & \text{if the child is a daughter} \\ \text{with } 0 \leq \beta \leq 1 & \end{cases}$$

where $u_F(.)$ is a well-behaved concave utility function, a is the father's ideal point regarding the policy x, uniformly distributed over [0,1], and $u_i(.)$ with $i = W, M$ is the utility of the child. β represents the level of altruism.

The first key assumption is that women get both an ideological and a direct benefit/cost from abortion legislation x, while men only get an ideological cost/benefit.

ASSUMPTION 1: Women derive a combination of an ideological effect and a direct effect from the policy x, while men only derive an ideological effect from it.

The children's utility functions can be written as follows:

$$\begin{cases} u_M(x) = -(a_M - x)^2 & \text{if the child is a son} \\ u_W(x) = \underbrace{-(a_W - x)^2}_{ideological} + \underbrace{\alpha\left(a_W - \frac{1}{2}\right)x}_{direct} & \text{if the child is a daughter} \end{cases}$$

a_i, with $i = W, M$, represents the child's ideal point. α is the relative weight attributed to the direct effect compared to the ideological effect in the daughter's utility function. In the Appendix, I discuss the set of values of a_W to characterize interior solutions both for the father's and the daughter's maximization problems.

The policy affects women via two channels: the ideological channel - the distance between the policy and their ideological ideal point - and the direct channel, which represents the direct impact of the policy on women's welfare. Women will be differently affected by the policy according to the location of their ideological ideal point with respect to the political center.

For instance, women in favor of abortion benefit from the introduction of this birth control technology by better managing career and fertility decisions. On the contrary, and as discussed by the literature, access to abortion can be detrimental to those women who do not want to have abortions, or who define themselves as religious. The intuition behind the model is that individuals' world views (being to the left or right of $\frac{1}{2}$) shape the way a policy might affect their welfare. If a woman is left-wing ($a_W < \frac{1}{2}$), a right-wing policy x (close to 1) will decrease her utility both because the policy is far from her ideological ideal point and because with $a_W - \frac{1}{2} < 0$, the policy has a detrimental effect on her welfare. However, with a policy x slightly above $\frac{1}{2}$, there will be a trade-off between the distance to the ideological ideal point and the direct effect.

The second key assumption is that fathers have paternalistic preferences. They take into account the ideological preferences of their children when maximizing their own utility, but they substitute their parameter a for a_W in the direct component of their daughter's utility function. The intuition is that fathers care about the utility of their children and respect their ideological tastes, but they assume that they have a better understanding of the consequences a policy might have on their daughter's welfare. Therefore, their evaluation of the cost/benefit of such a policy may differ from that of the children themselves. Previous theoretical work has used paternalistic preferences to model the fact that parents care about their children's consumption patterns even after the children have grown up and left home (Pollak 1988). In a recent theoretical contribution on parenting, Doepke and Zilibotti (2014) give another interpretation of paternalistic preferences. They assume that children's preferences can be influenced by parents: parents may take actions that restrict or expand the children's choice set. Here, I will assume that fathers substitute their own parameter a for a_W.

ASSUMPTION 2: Fathers have paternalistic preferences when it comes to the welfare implications of the policy. The utility function of a girl's father can be written:

$$u_{FW}(x) = -\left(a - x\right)^2 + \beta\left[-\left(a_W - x\right)^2 + \alpha\left(a - \frac{1}{2}\right)x\right]$$

1.2.2 Optimal choice of policy

I now derive the fathers' optimal policy choice when they have a son or a daughter respectively.

PROPOSITION 1: *When a father has a son and a positive level of altruism, his ideal* *policy x^*_{FM} will be such that he will be closer to his son's ideal point a_M.*

$$
\begin{aligned}
x^*_{FM} = \frac{a + \beta a_M}{1+\beta} > a \quad & \text{if } a_M > a \\
x^*_{FM} = \frac{a + \beta a_M}{1+\beta} < a \quad & \text{if } a_M < a \\
x^*_{FM} = a \quad & \text{if } a_M = a
\end{aligned}
$$

Proof is given in the Appendix. This result is quite intuitive, as I assume some level of altruism in the father's utility function. Suppose $\beta = 1$, then the policy is a perfect compromise between father's and son's ideal points. When $\beta < 1$, the optimal policy is closer to the father's ideal point, as the father values his son's utility less than his own. Moving closer to his own ideal point and moving away from his son's ideal point would increase his utility, while he only faces a utility cost of β.

PROPOSITION 2 (Polarization effect of daughter): *When a father has a daughter and a positive level of altruism β, his ideal policy x^*_{FW} will be such that he will opt for a more extreme policy than he would if he had a son.*

$$
\begin{aligned}
x^*_{FW} = \frac{a + \beta a_W}{1+\beta} + \frac{\beta\alpha}{2(1+\beta)}\left(a - \frac{1}{2}\right) > x^*_{FM} \quad & \text{if } a > \tfrac{1}{2} \\
x^*_{FW} = \frac{a + \beta a_W}{1+\beta} + \frac{\beta\alpha}{2(1+\beta)}\left(a - \frac{1}{2}\right) < x^*_{FM} \quad & \text{if } a < \tfrac{1}{2}
\end{aligned}
$$

Proof is given in the Appendix. For a given child's ideological ideal point ($a_W = a_M$), the combination of altruism and paternalistic preferences leads fathers to opt for a more extreme policy than when they have a son. The effect depends on the father's view of the world ($a \leq \frac{1}{2}$ or $a \geq \frac{1}{2}$). A left-wing (resp. right-wing) father has a certain idea of the impact such a policy will have on their daughter's welfare. This model sheds light on a mechanism that could explain why fathers do not necessarily become more socially progressive when they have daughters. It can also explain the heterogeneity of treatment effects across periods and across cultural contexts. In particular, if the ideological ideal points a, a_W and a_M have different distributions across countries, i.e., if we observe a large political gender gap or heterogeneity of preferences across generations, we might expect different effects. I investigate this issue in the two following propositions.

In this simple version of the model, I consider β and α as exogenous.[7] However, according to the level of paternalism and altruism of fathers, the size of the polarization effect might vary. This could explain why different studies in different cultural and historical contexts have provided conflicting results on the impact of children's gender on parents' political beliefs.

PROPOSITION 3 (Comparative statics): *For a given child's ideology, polarization is higher when the direct impact of the policy on the daughter's welfare is large (α high), and when the degree of altruism is high (β high).*

$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\alpha} > 0 \text{ and } \frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\beta} > 0 \quad \text{if } a > \tfrac{1}{2}$$
$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\alpha} < 0 \text{ and } \frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\beta} < 0 \quad \text{if } a < \tfrac{1}{2}$$

Proof is given in the Appendix. α only enters the direct effect of the policy, so the more the direct effect matters in the utility function, the larger the polarization. β plays a role in both the ideological component and the direct effect of the policy. At a given level of child's ideology ($a_W = a_M$), the ideological component is similar for the fathers of daughters and the fathers of sons. Therefore, the model predicts that polarization will be larger in the context of a high degree of altruism.

Finally, I have shown that the polarization mechanism holds for a given child's ideology. However, in reality a_W and a_M, the son's and daughter's ideologies, are unlikely to be the same. As pointed out by Edlund and Pande (2002), the difference between men's and women's political preferences is an important feature of the American political landscape. The next proposition investigates the impact of a gender gap in views toward abortion on the

7. A potential extension of the model would be to study the formation of paternalistic preferences in a dynamic setting, α being endogenous to parents' personal political types. This is left for future research.

polarization effect of daughter.

PROPOSITION 4 (Impact of a gender gap in ideologies): *Polarization is less likely to occur if daughters and sons do not have similar views on abortion.*

$$x^*_{FW} - x^*_{FM} = \left(\frac{\beta}{1+\beta}\right)\left[(a_W - a_M) + \frac{\alpha}{2}\left(a - \frac{1}{2}\right)\right] > 0 \text{ if } a > \frac{1}{2} + \frac{2}{\alpha}\left(a_W - a_M\right)$$
$$x^*_{FW} - x^*_{FM} = \left(\frac{\beta}{1+\beta}\right)\left[(a_W - a_M) + \frac{\alpha}{2}\left(a - \frac{1}{2}\right)\right] < 0 \text{ if } a < \frac{1}{2} + \frac{2}{\alpha}\left(a_W - a_M\right)$$

Proof is given in the Appendix. This result reflects the importance of the *ideological* effect. When $a_W > a_M$, that is when the daughter is more conservative than the son, left-wing fathers whose ideal points a are in the interval $[\frac{1}{2} - \frac{2}{\alpha}(a_W - a_M); \frac{1}{2}]$ will also switch to a more conservative ideal policy x^*_{FW} when they have a daughter. Conversely, when $a_W < a_M$, the son is more conservative that the daughter. Right-wing fathers whose ideal points a are in the interval $[\frac{1}{2}; \frac{1}{2} - \frac{2}{\alpha}(a_W - a_M)]$ will also switch to a more liberal ideal policy x^*_{FW} when they have a daughter. Therefore, the model predicts that the higher the gender gap in attitudes toward abortion, the less likely the polarization.

This model aims at motivating the empirical results and gives some predictions. I do not claim to fully account for the complete set of incentives that could cause the altruism motive. Moreover, I do not make any claims that altruism is the only mechanism leading to these predictions. Children could engage in explicit (and costly) actions to teach their parents about certain issues. Parents' socialization is a complex phenomenon, and my data do not allow me to disentangle these mechanisms. However, the key assumption when moving to the data is that daughters and sons are differently affected by the policy, and that fathers interpret the welfare cost/benefit of this policy according to their political type. A subsequent question, not addressed in the present model, is whether having more daughters increases the salience of the political issue, and therefore increases polarization. This is especially relevant if daughters occur in larger families generated by a stopping rule (as discussed in section 1.5.2).

The empirical results will provide some insights into the effect of each additional daughter on polarization.

1.3 Institutional context and data description

Most previous studies focused on one specific country or one population type (general public versus the elite). Ideally, panel data would allow identifying all parameters in the model. However, the most widely used panel data sets either lack questions on attitudes toward abortion or on the number of daughters in the household. To measure attitudes toward abortion, I use both voting records of congresspersons and value surveys. One could oppose that these two data sources could potentially capture different types of attitudes and reflect different incentives. On the one hand, a congressperson's voting record is publicly available, and voters could hold politicians accountable for their voting history. In the French context, where party discipline at the French National Assembly is particularly high, deviating from the party line can be particularly costly for politicians. On the other hand, electoral surveys are anonymous and not compulsory. Estimates of the impact of daughters on abortion views using these two different datasets are not therefore directly equivalent. However, they could provide an order of magnitude of the polarization effect in different contexts. Importantly, the European post-electoral survey is the first dataset that allows measuring the impact of daughters on attitudes toward abortion across countries.

1.3.1 French National Assembly members dataset

Following Washington (2008), I built an original dataset on French congresspersons from biographical information contained in *Who's Who* books from 1962 to 2002. These books contain, for each congressperson, the first name of each child by order of birth. [8] I collected a rich set of information on precise party affiliation, age, marital status, occupation and

8. I coded unisex first names when I could not identify the gender of the congressperson's child. The results are unchanged if I assign a specific gender identity to these unisex first names.

constituency.

In France, contraception and abortion were forbidden and criminalized by a law passed in 1920. In the late 1960s, several political movements and medical associations started to bring abortion to the forefront of public debate (Mossuz-Lavau 2002). The issue gained attention through political petitions and public trials.[9] In 1974, when abortion was legalized, the right held the majority of seats at the French National Assembly. Government ministers are often chosen from the pool of congresspersons.[10]. Table 1.1 gives the 1974 composition of the French National Assembly after nomination. Statistics show that the average age of French National Assembly members is over 54 years-old, suggesting that these congresspersons were likely to have completed their reproductive lives in 1974. The majority of members had two or three children. Finally, only nine women out of 490 were members of the National Assembly at the time, which corresponds to less than 2% of each political group. Therefore the impact of the gender of a congressperson on his/her voting behavior cannot be precisely estimated.

Attitudes toward abortion are measured using roll call votes of the 1974 abortion law.[11] They were collected using official registers (*Journal Officiel*) that list the results of major votes. A classification of the different types of votes in the French National Assembly is given in Appendix 1.6. Importantly, the French parliamentary system allows me to rule out the issue of change in party affiliation. Change in party affiliation - within a legislature and in general - is rare and therefore will not bias the results. As pointed out by Godbout and Foucault (2013), party unity is very high among French congresspersons and the policy space in the legislature is primarily one-dimensional. Political parties might exhibit less influence on a legislator's voting on moral and religious issues. Previous studies have found support for this assumption in the US context (Ansolabehere, Snyder Jr, and Stewart III 2001, Snyder Jr and Groseclose 2000). However, in the French context congresspersons have limited voting independence with respect to their political group, especially on the left (Nay 2003). Therefore

9. According to an IFOP survey published in the *Nouvel Observateur* in April 26, 1971, 55% of French respondents declared that women should be free to have an abortion if they wanted to, but 47% considered abortion as a crime (source found in Mossuz-Lavau 2002).

10. The detail of votes is given in Table 1.13 in Appendix

11. Also known as the "Veil law" after Simone Veil, the health minister who drafted the bill.

one might expect that congresspersons who traditionally never deviate from the party line are likely to do so only if they have strong preferences with respect to the issue at vote. Second, there is substantial political polarization on most economic and social issues (Rosenthal and Voeten 2004). To summarize, congresspersons are likely to have strong political preferences, but they must make their decisions - i.e., vote - in a constrained political environment due to high party discipline. This sample is thus particularly relevant to study the impact of female socialization on fathers' views on abortion.

1.3.2 European post-electoral survey

I use a recent post-electoral survey (CED-EU14, Sauger, Dehousse, and Gougou 2015). This internet survey was conducted a few days after the 2014 European election in seven countries: it contains nationally representative samples of 4,000 people in each country in Austria, France, Germany, Italy, and Spain, and 1,000 people in Greece and Portugal. Contrarily to most cross-national surveys, the questionnaire contains a specific question on attitudes toward abortion. It also includes information on both the number of children and of daughters of the respondents, as well as their educational level, household income, political affiliation, and religious practice.

1.4 Identification strategy

Following Washington (2008), the identification strategy is based on the assumption that conditional on the number of children, the number of female children is a random variable. This assumption will not be satisfied if a man follows a fertility "stopping rule". I discuss this issue in Section 1.5.2.

I use the following linear probability model:

$$\begin{aligned} Y_i &= \alpha + \beta_1 Shareofdaughters_i + \beta_2 Shareofdaughters_i * Right_i \qquad (1.1) \\ &+ \beta_3 Right_i + \eta Numberofchildren_i + \delta X_i + \epsilon_i \end{aligned}$$

I also run the regression following an alternative specification previously used by the literature.

$$\begin{aligned} Y_i &= \alpha + \beta_1 Atleastonedaughter_i + \beta_2 Atleastonedaughter_i * Right_i \qquad (1.2) \\ &+ \beta_3 Right_i + \eta Numberofchildren_i + \delta X_i + \epsilon_i \end{aligned}$$

For a French congressperson i, Y_i is a dummy variable equal to one when she/he voted "yea" to the 1974 law. The measure of political affiliation (right-wing) is based on party affiliation at the beginning of the term of office. For a respondent i in the European dataset, Y_i is a dummy equal to one if the respondent fully agrees with the statement "women should be free to decide on matters of abortion" (score 10 out of 10). I choose this specification 10 from a 0-10 continuous scale because of the right-skewed distribution of scores to this question, as shown in appendix (Figure 1.1). Because over 50% of respondents pool at 10, this dummy accurately captures attitudes in favor of abortion. Moreover, it contrasts with the approach of Conley and Rauscher (2013), who used questions in which abortion was framed as a medical question and not as a positive right for women. The measure of political affiliation is based on respondents' self-declared positions on a 0-10, left-to-right scale. Depending on the specifications, I include score 5 in either the left or the right. I present the impact of this choice of specification in Table 1.6 and discuss its implications in paragraph 1.5.2. The coefficients of interest are β_1 and β_2. The β_1 coefficient measures the impact of the treatment (having at least one daughter/a positive fraction of daughters among children) on attitudes toward abortion. The β_2 coefficient measures the heterogeneous effect depending on political affiliation. X_i includes individual characteristics, such as age and age squared, number of children, and a dummy equal to one when the congressperson is a doctor. [12] Controlling for marital status does not affect the results. Certain specifications using the CED-EU14 dataset include controls for each level of household income, each educational level, the intensity of religious practices, and country fixed-effects.

12. I control for this occupation type because it was especially prevalent among French National Assembly members. Moreover, the consequence such legislation has on members of the medical profession is particularly salient.

1.5 Results and discussion

1.5.1 Results

French National Assembly members dataset. Table 1.2 displays the results of the OLS regression for two votes on the same law: November 28, 1974, and December 20, 1974.[13] As expected, right-wing congresspersons are less likely to vote in favor of the abortion law. On the contrary, and as shown in Table 1.1, almost 100% of left-wing congresspersons followed the party line and voted "yea". In columns (1) and (3) of Table 1.2, I set the number of children to zero when they were not indicated in the *Who's who* books. Dropping these observations does not significantly change the results (columns (2) and (4)). There is a slightly less significant coefficient for the treatment of the November 28, 1974 vote. Finally, these results are robust when abstention and "nay" votes are treated separately (columns (1) to (4) of Table 1.8). The interaction coefficient shows a negative relation between having at least one daughter and the probability of voting "yea" when the congressperson is right-wing, with estimates ranging from 14 to 19 percentage points. The magnitude of the effect is important. Indeed, it corresponds to around 30% of the impact of right-wing political affiliation on abortion support. This result suggests that having a daughter might not necessary cause more progressive attitudes when it comes to gender issues, but rather a higher political polarization. Within the political context prevailing at the time - party discipline being extremely high in the French National Assembly, especially for left-wing parties -, it is not surprising that right-wing congresspersons were more likely to deviate from the party line.[14]

Table 1.3 displays the results when introducing a dummy variable for each additional daughter, in order to see whether the magnitude of the effect is correlated with the total number of daughters. Only the coefficient of the first daughter remains significant. This suggests that the polarization effect, if it exists, appears with the first daughter.

13. After the law had been discussed by a Joint Committee.
14. These results are in line with Washington (2008). On one hand, she found the greatest association between female children and voting patterns for reproductive rights issues. On the other hand, her results showed a larger effect for Democratic members, however, in the context of the US Congress the difference between the effect on the scores of Democratic and Republican members was not statistically significant.

European post-electoral survey. Table 1.4 displays the results on European data for specification (1.1) for the entire sample of men aged over 18. As expected, right-wing political affiliation has a negative impact on support for abortion, with a significant negative coefficient for all specifications. Results show a negative and statistically significant relation between the proportion of daughters when interacted with right-wing political affiliation and support for abortion right. Introducing country fixed effects in column (2), or a dummy for each income and educational level in column (3), does not reduce the magnitude of the effect, which corresponds to about a half of the impact of political affiliation on support for abortion. The coefficient becomes insignificant when I introduce controls for each level of religious practice, although this might also be due to sample size. The proportion of daughters is positively correlated with the probability of supporting abortion right for the left-wing respondents.

In addition, I investigate variations of the polarization effect on abortion views across different cultural contexts. To my knowledge, Oswald and Powdthavee (2010) and Lee and Conley (2016a) are the only articles to study cross-country differences, and therefore to account for heterogenous treatment effects and cultural contexts. However, they do not provide predictions as to how these effects should vary by country. In Table 1.5, I break down the sample by countries. The first observation is the relative heterogeneity of the polarization effect. Except for the samples of respondents from Greece and Portugal, a higher share of daughters is associated with an increase in pro-choice attitudes, although estimated coefficients of the impact of the proportion of daughters on support for abortion are only statistically significant for the sample of Italian respondents. The interacted coefficient with right-wing political affiliation is negative across specifications, and it is particularly large and statistically significant for Austria. The sample size limits greatly the breadth of the analysis, however all together, these results seem to suggest the existence of a polarization effect of daughters, which varies across countries. Proposition 4 of the model suggests that polarization is less likely to occur if daughters and sons do not have similar views on abortion. As I cannot observe this variation for the same individual, I take advantage of the differing gaps between males and females in views on abortion across different countries, as shown in Figure 1.2. [15] I try to test the prediction of Proposition 4 in Figure 1.3. I compute for each country the difference between the percentage of women and the percentage of men who fully agree with the proposition "Women should be free to decide on matters of abortion" (score 10) from the sample of respondents younger than 25 years-old. [16] The x-axis corresponds to the gender gap in attitudes toward abortion of the "children". The y-axis corresponds to the polarization effect obtained from the coefficient β_2 from specification 1.1 on the sample of male respondents older than 25 ("the fathers"). A negative and significative coefficient corresponds to the presence of a polarization effect. Again, sample size limits the interpretation, but the figure provides suggestive evidence that polarization is more likely to be observed in a context of low gender gap in attitudes toward abortion.

1.5.2 Robustness checks and discussion

The results discussed above provide evidence of a polarization effect, both for the sample of French congresspersons in 1974 and of European respondents in 2014. I also investigated heterogeneity across countries, with a left-leaning effect in the case of contemporary Italy, and a polarization effect in the case of Austria. The main limitation of this study is the absence of panel data that would allow me to clearly identify the change in political preferences after the birth of a daughter. To my knowledge, such data containing both a measure of abortion views and of the presence of daughters do not exist. Below, I try to present a series of robustness checks, and I investigate the issues of endogeneity of political leaning or family composition.

1.5.2.1 Robustness checks

I present here a series of robustness checks on the sample of European respondents. Column (1) of Table 1.6 shows the baseline regression. In column (2), I investigate the impact of the presence of daughters on support for abortion using an alternative measure of support

15. The difference between men's and women's political preferences has already been pointed out by Edlund and Pande (2002) in the American context.

16. Changing this age-threshold does not significantly affect the results.

for abortion. The dependent variable is a dummy variable indicating that the respondent answers to the question on abortion with a score 9 or 10 out of 10. The significance of the effect is affected by these changes, even if the sign of the effect remains similar. The skewed distribution of answers to this question in the population, as shown in Figure 1.1, suggests that the results might be sensitive to extreme values. I confirm this result by running a multinomial logit regression with country fixed effects presented in Table 1.7. Results show a statistically significant polarization effect of daughters for the score 10 out of 10. I also use variations in the definition of the right-wing group. In column (3) of Table 1.6, right-wing political affiliation is proxied by a dummy variable equal to one if the respondent answers with a score greater or equal to 6 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". Given the spike at 5 in the distribution of answers to this question, the number of right-wing respondents decreases greatly with this new measure (from 68% to 39% of respondents from the sample of male respondents older than 18 with children). Therefore, it is not surprising to observe a less significant effect, although the sign remains negative. So far, I assumed in all specifications that, conditional on the family size, the children's gender was exogenous. I investigate this issue in detail in the last paragraph to relax this hypothesis, I restrict the sample to male respondents older than 18 with exactly one child. The sample size is divided by three, and the effect is affected both in magnitude and significance. In column (5), I estimate specification 1.1 on a larger sample including respondents older than 25. The magnitude of the polarization effect is comparable to the baseline regression. Finally, in column (8) I run specification 1.2 on the same sample as the baseline regression, and find qualitatively the same results.

1.5.2.2 Political leaning

In order to study whether the results are driven by a more general pattern of party indiscipline in the French National Assembly, I run several falsification tests using other reforms, presented in Table 1.8. I run specification 1.2 on another reform related to women's rights: the law on divorce passed in 1974 (columns 5 and 6). The effect of the presence of daughters is not statistically significant, as party affiliation seems to drive most voting behaviors. One could argue that abortion is an ethical issue. Therefore if daughters made their congressional parents more liberal or conservative on moral and ethical issues, this could potentially influence voting behavior on death penalty. My results suggests that this is not the case in the French context, as shown in columns (7) and (8). Finally, I also investigated the impact of the presence of daughters on a more recent abortion vote, the 2001 law (the 12-week time-limit to have an abortion) in columns (9) and (10). However, the government did not share the same political color as the president in 2001 (*cohabitation*), party discipline was therefore much higher in the French National Assembly, and I do not observe a sufficient deviation from the party line, for either the left or the right. I also take selection bias into account: if voters chose to support politicians based on their individual characteristics, such as the gender composition of their children, one could argue that the voting pattern observed is simply due to endogenous selection of congresspersons. However, I argue that this information was not available to voters. Analyzing electoral archives collected by the CEVIPOF, [17] I found no evidence that the gender composition of the children was made public in political programs. While congresspersons do sometimes provide some biographical information, they rarely mention children and never mention the number of daughters they have. Moreover, one might argue that the polarization effect I identify could be driven by a more general shift toward more conservative or progressive views. More precisely, if daughters had an effect on their fathers' political affiliation, it would be coherent to observe a shift in attitudes toward a specific issue such as abortion. I test the hypothesis of endogenous political leaning using the CED-EU14 dataset. I run the same model on the same sample, where the dependent variables capture other political issues such as attitudes toward public debt, tax, same-sex marriage, immigration and political affiliation. Results are reported in Table 1.10, and I do not find consistently significant results. More importantly, I find zero effect of the presence of daughters on right-wing political affiliation. I can therefore argue as Lee and Conley (2016a) that political affiliation does not seem to be affected by the share of daughters, and that

17. CEVIPOF electoral archives are available online at https://archive.org/details/archiveselectoralesducevipof

abortion is a specific issue in the study of parents' socialization by their female children, potentially because fathers acknowledge the direct effect such a policy can have on their daughters' welfare.

1.5.2.3 Family composition

One major concern in the literature on the effect of children's gender on parents' behavior is the potential existence of a stopping rule of fertility pattern, i.e. the existence of a correlation between family size and the number of daughters. This would suggest that fathers might have an underlying preference for sons. Following Angrist and Evans (1998), I run a test based on sex ratios of children: I look at the probability of having a third child conditional on having two daughters, two sons, or one daughter and one son. As shown in the first two columns of Table 1.11, this test is not significant. I run the same test conditional on having one son or one daughter and find similar results. I can therefore reject the hypothesis of a stopping-rule among congress members. In order to look at the existence of a specific pattern for the right, and to avoid sample size constraints, I combined several legislations all together to implement the sex ratios-test. [18] The results are presented in the last four columns of Table 1.11 and show no significantly different pattern for the right compare to the other Congress persons. The birth order is not available is the CED-EU14 dataset, however I can provide a balancing test to investigate whether fathers of one daughter share sociodemographic characteristics that could be correlated with different attitudes toward abortion. [19] Results are displayed in Table 1.9. I observe a small but significant difference in the probability for the household of being at the very bottom of the income distribution. All the other sociodemographic characteristics are not statistically different for the group of fathers of a son and of a daughter. I also investigate whether my results vary when controlling for the age composition of the children. In column (6) of Table 1.6, I control for the presence of children who are all strictly older than 12. [20]

18. 1962-1967, 1968-1973, 1973-1978 and 1978-1981. Regressions include usual sociodemographic controls as well as tenure in office.

19. The Trivers-Willard hypothesis (Trivers and Willard 1973) suggests that fathers with low socioeconomic status will skew toward female children because the reproductive risk is lower.

20. I use such a variable because there is no continuous measure of each child's age in the survey.

Another proxy for children's age is given in column (7), where I control for the presence of all children at home during the interview. The results are not affected by these controls. Finally, as pointed out by Lee and Conley (2016a), it could be the case that personal ideology and choosing to marry into a family with preexisting boys or girls, or choosing to adopt a boy or girl, might be correlated. The present datasets unfortunately do not allow to distinguish between biological children and step- or adopted children. However, results are robust when excluding Congress persons who did remarry, in order to account for potential step-children.

1.6 Conclusion

This paper examines the hypothesis that men's political attitudes toward abortion might respond differently to the presence of a daughter according to their general political beliefs. A simple theoretical model suggests that when fathers have paternalistic preferences with respect to the impact of a policy on their daughter's welfare, they tend to opt for a more polarized political position than when they have a son. Using two original and very different datasets, I provide evidence of a polarization effect of daughters on their fathers' attitudes toward abortion. These results are robust to various specifications and do not seem to be driven by endogenous political leaning, nor by family composition. This suggestive evidence could contribute to reconcile two opposite strands of the literature on the socialization effect of daughters on their fathers' political views. Importantly, this paper confirms that the socialization effect of daughters is particularly salient on reproductive rights, but also suggests that when individuals form opinions about a complex societal issue, they might do so in a way that preserves their cultural and political identity. As a consequence, these results advocate that future models of transmission of political preferences take into consideration the general political preferences of the parents. Finally, understanding the extent to which paternalistic preferences are endogenously shaped by personal ideology and by different cultural contexts could be a direction for future research.

Tables and Figures

Table 1.1 – Summary statistics - 1974 Congresspersons

	Full sample	Right	Left
Independent variables			
Age	54.79	55.04	54.34
Woman	0.02	0.02	0.02
Substitute	0.11	0.16	0.02
Physician	0.04	0.04	0.03
Total number of children			
Number of children	2.71	2.87	2.29
No child	0.06	0.07	0.02
One child	0.14	0.12	0.22
2 children	0.33	0.28	0.45
3 children	0.21	0.24	0.14
4 children	0.15	0.16	0.12
5 children or more	0.07	0.10	.02
Number of girls	1.35	1.42	1.20
Dependent variables			
Vote Yes abortion Nov. 28, 1974 Law	0.58	0.34	0.99
	(0.02)	(0.03)	(0.00)
Vote Yes abortion Dec. 20, 1974 Law after joint committee	0.57	0.32	0.99
	(0.02)	(0.03)	(0.00)
N	490	312	178

The table reports summary statistics for the full sample, and for the left-wing and the right-wing Congress persons separately.
Source: Author's calculations are from the Congressperson dataset.

Table 1.2 – Polarization effect of daughters on legislator voting on abortion law

	Vote abortion Nov. 28, 1974		Vote abortion Dec. 20, 1974	
	(1)	(2)	(3)	(4)
Right-Wing	-0.520***	-0.523***	-0.506***	-0.508***
	(0.070)	(0.071)	(0.070)	(0.071)
At least one daughter	-0.035	-0.026	-0.036	-0.032
	(0.023)	(0.031)	(0.023)	(0.030)
(At least one daughter)*Right	-0.150*	-0.140*	-0.197**	-0.186**
	(0.076)	(0.081)	(0.077)	(0.080)
Controls	Yes	Yes	Yes	Yes
Observations	490	339	490	339
Adjusted R^2	0.44	0.38	0.47	0.40
Sample mean	0.536	0.579	0.522	0.565

The table presents OLS estimates of the impact of having at least one daughter on the probability to support abortion law, interacted with political affiliation. The dependent variable is a dummy indicating that a congressperson voted for abortion law in the first version (November 28, 1974) and the revised version (December 20, 1974). The coefficient of interest is the interaction of the presence of a daughter with political affiliation. Robust standard errors are in parentheses. In columns (1) and (3), missing values for the number of children are set to zero. Controls include age and age squared, the number of children, gender, and a dummy equal to one when the congressperson is a doctor. Abstentions are included in "nay".
*** p<0.01, ** p<0.05, * p<0.1.
Source: Author's calculations are from the Congressperson dataset.

Table 1.3 – Polarization effect of the first daughter on legislator voting on abortion law

	Vote abortion Nov. 28, 1974		Vote abortion Dec. 20, 1974	
	(1)	(2)	(3)	(4)
Right-Wing	-0.515***	-0.514***	-0.497***	-0.500***
	(0.071)	(0.072)	(0.071)	(0.072)
At least one daughter	-0.016	-0.021	-0.019	-0.028
	(0.025)	(0.030)	(0.025)	(0.030)
(At least one daughter)*Right	-0.187**	-0.181*	-0.187*	-0.179*
	(0.091)	(0.093)	(0.092)	(0.093)
At least two daughters	-0.004	0.008	0.026	0.011
	(0.026)	(0.031)	(0.026)	(0.032)
(At least two daughters)*Right	-0.010	-0.006	-0.030	-0.031
	(0.084)	(0.084)	(0.086)	(0.087)
At least three daughters	-0.007	0.010	-0.012	-0.001
	(0.032)	(0.036)	(0.031)	(0.036)
(At least three daughters)*Right	0.060	0.097	0.020	0.031
	(0.077)	(0.096)	(0.076)	(0.094)
Controls	Yes	Yes	Yes	Yes
Observations	469	323	469	323
Adjusted R^2	0.44	0.38	0.45	0.39
Sample mean	0.554	0.597	0.547	0.590

The table presents OLS estimates of the impact of each daughter on the probability to support abortion law, interacted with political affiliation. The dependent variable is a dummy indicating that a congressperson voted for abortion law in the first version (November 28, 1974) and the revised version (December 20, 1974). The coefficient of interest is the interaction of the number of daughters with political affiliation. Robust standard errors are in parentheses. In columns (1) and (3), missing values for the number of children are set to zero. Controls include age and age squared, the number of children, gender, and a dummy equal to one when the congressperson is a physician. Abstentions are excluded.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations are from the Congressperson dataset.

Table 1.4 – Polarisation effect of daughter on support for abortion

	Support for abortion			
	(1)	(2)	(3)	(4)
Proportion of daughters	0.0489*	0.0510*	0.0445	0.0593*
	(0.0292)	(0.0289)	(0.0293)	(0.0359)
(Proportion of daughters)*Right	-0.0663*	-0.0612*	-0.0609*	-0.0444
	(0.0353)	(0.0350)	(0.0354)	(0.0423)
Right	-0.0893***	-0.1000***	-0.0977***	-0.0664**
	(0.0222)	(0.0220)	(0.0223)	(0.0266)
Number of children	-0.0158**	-0.0224***	-0.0157**	-0.00906
	(0.00649)	(0.00664)	(0.00650)	(0.00723)
Age	Yes	Yes	Yes	Yes
Age^2	Yes	Yes	Yes	Yes
Country FE		Yes		Yes
Income			Yes	Yes
Education			Yes	Yes
Religious practice				Yes
Observations	5,740	5,740	5,740	3,912
Adjusted R^2	0.025	0.037	0.026	0.065
Sample mean	0.435	0.435	0.435	0.363

The table presents OLS estimates of the impact of the proportion of daughters on the probability to fully agree with the proposition "Women should be free to have an abortion". The dependent variable is a dummy variable indicating that the respondent fully agrees (score 10 out of 10) with the statement on abortion. The coefficient of interest is the ratio between the number of daughters and the total number of children, interacted with right-wing political affiliation. Right-wing political affiliation is proxied by a dummy variable equal to one if the respondent answers with a score greater or equal to 5 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". Robust standard errors are in parentheses. The model is estimated on the sample of men older than 18. In all specifications, controls include political affiliation, the number of children, age, and age squared. Columns (2) and (4) include country fixed effects. Columns (3) and (4) include a dummy for each category of household income, and a dummy for each level of education. Column (4) also includes a dummy for each category of intensity of religious practice.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations are from the CED-EU14 dataset.

Table 1.5 – Polarisation effect of daughter on support for abortion by country

	Support for abortion						
	France	Germany	Italy	Spain	Austria	Greece	Portugal
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Proportion of daughters	0.101	0.0162	0.135**	0.0458	0.0498	-0.184	-0.0420
	(0.0819)	(0.0665)	(0.0589)	(0.0623)	(0.0786)	(0.125)	(0.121)
(Proportion of daughters)*Right	-0.0946	-0.0762	-0.0674	-0.0136	-0.171*	0.138	0.116
	(0.0953)	(0.0819)	(0.0734)	(0.0787)	(0.0913)	(0.150)	(0.144)
Right	-0.0339	-0.105**	-0.00764	-0.316***	0.0317	-0.178*	-0.186*
	(0.0568)	(0.0526)	(0.0461)	(0.0489)	(0.0582)	(0.0953)	(0.0979)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,023	958	1,106	1,049	1,020	276	308
Adjusted R^2	0.018	0.045	0.012	0.100	0.033	0.051	0.010
Sample mean	0.515	0.413	0.376	0.480	0.435	0.375	0.357

The table presents OLS estimates of the impact of the proportion of daughters on the probability to fully agree with the proposition "Women should be free to have an abortion". The dependent variable is a dummy indicating that the respondent fully agrees (score 10 out of 10) with the statement on abortion. The coefficient of interest is the ratio between the number of daughters and the total number of children, interacted with political affiliation. Political affiliation is proxied by a dummy equal to one if the respondent answers with a score greater or equal 5 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". Robust standard errors are in parentheses. The model is estimated on the sample of men older than 18, separately for each country. Controls include political affiliation, age, age squared, and the number of children.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations are from the CED-EU14 dataset.

Table 1.6 – Polarisation effect of daughters - Robustness checks

	Support for abortion							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Proportion of daughters	0.0510*	0.0375	0.0266	0.0230	0.0459	0.0504*	0.0476*	
	(0.0289)	(0.0277)	(0.0210)	(0.0400)	(0.0291)	(0.0289)	(0.0288)	
(Proportion of daughters)*Right	-0.0612*	-0.0374	-0.0395	-0.0329	-0.0585*	-0.0606*	-0.0592*	
	(0.0350)	(0.0343)	(0.0335)	(0.0482)	(0.0353)	(0.0350)	(0.0349)	
At least one daughter								0.0430*
								(0.0250)
(At least one daughter)*Right								-0.0452
								(0.0298)
Right	-0.1000***	-0.141***	-0.0818***	-0.106***	-0.100***	-0.100***	-0.101***	-0.0988***
	(0.0220)	(0.0217)	(0.0210)	(0.0336)	(0.0223)	(0.0221)	(0.0221)	(0.0248)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All children older than 12						Yes		
All children at home							Yes	
Observations	5,740	5,740	5,740	1,867	5,672	5,740	5,740	5,740
Adjusted R^2	0.037	0.054	0.032	0.053	0.035	0.037	0.038	0.037
Sample mean	0.435	0.536	0.435	0.442	0.437	0.435	0.435	0.435

The table presents OLS estimates of the impact of the presence of daughters on support for abortion, using alternative measures of support for abortion and political affiliation, alternative samples and alternative specification. Column (1) presents the baseline regression, where the dependent variable is a dummy variable indicating that the respondent fully agrees (score 10 out of 10) with the statement on abortion, following specification 1.1 in which the parameter of interest is the proportion of daughters interacted with political affiliation. Right-wing political affiliation is proxied by a dummy variable equal to one if the respondent answers with a score greater or equal 5 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". In column (2), the dependent variable is a dummy variable indicating that the respondent answers to the question on abortion with a score greater or equal to 9 out of 10. In column (3), political affiliation is proxied by a dummy variable equal to one if the respondent answers with a score greater or equal to 6 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". In column (4), the sample is restricted to male respondents older than 18 with only one child. In column (5), the sample is restricted to male respondents older than 25. In columns (6) and (7), I control for, respectively, the presence of children all older than 12, and the fact that all children live at home. Finally, column (8) presents the results obtained from 1.2 where the coefficient of interest is a dummy variable equal to one if the respondent has at least one daughter, interacted with right-wing political affiliation. Robust standard errors are in parentheses. In all specifications, controls include right-wing political affiliation, the number of children, age, age squared, and country fixed effects.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Author's calculations are from the CED-EU14 dataset.

Table 1.7 – Polarisation effect of daughter on support for abortion - Multinomial logit

	Support for abortion				
	[0 Fully disagree]	[1]	[2]	[3]	[4]
Proportion of daughters	0.390	-0.281	0.869	1.216***	-0.544
	(0.487)	(0.696)	(0.678)	(0.462)	(0.632)
(Proportion of daughters)*Right	-0.791	0.154	-0.839	-1.260**	0.136
	(0.542)	(0.782)	(0.741)	(0.541)	(0.699)
Right	0.877***	0.307	0.788	0.249	-0.059
	(0.332)	(0.459)	(0.479)	(0.364)	(0.355)
	[6]	[7]	[8]	[9]	[10 Fully agree]
Proportion of daughters	0.339	0.561*	0.336	0.291	0.516**
	(0.372)	(0.314)	(0.267)	(0.273)	(0.226)
(Proportion of daughters)*Right	-0.179	-0.194	-0.294	-0.168	-0.543**
	(0.429)	(0.360)	(0.314)	(0.325)	(0.264)
Right	-0.136	-0.101	-0.262	-0.653***	-0.496***
	(0.262)	(0.224)	(0.190)	(0.195)	(0.156)
Controls	Yes				
Observations	5,740				
Pseudo R^2	0.0164				
Wald chi^2(60)	323.49				

The table presents multinomial logit regression estimates of the impact of the proportion of daughters on the support for abortion. Each discrete value corresponds to the answer, from 0 "Fully disagree" to 10 "Fully agree", to the question "Women should be free to have an abortion". The reference category for the multinomial logit is 5. The coefficient of interest is the ratio between the number of daughters and the total number of children, interacted with political affiliation. Political affiliation is proxied by a dummy equal to one if the respondent answers with a score greater or equal to 5 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". Robust standard errors are in parentheses. The model is estimated on the sample of men older than 18. Controls include political affiliation, age, age squared, and the number of children.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations are from the CED-EU14 dataset.

TABLE 1.8 – EFFECT OF THE PRESENCE OF A DAUGHTER ON LEGISLATOR VOTING BEHAVIOUR

	Vote abortion Nov, 1974		Vote abortion Dec, 1974		Vote divorce June, 1975		Vote death penalty Sept, 1981		Vote abortion Dec, 2000	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Right-Wing	-0.532***	-0.529***	-0.515***	-0.508***	-0.262***	-0.288***	-0.733 ***	-0.734 ***	-0.952***	-0.953***
	(0.072)	(0.071)	(0.072)	(0.071)	(0.079)	(0.077)	(0.074)	(0.073)	(0.034)	(0.034)
At least one daughter	-0.023	-0.032	-0.026	-0.029	-0.011	-0.033	-0.018	-0.004	0.008	-0.003
	(0.028)	(0.021)	(0.028)	(0.021)	(0.053)	(0.046)	(0.017)	(0.011)	(0.006)	(0.004)
(At least one daughter)*Right	-0.143*	-0.149*	-0.179**	-0.189**	0.065	0.026	-0.001	0.004	0.005	0.019
	(0.081)	(0.078)	(0.080)	(0.077)	(0.091)	(0.085)	(0.080)	(0.079)	(0.039)	(0.039)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	323	469	323	469	323	469	361	446	402	548
R^2	0.376	0.440	0.396	0.458	0.083	0.118	0.703	0.700	0.905	0.900
Sample mean	0.554	0.597	0.547	0.590	0.770	0.778	0.737	0.713	0.532	0.589

The table presents OLS estimates of the impact of having at least one daughter on voting behavior, interacted with right-wing political affiliation. The dependent variable is a dummy variable indicating that a congressperson voted for various laws: abortion law in the first version (November 28, 1974) and second version (December 20, 1974) in columns (1) to (4) when abstentions are excluded, divorce law in the first version (June 4, 1975) in columns (5) and (6), death penalty (September 18, 1981) in columns (7) and (8) abortion law (December 5, 2000) in columns (9) and (10). In columns (5) to (10), abstentions are included in "nay". The coefficient of interest is the interaction of the presence of a daughter interacted with right-wing political affiliation. Robust standard errors are in parentheses. The even columns display results when missing values for the number of children are set to zero. Controls include age and age squared, the number of children, gender, and a dummy equal to one when the congressperson is a physician.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations are from the Congressperson dataset.

Table 1.9 – Balancing test - Fathers of one son/one daughter

	One son	One daughter	Difference
Sociodemographic characteristics			
Low level of education	0.12	0.11	-0.00
Middle level of education	0.62	0.61	-0.01
High level of education	0.26	0.27	0.01
Age	50.36	50.80	0.44
Number of children	1	1	0.000
Married	0.59	0.60	0.00
Intensive religious practice	0.221	0.230	-.009
Paid work	0.59	0.58	-0.01
Unemployed	0.09	0.09	0.00
Political opinions			
Importance for country: tax burden	5.99	6.00	-0.01
Importance for country: public debts and deficits	8.04	8.02	0.02
Left-Right	4.84	4.77	0.07
Immigration threat for jobs	6.95	7.05	-0.10
Pro Choice	0.48	0.49	-0.01
Household income			
Less than 750 euro a month	0.06	0.05	-0.02**
751-1000	0.07	0.08	0.01
1001-1500	0.15	0.15	-0.00
1501-1750	0.08	0.09	0.01
1751-2000	0.10	0.10	-0.00
2001-2500	0.12	0.13	0.02
2501-3000	0.12	0.11	-0.00
3001-4000	0.11	0.12	0.01
4001-5000	0.06	0.05	-0.01
5001-7000	0.03	0.03	0.00
7001-10000	0.01	0.01	-0.00
More than 10001 euro a month	0.01	0.00	-0.00
Observations		4316	

The table compares the characteristics of fathers of one son or one daughter, who are older than 25. In the first two columns, each cell reports the sample mean of different sociodemographic characteristics, political opinions and household income, in columns (1) for the sample of fathers of one son and in column (2) for the sample of fathers of one daughter. Column (3) reports the difference between the sample means.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Author's calculations are from the CED-EU14 dataset.

Table 1.10 – Falsification test

	Support for abortion	Attitudes toward tax burden	Public debt	Immigration	Same-sex marriage	Right-wing affiliation
	(1)	(2)	(3)	(4)	(5)	(6)
Proportion of daughters	0.0510*	0.0157	0.00357	0.0254	-0.0109	0.0000
	(0.0289)	(0.0277)	(0.0158)	(0.0238)	(0.0274)	(0.0158)
(Proportion of daughters)*Right	-0.0612*	-0.0279	-0.00753	-0.0302	-0.0196	
	(0.0350)	(0.0321)	(0.0184)	(0.0278)	(0.0338)	
Right	-0.1000***	0.126***	0.0306***	0.0902***	-0.247***	
	(0.0220)	(0.0203)	(0.0116)	(0.0179)	(0.0214)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,740	5,394	5,717	5,626	5,733	5,761
Adjusted R^2	0.037	0.039	0.013	0.024	0.097	0.014
Sample mean	0.435	0.781	0.937	0.830	0.486	0.678

The table presents OLS estimates of the impact of the proportion of daughters on a series of opinion measures. Column (1) presents the baseline regression, for which the dependent variable is a dummy indicating that the respondent fully agrees (score 10 out of 10) with the statement "Women should be free to have an abortion". In column (2), the dependent variable is a dummy variable indicating that the respondent agrees (score from 5 to 10 out of 10) with the statement "Tax burden is an important issue for the country". In column (3), the dependent variable is a dummy variable indicating that the respondent agrees (score from 5 to 10 out of 10) with the statement "Public debts and deficits are an important issue for the country". In column (4), the dependent variable is a dummy variable indicating that the respondent agrees (score from 5 to 10 out of 10) with the statement "Immigration is an important issue for the country". In column (5), the dependent variable is a dummy variable indicating that the respondent disagrees (score from 0 to 4 out of 10) with the statement "Same sex marriage should not be authorized". Finally, in column (6) presents the effect ratio between the number of daughters and the total number of children on right-wing political affiliation, proxied by a dummy variable equal to one if the respondent answers with a score greater or equal 5 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". The coefficients of interest are the proportion of daughters, and the proportion of daughters interacted with political affiliation, except in column (6). Political affiliation is proxied by a dummy equal to one if the respondent answers with a score greater or equal to 5 to the question "How would you place yourself on a Left-Right scale from 0 to 10?". Robust standard errors are in parentheses. The model is estimated on the sample of men older than 18. In all specifications, controls include political affiliation, the number of children, age, age squared, and country fixed effects.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Author's calculations are from the CED-EU14 dataset.

Table 1.11 – Robustness test: Same sex ratio

	Probability to have a third child					
	1973-1978 legislature		1962-1967 to 1978-1981 legislatures			
			All		Right	
	(1)	(2)	(3)	(4)	(5)	(6)
First two children girls	0.053	0.053	0.049	0.013	-0.027	-0.043
	(0.077)	(0.077)	(0.035)	(0.050)	(0.040)	(0.055)
First two children boys	0.065	0.063	0.028	0.022	-0.022	-0.012
	(0.076)	(0.076)	(0.035)	(0.049)	(0.039)	(0.052)
Controls	No	Yes	No	Yes	No	Yes
Observations	248	247	1,137	577	880	471
Adjusted R^2	-0.004	-0.007	0.000	0.002	-0.002	0.009
Pre-treatment mean	0.584	0.584	0.593	0.593	0.635	0.635

The table presents OLS estimates of the impact of the sex of the two first children on the probability to have a third child. The sample is restricted to congresspersons with at least two children. In columns (1) and (2), the sample is composed of congresspersons from the 1973-1978 legislature only. In columns (3) and (4), the sample is composed of congresspersons from legislatures 1962-1967, 1968-1973, 1973-1978 and 1978-1981. In columns (5) and (6), the sample is restricted to the right-wing legislators of these legislatures. The dependent variable is a dummy indicating that a congressperson has three children. Robust standard errors are in parentheses. The even columns include controls for age, gender, and marital status. Regressions in columns (4) to (6) also include a control for tenure in office.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Source: Author's calculations are from the Congressperson dataset.

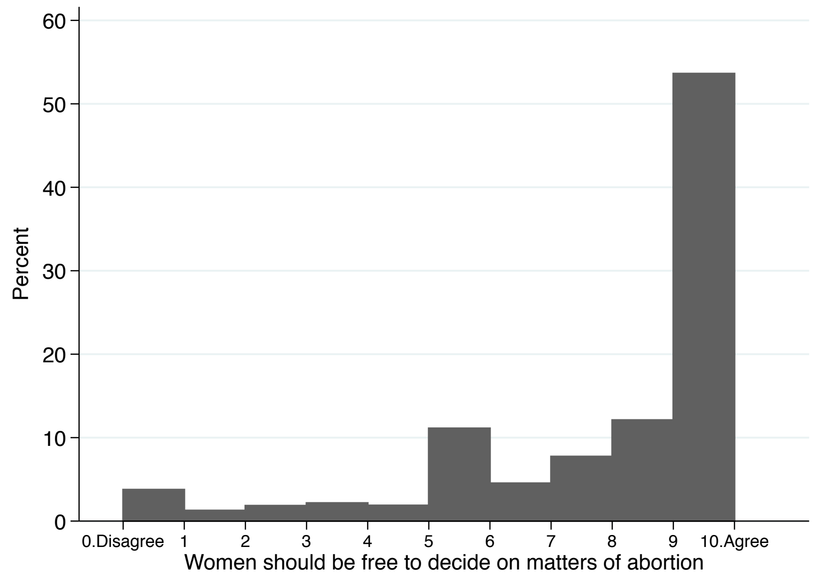

Figure 1.1 – Distribution of views on abortion

The figure shows the percentage of respondents for each score given to the question "How much do you agree with the statement *Women should be free to decide on matters of abortion* on a 0 (totally disagree) to 10 (totally agree) scale". The sample is restricted to male respondents older than 25 with children.

Source: CED-EU14 dataset.

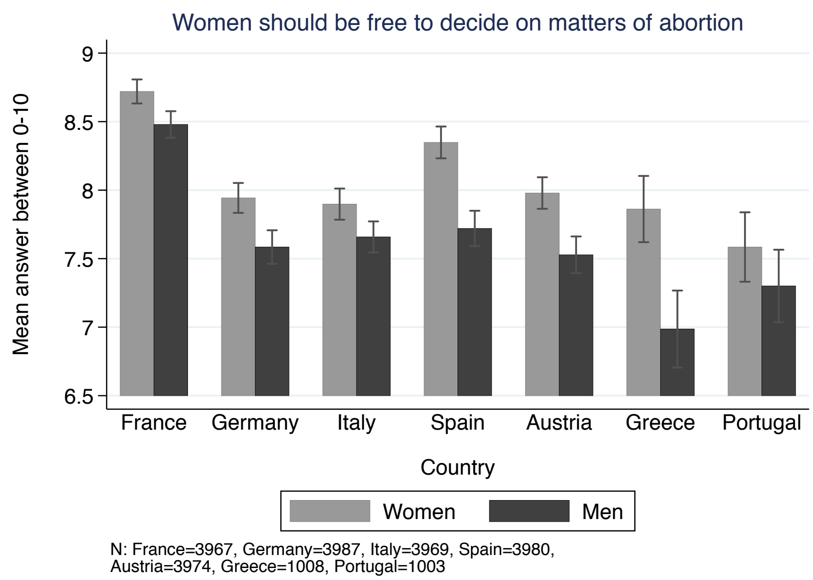

Figure 1.2 – Views on Abortion Men-Women

The figure shows the average score given by respondents to the question "How much do you agree with the statement *Women should be free to decide on matters of abortion* on a 0 (totally disagree) to 10 (totally agree) scale". Results are displayed per country and gender. Confidence intervals are at the 95% level.

Source: CED-EU14 dataset.

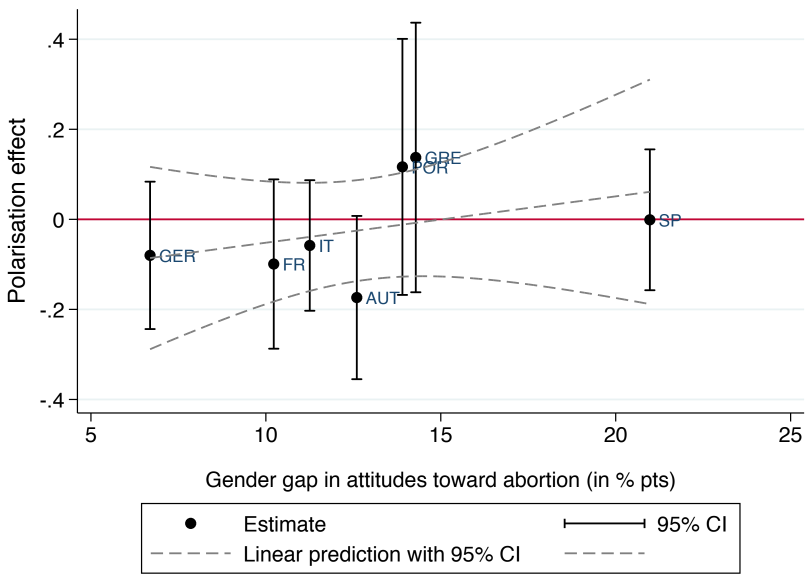

Figure 1.3 – Polarization effect and gender gap in attitudes toward abortion

The figure shows the correlation between the polarization effect of daughters and the gender gap in attitudes toward abortion. The y-axis corresponds to the polarization effect of daughters. Coefficients correspond to the β_2 coefficient of specification 1.1. They are derived from an OLS regression by country with robust standard errors on the sample of male respondents older than 25 years-old. Controls include the number of children, age and age squared. Confidence intervals are at the 95% level. The x-axis corresponds to the difference between young women's and young men's views on abortion. Each gender gap is computed at the country-level from the sample of respondents younger than 25 years-old, and corresponds to the difference between the percentage of women and the percentage of men who fully agree with the statement "Women should be free to decide on matters of abortion" (score 10).

Source: CED-EU14 dataset.

Appendix

The Appendix provides additional figures and tables related to identification assumptions, sensitivity tests, and robustness checks of the bunching estimation techniques

French parliamentary system: background

Three types of votes exist at the French National Assembly:

- "Show of hands" (the most frequent one). In this case, there is no record, only whether the law was adopted or not.
- Open votes (*scrutins publics*). The total number of votes is recorded, as well as voters who deviated from the majority vote of their party.
- Roll-call votes (*scrutins solennels*). This is the category of votes I can use.

The choice of votes that are public roll-call is not random. Votes on current affairs are adopted by show of hands. However: this potential bias should not overestimate the effect too much: preferences are revealed, strong polarization. Votes are obtained and registered from the *Journal Officiel*. The date of vote differs from the date of publication in the Journal Officiel, so I had to report the vote date using the register from the *Table des lois*. I investigated several votes for the same law.

Table 1.12 – Characteristics of the Vth and VIth legislatures

	# of votes	Average turnout	# of days	# of MNA	Government	Parties in Government
V (1973-1978)	88	0.97	1826	490	Right	6
VI (1978-1981)	87	0.97	1145	491	Right	2

The table presents OLS estimates of the impact of having at least one daughter on support for divorce law, interacted with political affiliation. The dependent variable is a dummy indicating that a congressperson voted for divorce law in the first version (June 4, 1975). The coefficient of interest is the interaction of the presence of a daughter with political affiliation. Robust standard errors are in parentheses. In columns (2) and (4), missing values for the number of children are set to zero. Controls include age and age squared, the number of children, gender, and a dummy equal to one when the congressperson is a physician. Abstentions are included in "nay".

Source: Godbout and Foucault (2013)

Mathematical Appendix

Proof of Proposition 1 The father maximizes his utility over x

$$\max_x u_{FM}(x) = \max_x \{-(a-x)^2 + \beta \left[-(a_M - x)^2\right]\}$$

Differentiating u_{FM} with respect to x, we find the optimal political position

$$x^*_{FM} = \frac{a + \beta a_M}{1+\beta}$$

We then derive that

$$\frac{a + \beta a_M}{1+\beta} > a \Leftrightarrow a_M > a$$

and

$$\frac{a + \beta a_M}{1+\beta} < a \Leftrightarrow a_M < a$$

If the father cares about his son's welfare ($\beta > 0$), he will then move to his son's ideal point. Finally, when the father and the son share the same preferences, father's utility is maximized at a.

Proof of Proposition 2 First we investigate the feasible set of a_W to characterize interior solutions both for the daughter's and the father's maximization problem.

Maximizing daughter's utility, one finds:

$$x^*_W = a_W \left(1 + \frac{\alpha}{2}\right) - \frac{\alpha}{4}$$

For x^*_W to be an interior solution, we need that

$$0 < a_W \left(1 + \frac{\alpha}{2}\right) - \frac{\alpha}{4} < 1$$

This is true if and only if

$$a_W > \frac{1}{\frac{4}{\alpha}+2} \text{ and } a_W < \frac{4+\alpha}{4+2\alpha}$$

For the simplest case ($\alpha = 1$), we find interior solutions for $a_W \in \left[\frac{1}{6}, \frac{5}{6}\right]$.

The father maximizes his utility over x

$$\max_x u_{FW}(x) = \max_x \left\{-(a-x)^2 + \beta\left[-(a_W - x)^2 + \alpha\left(a - \frac{1}{2}\right)x\right]\right\}$$

When considering the utility function of this daughter, he takes into account her ideology a_W but chooses his own parameter a to evaluate the cost/benefit such a policy could have on the daughter's welfare.

Assuming interior solutions, we differentiate u_{FW} with respect to x and find the optimal political position:

$$x^*_{FW} = \frac{a + \beta a_W}{1+\beta} + \frac{\beta\alpha}{2(1+\beta)}\left(a - \frac{1}{2}\right)$$

The left-hand term is identical to the optimal policy in the case of a son. Here, we assume positive values for both α and β. When $a > \frac{1}{2}$, i.e., when the father is right-wing, it is straightforward to see that the right-hand term is positive. Therefore for a given ideological ideal point of the child ($a_M = a_W$), the optimal position of a girl's father is more right-wing than that of a boy's father. Similarly, when $a < \frac{1}{2}$, the right-hand term is negative, therefore the optimal policy of a girl's father is to the left of the optimal policy of a boy's father. Therefore,

$$x^*_{FW} = \frac{a + \beta a_W}{1+\beta} + \frac{\beta\alpha}{2(1+\beta)}\left(a - \frac{1}{2}\right) > x^*_{FM} \quad \text{if } a > \tfrac{1}{2}$$
$$x^*_{FW} = \frac{a + \beta a_W}{1+\beta} + \frac{\beta\alpha}{2(1+\beta)}\left(a - \frac{1}{2}\right) < x^*_{FM} \quad \text{if } a < \tfrac{1}{2}$$

For x^*_{FW} to be an interior solution, we need that

$$0 < \frac{a+\beta a_W}{1+\beta} + \frac{\beta\alpha}{2(1+\beta)}\left(a-\frac{1}{2}\right) < 1$$

This is true if and only if

$$a_W > \frac{\alpha}{4} - a\left(\frac{\alpha}{2}+\frac{1}{\beta}\right) \text{ and } a_W < \frac{1+\beta}{\beta} + \frac{\alpha}{4} - a\left(\frac{\alpha}{2}+\frac{1}{\beta}\right)$$

Given that the utility function is an inverse U-shaped function over R, we characterize the corner solutions as follows:

$$x^*_{FW} = 0 \quad \text{if} \quad a_W \leq \frac{\alpha}{4} - a\left(\frac{\alpha}{2}+\frac{1}{\beta}\right)$$
$$x^*_{FW} = 1 \quad \text{if} \quad a_W \geq \frac{1+\beta}{\beta} + \frac{\alpha}{4} - a\left(\frac{\alpha}{2}+\frac{1}{\beta}\right)$$

Let us take a simple case, to study the consequences of these restrictions for the set of feasible a_W.

If $\alpha = \beta = 1$, a_W has to be in the interval $\left[\frac{1}{4};\frac{3}{4}\right]$. Therefore, we find interior solutions for non-extreme values of the daughter's ideological ideal point.

Proof of Proposition 3 The polarization effect is measured by:

$$x^*_{FW} - x^*_{FM} = \frac{\beta\alpha}{2(1+\beta)}\left(a-\frac{1}{2}\right)$$

Assuming interior solutions, the comparative statics for β writes

$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\beta} = \frac{2\alpha}{\left[2(1+\beta)\right]^2}\left(a-\frac{1}{2}\right)$$

For any strictly positive value of α,

$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\beta} > 0 \quad \text{if } a > \tfrac{1}{2}$$
$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\beta} < 0 \quad \text{if } a < \tfrac{1}{2}$$

Assuming interior solutions, polarization increases with the level of altruism. Finally,

$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\alpha} = \frac{\beta}{2(1+\beta)}\left(a - \frac{1}{2}\right)$$

Therefore, with $\beta > 0$

$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\alpha} > 0 \quad \text{if } a > \tfrac{1}{2}$$
$$\frac{d\left(x^*_{FW} - x^*_{FM}\right)}{d\alpha} < 0 \quad \text{if } a < \tfrac{1}{2}$$

Assuming interior solutions, polarization is larger when the direct impact of the policy on the daughter's welfare is large (α high).

Proof of Proposition 4 The polarization effect is now measured by:

$$x^*_{FW} - x^*_{FM} = \left(\frac{\beta}{1+\beta}\right)\left[(a_W - a_M) + \frac{\alpha}{2}\left(a - \frac{1}{2}\right)\right]$$

Let $g = a_W - a_M$ be the gender gap in preferences. When g is positive, the daughter is more conservative than the son. The quantity $x^*_{FW} - x^*_{FM}$ can be written as a function $f(g)$ such that

$$f(g) = \left(\frac{\beta}{1+\beta}\right)\left[g + \frac{\alpha}{2}\left(a - \frac{1}{2}\right)\right]$$

For a given g, $f(g) = 0$ when $a = \frac{1}{2} - \frac{2}{\alpha}g$. When $g > 0$, that is when the daughter is more conservative that the son, $f(g) < 0$ for values of a such that $a < \frac{1}{2} - \frac{2}{\alpha}g$. Left-wing fathers whose ideal points a are in the interval $[\frac{1}{2} - \frac{2}{\alpha}g; \frac{1}{2}]$ will also switch to a more conservative ideal policy x^*_{FW} when they have a daughter, because of the importance of the *ideological* effect. Conversely, when $g < 0$, that is when the son is more conservative that the daughter, $f(g) > 0$ for values of a such that $a > \frac{1}{2} - \frac{2}{\alpha}g$. Right-wing fathers whose ideal points a are in the interval $[\frac{1}{2}; \frac{1}{2} - \frac{2}{\alpha}g]$ will also switch to a more liberal ideal policy x^*_{FW} when they have a daughter. Therefore, when $|g| > 0$, the polarization effect of daughter is reduced. The higher the gender gap in attitudes toward abortion, the less likely polarization.

Additional tables and figures

Table 1.13 – Vote by party - 1974 abortion law

Vote abortion Nov. 28, 1974 Law	Left	Right	Total
Abstention	0	6	6
Not present	0	5	5
Nay	0	189	189
Not voting	1	5	6
Yea	178	106	284
Total	179	311	490
Vote abortion Dec. 20, 1974 Law after joint committee	**Left**	**Right**	**Total**
Abstention	0	11	11
Nay	0	192	192
Not voting	1	9	10
Yea	178	99	277
Total	179	311	490

The table reports votes from the left-wing and the right-wing on two versions of the abortion law: November 28, 1974 and December 20, 1974 after the law was examined by a joint committee. The French Parliamentary system makes a distinction between Congress persons who abstain and those who are not voting.
Source: Author's calculations are from the Congressperson dataset.

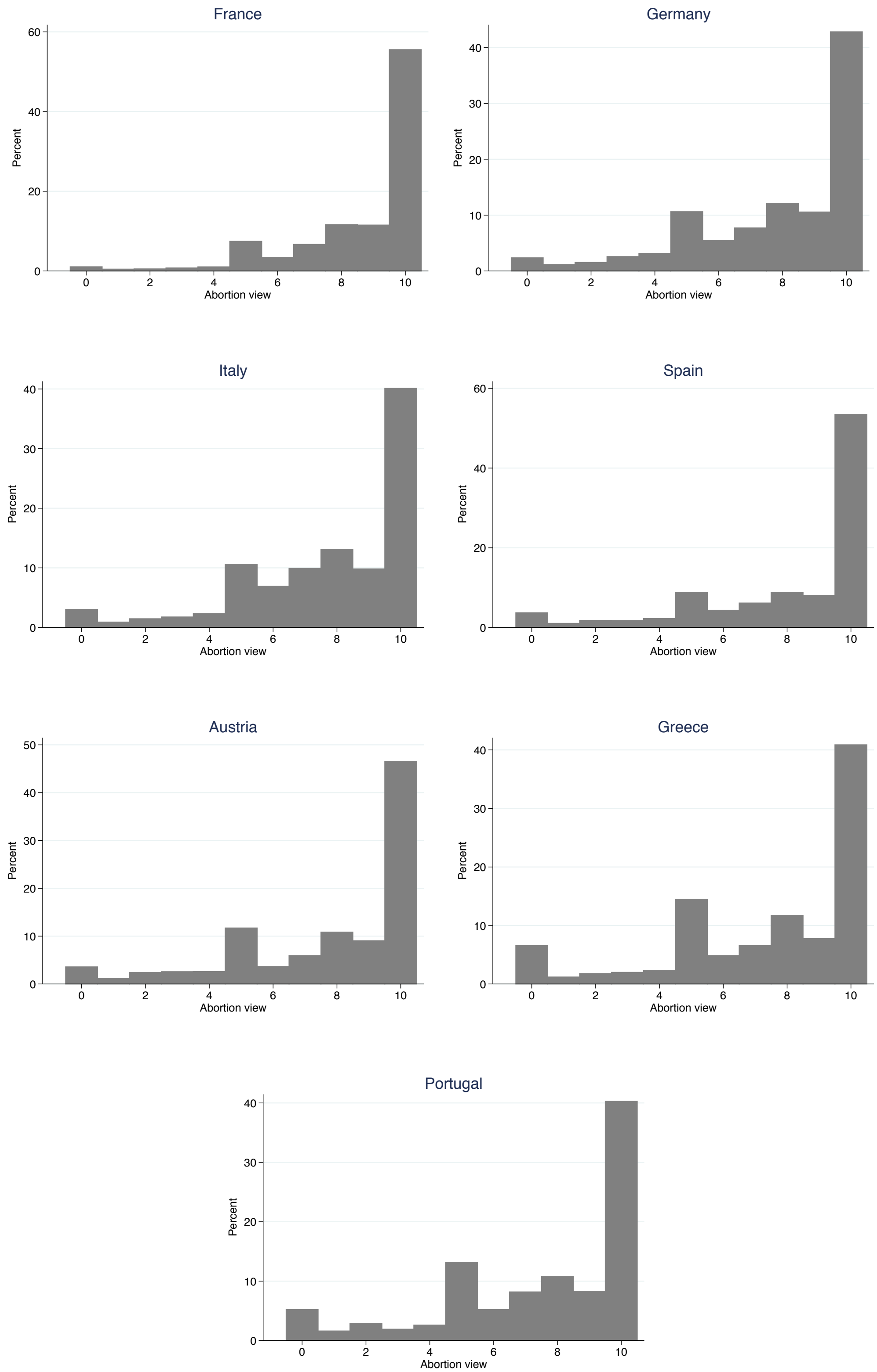

Figure 1.4 – Distribution of views on abortion per country

The figure shows the distribution of answers given by respondents to the the question "How much do you agree with the statement *Women should be free to decide on matters of abortion* on a 0 (totally disagree) to 10 (totally agree) scale". Results are displayed per country.
Source: CED-EU14 dataset.

Table 1.14 – Effect of the presence of daughters on support for abortion

	Support for abortion		
	All	Right	Left
	(1)	(2)	(3)
Panel A.			
At least one girl	0.010	-0.006	0.043*
	(0.014)	(0.018)	(0.026)
Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	6,173	3,845	1,827
Adjusted R^2	0.02	0.03	0.04
Sample mean	0.437	0.373	0.501
Panel B.			
Proportion of daughters	0.011	-0.014	0.047
	(0.016)	(0.020)	(0.029)
Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	6,173	3,845	1,827
Adjusted R^2	0.02	0.03	0.04
Sample mean	0.437	0.373	0.501

The table presents OLS estimates of the impact of having at least one daughter on the probability to fully agree with the proposition "Women should be free to have an abortion". The dependent variable is a dummy indicating that the respondent fully agrees (score 10 out of 10) with the statement on abortion. In Panel A., the coefficient of interest is the presence of at least one daughter. In Panel B., the coefficient of interest is the ratio between the number of daughters and the total number of children. Robust standard errors are in parentheses. The model is estimated on the sample of men older than 25 years old in column (1). I use a question on political affiliation ("How would you place yourself on a Left-Right scale from 0 to 10?") to estimate the model on a sample of right-wing men older than 25 years old (score 5-10) in columns (2), and of left-wing men older than 25 years old (score 1-4) in column (3). Controls include the number of children, age, age squared, a dummy for each level of education, and country fixed effects.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations are from the CED-EU14 dataset.

Chapter 2

Do women want to work more or more regularly? Evidence from a natural experiment[1]

1. This chapter is based on a joint work with Emma Duchini. We are grateful to Antoine Bozio, Gabrielle Fack, Julien Grenet, Thomas Piketty, Xavier d'Hautfoeuille and Sandra McNally for their advise and support. We also acknowledge Libertad Gonzalez, Camille Hémet, Alessandro Tarozzi, and all the participants in the UPF and PSE seminars for their useful comments. We further thank Philippe Aghion, Richard Blundell, Monica Costa Dias, Steven Pischke, Alan Manning, Sandra McNally, Guy Michaels, Samuel Berlinski, Lena Edlund, Douglas Almond, François Gerard, Pierre-André Chiappori, Miguel Urquiola and seminar participants in the 2015 London EDP Jamboree, the 29th EEA conference, the LSE Labor WIP seminar, and Columbia internal seminar for their constructive comments and suggestions. We are especially grateful to to the French Ministry of Education for giving us access to the Enrysco database, and to the Institut des politiques publiques (IPP) for its financial support on this project. I further thank the Alliance Program, the Labex OSE "Ouvrir la science économique", and the Institut du Genre for their additional financial support.

Abstract

This paper studies women's employment decisions when institutions limit their chances of having a regular working schedule. Since 1972, French children in kindergarten and primary school had no school on Wednesday. In 2013, a reform reallocates some classes to Wednesday morning. A descriptive analysis of the pre-reform period suggests that women value flexibility when children demand it. Importantly, we observe that women's decision to stay at home on Wednesday hinges on the interplay between the cost of flexibility associated with their occupation and their bargaining power at work. Next, we take advantage of the 2013 reform to obtain the first estimate of women's elasticity to the value of flexibility. To measure mothers' response we exploit variation in the implementation of this policy over time and across the age of the youngest child. Our results show that, although mothers do not increase their total weekly hours of work, they do take advantage of the fall in the value of flexibility to close 1/3 of their initial gap in the probability of working on Wednesday with respect to the control group. This response seems to be driven by mothers who are more rewarded for a regular presence at work, such as those working in managerial positions.

JEL codes: H52, J13, J16, J22.

Keywords: school schedule; institutional constraints; female labor supply; cost of flexibility.

Introduction

Since the introduction of compulsory primary education in 1882, French children had a full day off in the middle of the week. This was first allocated to Thursday and from 1972 onwards to Wednesday. While other aspects of the school calendar have changed over the last decades, the break on Wednesday has always been maintained. In the meantime, women labour force participation in France has constantly increased to attain nowadays one of the highest level across OECD countries (OECD 2016b). Yet, as displayed in figure 2.1, the Multinational Time Use Survey (Gershuny and Fisher 2013) tells us that, while women with children in the UK, Germany and Spain distribute their working time equally along the week, French mothers work significantly less time on Wednesday than on the other working days of the week. On the contrary French fathers and women without children have a regular working schedule.

An increasing number of studies suggest that as women's labor force participation rates increase, their wage elasticity may fall down to approach men's one (Cascio 2009, Fitzpatrick 2010, Gelbach 2002, Goldin 2006, Havnes and Mogstad 2011). At the same time, several papers show that women value flexibility at work more than men (Filer 1985, Goldin and Katz 2011, Flabbi and Moro 2012, Wiswall and Zafar 2016, Mas and Pallais 2016). Goldin (2014) and Goldin and Katz (2016) further argue that this quest for flexibility can result in wage penalizations, especially in those occupations where the continuous presence at work and the availability to work long hours is particularly rewarded.

In this paper we exploit the peculiarity of the French school schedule to show that women value flexibility when their children demand it. However, we also observe that the possibility to adopt a flexible working schedule hinges on the interplay between the cost that this imposes at work and the bargaining power that women have vis-Ã -vis their employer.

Next, we take advantage of a recent reform of the school schedule to obtain the first estimate of women's elasticity to the value of flexibility, and to test whether women are indeed becoming less sensitive to changes in their own wages. Since 2008, children in kindergarten and primary school had 24 hours of classes per week, split over only four days. In January 2013, the French government decided to reduce the length of the instruction time per day and add an extra half day of classes on Wednesday morning, in order to lighten the daily workload of children, while maintaining invariant the total amount of weekly teaching hours. Moreover, in order to compensate for the shortening of each school day, the government introduced three optional hours of extra-curricular activities, at almost no additional cost for families.

On the one hand, we use the reorganization of the teaching time and, in particular, the introduction of classes on Wednesday morning, to estimate women's elasticity to the value of flexibility and to study how this varies along its cost curve. On the other hand, we exploit the implicit wage subsidy delivered by this reform via the introduction of the extracurricular activities to obtain a new estimate of women's own wage elasticity in a context of high female labor force participation.

To analyze mothers' employment decisions we choose to focus on mothers whose youngest child is of primary school age and compare them to mothers whose youngest child is slightly older. To carry out this study we use the quarterly data of the French Labor Force Survey from 2009 to 2015. Moreover, to identify which occupations reward more a regular and prolonged presence at work, potentially imposing a higher cost of flexibility, we exploit the O*NET classification of occupations. This online platform, created by the U.S. Department of Labor, regroups jobs on the basis of the skills used and activities performed at work. Following Goldin (2014), we classify occupations as imposing a high or a low cost of flexibility, by focusing on elements such as the degree of time pressure, the importance of interpersonal relationships with co-workers, and the extent to which the worker has close substitutes.

In a descriptive analysis of the pre-reform period, we show that considering the interplay between the cost of flexibility associated to women's occupation, and their bargaining power at work is crucial to understand women's behavior. Before 2013, more than 40 percent of women with children in primary school age stay at home on Wednesday, in comparison with only 30 percent of those with older children. This proportion is larger among women with a higher bargaining power at work - proxied in particular by their level of education - despite the fact that these women tend to be the ones facing a high cost of flexibility. Yet, women working in managerial positions, who have potentially both a very strong bargaining power and a very high cost of flexibility, are more likely to work on Wednesday than the average high-skilled mother with her youngest child in primary school, especially if they work in large firms.

Next, comparing the evolution of employment decisions of mothers with primary school aged children to that of mothers with children aged twelve to fourteen, in a difference-in-difference framework, we show that mothers do react to the 2013 reform. Although this intervention does not boost labor force participation or total weekly hours of treated mothers, their probability of working on Wednesday rises by more than three percentage points. In other words, the reform allows treated mothers to close up to 1/3 of the pre-existing gap with control mothers, and 1/6 of the initial gender gap on this margin. Taken together, these findings imply that treated mothers reorganize their working time in accordance to their children's new school schedule, but that they do not react to the implicit wage subsidy this reform provides. In accordance with the insights delivered by the descriptive analysis, we find suggestive evidence that these results are driven by mothers facing the highest cost of flexibility, and in particular by women occupying managerial positions. In addition, these mothers also seem to take advantage of the introduction of the extracurricular activities to slightly increase their weekly hours of work.

To complete our analysis, we also study fathers' reaction to the reform and find no evidence that this intervention affects their employment decisions. On the one hand, this result supports the findings of the recent strand of the literature establishing the importance of cultural norms as determinants of gender identity and women's employment decisions (Fernández, Fogli, and Olivetti 2004, Fortin 2005, Bertrand 2011, Fernández 2011, Kleven, Landais, and Sogaard 2015). On the other hand, it shows that, precisely because a strict division of roles persists within the household even in a context of high female labor force participation, limiting institutional constraints can help modify these cultural beliefs.

Overall, our findings have several policy implications. First, we prove that women value flexible working schedules in the presence of institutional constraints, but tend to abandon such arrangements as soon as these constraints are relaxed. This suggests that women do not have an intrinsic and higher taste for flexibility than men, and that removing institutional constraints must remain a priority for governments that want to boost female labor supply, as suggested also by Olivetti and Petrongolo (2017). Secondly, our study suggests that adopting a flexible working schedule is simply not an option for many workers and this is true both for a low-skilled worker who cannot organize her work independently and for the top-manager who must show up at work to coordinate others' job. Technological advancements are already enhancing the ability of firms and workers to develop new forms of work, and even create forms of flexible work that are suitable to low-skilled workers. Yet, policy makers who want to promote flexible work arrangements as a way to achieve a better work-life balance, on the one hand, and help women breaking the glass ceiling, on the other, still have to take into account these specific job constraints. Finally, the fact we do not observe a strong reaction to the implicit wage subsidy offered by the 2013 reform provides some support for the hypothesis that women's wage elasticity might indeed be weaker in countries with high female labor market participation rates. Yet, it might also indicate that parents' negative perception regarding the quality of childcare services might influence their decision to take advantage of these programs, as suggested by ample anecdotical evidence circulating in the French press. Besides, three additional hours of childcare might simply not be enough to generate a substitution of work for leisure.

The paper proceeds as follows. Section 2.1 gives a detailed description of the French primary school system and how this has been affected by the 2013 reform. Section 2.2 describes the data used to conduct this analysis. Section 2.3 contains two subsections. The first one presents a descriptive analysis of the pre-reform period. The second one focuses on the impact of the reform and discusses the identification strategy, the main results and robustness checks. Section 2.4 analyzes potential channels and consequences of these results. Section 2.5 concludes.

2.1 The French primary school system

The French educational system is divided into three stages: elementary education, for children aged six to eleven; secondary education – in turn divided into middle school (*collège*) and high school (*lycée*) – and tertiary education. Education is compulsory since the age of six till sixteen. However, parents can send their children to free public pre-kindergarten (*école pre-maternelle*) already when they are two, or to kindergarten (*école maternelle*) at the age of three. By now, 23 percent of two-years old children and 95 percent of children aged three to five attend this pre-school stage (Goux and Maurin 2010).

Public primary schools are financed by municipalities. The private sector comprises mainly religious schools and enrolls fourteen percent of all primary school pupils.

With respect to the structure of the school calendar, France has always been one of the countries with the longest period of holidays, longest number of hours per year, and longest school day, in primary school.

Since the introduction of compulsory primary education in 1882 (*Loi Ferry*) until the end of the 1960s, children spend five full days at school, with a break on Thursday and Sunday, for a total of 30 hours per week. In 1969, Saturday afternoon is abolished, and three years later, in 1972, the break in the middle of the week is advanced from Thursday to Wednesday, and two hours of physical activities are added to the school week.

It is only with the development of the chronobiology in the 1980s that an intense debate on the optimal structure of the school schedule spreads out. Experts of this discipline point out that primary school children need more frequent holidays and a shorter day at school. As a consequence, the Jospin Law restructures the school year in 36 weeks over five periods, and reduces by one hour the weekly schedule. Moreover, in 1991, a ministerial decree gives municipalities the possibilities to adopt a four-days schedule. Only a few choose this possibility. In 1995 it is the Ministry of education that relaunches this option by selecting a pool of pilot schools to experiment the four-days school week. From that moment, several municipalities start to consider this option. Finally, in 2008, under an harsh debate, the four-days schedule is extended to all primary schools in France and weekly hours are reduced from 26 to 24. Nonetheless, in 2013, under the pressure of chronobiologists, the Minister of Education reintroduces the four-and-half days school week.

In particular, with the 2013 reform, the school day is shortened by 45 minutes; in order to maintain invariant the total amount of weekly hours, an half day is added, mainly on Wednesday morning, and exceptionally on Saturday; and municipalities are invited to provide free extra-curriculum activities for children, for a total of three weekly hours; these should compensate for the reduction of the daily instruction time. Importantly, municipalities are given the possibility to implement the new schedule either in the year 2013-14 or in 2014-15. 20 percent of them chose to do it in 2013; the rest adopts the new system only in 2014. Moreover, each municipality can chose how to allocate the extracurricular activities, whether to concentrate them on two days a week or spread them along the week. Regarding private schools, these have the freedom to chose whether to implement the 2013 reform or not at all, and, by the end of the academic year 2014-2015, fifteen percent of them, comprising 13.5 percent of French pupils attending a private school, adopt the new schedule. [2]

Finally, it is important to notice that both the 2008 and 2013 reforms affect only kindergarten and primary school children. In middle and secondary school, pupils have at least 24 hours and a half of classes per week, spread over five days, and this schedule has not modified for a long time.

2.2 Data description

Our study relies on the use of several databases. First, we use the 2009-2015 waves of the French Labor Force Survey (*Enquête Emploi en Continu*) or FLFS. This data set

2. In our data we cannot tell whether a family sends their child to a public or a private school. We can only observe the aggregate proportions of students enrolled in public and private schools every year and these remain stable over the years of implementation of the reform. In other words, it does not seem that some families are moving their children from one type of school to the other because of the reform. Overall, this implies that our estimates might be slightly downward-biased as around twelve percent of families in our sample are not affected by the reform (corresponding to the 87 percent of the fourteen percent of children attending private schools.)

collects information on work-related statistics with quarterly interviews to a representative sample of the French population. From the FLFS we extract data on women's age, level of education, marital status, present and past labor market status, income, and the structure of the household in which they reside. Crucially, we exploit the information on the municipality of residence, the number of children women have, and their age.

Secondly, in order to identify the timing of the implementation of the 2013 reform across municipalities, we exploit the Enrysco database. This is an administrative data set that has been created by the French Ministry of Education and provides a precise description of the weekly teaching schedule for each school, in each municipality.

Next, we exploit the *Déclarations Annuelles de Données Sociales*, a large-scale administrative data set of matched employer-employee information, which is based upon mandatory employers' reports of their workers' gross earnings. The French statistical agency gives access to researchers to an extract of this database containing information on all individuals employed in French private firms and born in October of even-numbered years. For the moment it is available up to 2013, and we use it to precisely measure workers' earnings in the pre-reform period.

Finally, to better investigate the mechanisms that drive women's demand for flexibility, we exploit the United States Department of Labor Occupational Information Network, or O*NET. This database, available online, classifies occupations on the base of the activities performed and skills used at work. There are eight broad categories: abilities, interests, knowledge, skills, work activities, work context, work style, and work values. Following Goldin (2014), we focus on the categories of work activities and work context, which comprise several aspects of the work environment that can help us understand quantifying how costly flexible work arrangements can be for women in terms of wage and career advancements.

2.3 Empirical analysis

2.3.1 Pre-reform period

Table 2.1 describes the characteristics of French mothers aged between 18 and 55 and interviewed in the Labour Force Survey before the introduction of the 2013 reform. We regroup them along the age of their youngest child. Three preliminary considerations are worth mentioning. First, mothers of younger children tend not only to be younger but also more likely to hold a college degree, which is consistent with the well-documented increasing trend in female education attainment common to many OECD countries (OECD 2016a). This suggests that looking at incentives, constraints and choices of highly educated women is particularly relevant to predict the behavior of future generations. Secondly, mothers' labor force participation is strongly correlated with their children's age and, in particular, we can see that it increases discontinuously as soon as their youngest child starts attending primary school. Third, conditional on participation, we can see that the probability of working part-time decreases as the youngest child ages and the average number of hours and days increases accordingly.

However, what appears especially striking in this table is the large gap in the proportion of mothers who are working on Wednesday as the youngest child goes from primary to middle school. More than 40 percent of working mothers whose youngest child is in kindergarten or primary school do not work on Wednesday, and this proportion decreases by almost ten percentage points as soon as the youngest child enrolls in middle school. Besides, such pattern does not emerge at all when looking at the probability of working on another day of the week such as Thursday. These figures are consistent with the evidence provided by the Time Use Survey. As shown in figure 2.2, they are also in line with the results of a survey on childcare arrangements for Wednesday directed to families with children aged 0-6. There, up to 70 percent of respondents declare that parents themselves are taking care of their children when they do not have school on Wednesday.

And what these figures clearly show is that the institutional constraint imposed by children's school schedule appears to bind for a large fraction of women. Or, in other words, that a large proportion of working mothers needs a flexible working schedule in the pre-reform period.

To get more insight on who actually adopts such a schedule, from now on we mainly focus on mothers whose youngest child is in primary school, as it appears uncontroversial to compare their behavior to that of mothers with slightly older children. Table 2.1 tells us indeed that, except for the allocation of their working time along the week, their behavior in terms of educational, marriage and employment decisions closely resembles that of mothers whose youngest child is in middle school. [3]

When we break down the previous figures by mothers' characteristics, a few factors appear especially important to predict which mothers are adopting a flexible working schedule prior to the reform, as shown in table 2.2. First, despite working more than four hours more per week, highly educated women whose youngest child is in primary school are significantly less likely to work on Wednesday than low educated mothers and such difference is reduced for mothers whose youngest child is in middle school (table 2.3). We exclude that these correlations are driven by the differential cost of alternative child care arrangements for high-income versus low-income households, as this does not vary much by family income, as shown in table 2.6. We rather believe that these figures indicate that bargaining power plays a crucial role in the ability of workers to negotiate a flexible working schedule with their employer, which is also consistent with the evidence provided by Katz and Krueger (2016) that the recent growth in freelance and contract work largely excludes the low-wage sector.

In addition, it has to be remarked that highly educated women are more likely to negotiate

3. Concerning mothers with children in kindergarten age instead, table 2.1 clearly shows that their participation rate in the labor market, as well as several observable characteristics, differ substantially from that of mothers with older children. This suggests that the incentives driving their decisions might differ as well. For instance, mothers with children between two and three in France are entitled to receive specific childcare subsidies that are withdrawn as children enter in primary school. In addition, kindergarten is not compulsory and only 30 percent of families whose youngest child is two years old actually make use of this service (Goux and Maurin 2010). For all these reasons, we prefer to exclude mothers with children aged two to five from our analysis. For these same reasons, we decide to exclude them as well from the regression analysis studying the impact of the 2013 reform. However, in table 2.18 in the appendix we show that our results do not change substantially when we include them in the treatment group.

a flexible work schedule, despite the fact that they have also higher chances of working in occupations where a regular presence at work could be more rewarded. We get to this conclusion when looking at the probability of working on Wednesday by cost of flexibility, a concept that we borrow from Goldin (2014). In this recent contribution, Goldin argues than in some occupations working longer hours and/or a regular presence at work might be more rewarded than in others or, in other words, that the wage penalization for adopting a flexible working schedule might be especially high in certain occupations rather than in others. Such professions are in particularly those in which it is important to build solid relationships with co-workers, meeting clients often, perform tasks under pressure, and where the worker is less likely to have close substitutes. Following Goldin, we use the O*NET database to classify occupations on the basis of these characteristics. [4] The importance of each of these aspects in every occupation is measured by a score ranging from zero to 100. An index of the cost of flexibility can then be obtained as the average of the standardized scores of these characteristics. Strikingly, figure 2.3, constructed using French matched employer-employee data, shows that the larger is this index, the wider the gender wage gap tends to be. In other words, this figure tells that the wage penalization that women experience in the labor market with respect to men is higher precisely in those occupations where the availability to work longer hours and having a regular presence at work are particularly important. We then regroup women's occupations in two groups, the ones imposing a low cost versus those characterized by a high cost of flexibility, depending on whether the average score is below or above the median for the entire sample. As shown in table 2.2, mothers whose youngest child is in primary school, working in occupations imposing a high cost of flexibility are significantly less likely to work on Wednesday in the pre-reform period than mothers facing a low cost

4. In detail, we rank occupations depending on their importance of five specific dimensions: time pressure, which uses the question "How often does this job require the worker to meet strict deadlines"; frequency of decision making, referring to the incidence with which a worker is required to make decisions that affect other people, the financial resources, and/or the image and reputation of the organization; structured versus unstructured work, representing the extent to which the job is structured for the worker, rather than allowing her to determine tasks, priorities, and goals; contact with others, referring to the extent the job requires the worker to be in contact with others (face-to-face, by telephone, or otherwise) in order to perform it; establishing and maintaining interpersonal relationships, representing the importance of developing constructive and cooperative working relationships with others, and maintaining them over time.

of flexibility. Yet, the former work significantly more hours per week than the latter. Once again these differences attenuate as the youngest child gets to middle school (table 2.3). These figures show that flexibility becomes costly for women precisely in those occupations in which their position, or once again, their bargaining power, allows them to ask for flexibility in the first place - note that almost 70 percent of highly educated women work in occupations imposing a high cost of flexibility.

However, and here we come to the second point, there seems to exist a threshold in the cost of flexibility, above which mothers become less likely to adopt a flexible work arrangement, despite having the bargaining power for doing so. This is the case of women occupying managerial positions in particular, who, especially in large firms, are more likely to work on Wednesday, and work more hours than the average highly educated mother whose youngest child is in primary school.

Third, as it is plausible to expect, the characteristics of the employer are also strongly correlated with the probability that mothers work or not Wednesday in the pre-reform period. Women working in firms with less than 20 employees are 5 percentage points less likely to stay at home on Wednesday than those employed in larger firms. And mothers working in the public sector are up to 10 percentage points less likely to work on Wednesday than those employed in the private sector. Besides, both in small firms and in the public sector, women are more likely to work part-time than in the private sector and in large firms.

Importantly, the gap in the ability to negotiate a flexible working schedule between high-skilled and low-skilled mothers, whose youngest child is in primary school, persist across jobs' characteristics, such as public versus private sector, or firm size. For instance, our data show that in small firms low-educated mothers whose youngest child is in primary school are up to five percentage points more likely to work on Wednesday than highly-educated mothers in the pre-reform period, with the proportions being respectively 64 and 59 percent. Said differently, while there is clearly evidence of sorting to the extent that mothers working in small firms or the public sector are more likely to stay at home on Wednesday, highly educated mothers have always higher chances of doing so than low educated ones.

Importantly, table 2.4 tells us something more. Contrary to what suggested by Bertrand, Kamenica, and Pan (2015) for the United States, in France couples in which the woman is highly educated seem more likely to specialize according to their comparative advantages. In households in which the youngest child is in primary school, wherever the mother is more likely to be the breadwinner in the household - as her level of education is higher than that of her husband - she is more likely to work on Wednesday than in those couples in which the woman has the same or a lower level of education than her partner - saying couples where the woman holds a bachelor's degree and her partner holds a master's degree. Interestingly, in couples where the woman has at most a high school degree, mothers' probability of working on Wednesday does not seem to vary with her role in the household.

Overall, this first part of the empirical analysis clearly suggests that women value flexibility when children demand it. However, it also shows that the possibility of adopting a flexible schedule relates to the interplay of different factors, among which women's bargaining power at work and the career cost of flexibility play an important role.

2.3.2 The impact of the 2013 reform

To further study how the 2013 reform affects mother employment decisions, we adopt a difference-in-difference strategy. We define a woman as being treated if her youngest child is affected by this intervention. Next, as in the descriptive analysis, we choose to compare mothers whose youngest child is between six and eleven, with those whose youngest child is between twelve and fourteen – corresponding to the age-interval of middle school pupils. The graphical analysis of pre-treatment trends in the labor supply measures we have chosen, displayed in figure 2.6,[5] supports this choice, as the employment decisions of the treatment and control group exhibit a comparable evolution.

Even though the evolution of several labor supply measures is similar among mothers with children in kindergarten and those with older children, we decide to exclude the former from

5. This figure shows trends in selective outcomes, notably the probability of working on Wednesday and the number of days worked per week. Figure 2.9 in the appendix reports the evolution of the other outcomes we study, that is labor force participation and hours worked per week.

the treatment group for the same reasons explained in the previous paragraph. Their baseline characteristics are indeed too different from those of our control group to assume that absent the reform they would respond to the same type of incentives.

Next, in the main regressions we consider both mothers living in municipalities that implement the reform in 2013 and those living in municipalities that postpone its introduction to 2014.[6]

On the basis of these choices, we run the following specification on mothers aged 18 to 55, interviewed between 2009 and 2015, and whose youngest child is between six and fourteen years old:

$$\begin{aligned} Y_{icmt} &= \gamma_m + \delta_t + \pi * X_{icmt} + \alpha * Yst\_Child\_btw\_6\_11_c \\ &+ \beta * Yst\_Child\_btw\_6\_11 * Post\_Sep\_2013_{ct} + u_{icmt} \end{aligned} \tag{2.1}$$

Here i stand for each interviewed woman, c for the age of the youngest child, m for the municipality of residence and t for the wave in which the woman is interviewed. Y_{icmt} represents the outcome considered. These comprise labor force participation, the choice of working part-time or full-time, hours worked per week, days worked per week, and the decision to work on each specific day of the week.[7] The vector X_{icmt} includes all the individual

6. In principle, to identify the effect of the reform, we could exploit the variation over time and across municipalities in the implementation of the reform. In this way, we would compare mothers whose youngest child is in the affected age-range and live in municipalities that introduced the reform in 2013, with the same group of mothers who live in municipalities that postponed the implementation of the reform to 2014. However, we prefer not to adopt this strategy for two reasons. First, the comparison of the pre-trends in labor supply measures for these two groups of mothers – figure 2.10 – reveals that their dynamics seem to diverge before the implementation of the reform. Therefore, it is hard to claim that, absent the reform, the evolution of labor supply would have been the same across these groups. This concern is also confirmed by a formal test on the parallel trend assumption. In a regression model that compares the evolution of labor supply for these two groups of mothers, we include a battery of dummies taking value one for mothers "treated in 2013", in the three waves before September 2013. A test on their joint significance leads us to reject the null for all the outcomes considered. Secondly, by adopting this strategy we would be able to study only the impact of the reform in his first year of implementation, given that from 2014 onward, all municipalities adopt the new schedule. As it might take some time for its effect to manifest, we think that considering only its short-run impact would considerably limit the objectives of our analysis.

7. To measure these outcomes we construct, respectively: a dummy equal to one if the woman belongs to the active population; a dummy equal to one if the woman works part-time, a continuous variable indicating the number of hours worked on average per week, one measuring the number of days worked per week, and a

variables that can affect women's labor supply decisions. These include age, age squared, level of education, number of children, marital status, and presence of other members in the household; α measures the impact of having the youngest child in primary school age. Post_Sep_2013$_{ct}$ is a dummy equal to one starting from September 2013 for those mothers living in municipalities that introduced the reform in 2013, and from September 2014 for mothers living in municipalities that postponed the implementation to 2014. The main coefficient of interest is β that should capture any deviation from a parallel evolution in the outcome of interest between the treatment and the control group, due to the implementation of the new schedule in primary school. In all regressions we also include municipality of residence, γ_m, and wave of interview fixed effects, δ_t. Finally, in all specifications, standard errors are clustered at the municipality level to account for any correlation of the outcomes for women residing in the same municipality.

Tables 2.7 and 2.8 show the main results. As expected, the 2013 reform does not trigger any response at the extensive margin – table 2.7, column 1. Point estimates in table 2.7, column 2 and 3, suggest that, after the implementation of the reform, treated mothers are less likely to work part-time and tend to work more hours. However, these coefficients are not precisely estimated. In contrast, column 4 indicates that the reform has a significant impact on the number of days worked per week, as treated mothers work on average one fourth of a day more, from a pre-reform level of slightly more than four days and half. In table 2.8, we can see that, accordingly, their probability of working on Wednesday increases by roughly three percentage points, significant at one percent significance-level. Reassuringly, with the exception of Saturday, their likelihood of working on each other day of the week does not change with respect to the pre-reform period, in comparison with control mothers.[8] The fact that we find a negative effect of the reform on the probability of working on Saturday simply suggests that some of the few mothers who, prior to the reform, were working on

dummy equal to one if the woman works on a specific day of the week.

8. It has to be noticed that, in the FLFS, the decision to work on each days of the week is measured only from 2013 onward. However, the fact that the reform also has a significant impact on the number of days worked per week shows that the effect on the probability of working on Wednesday does not merely depend on the span of time over which this outcome is observed.

Saturday - probably to compensate for their absence on Wednesday - take advantage of the reorganization of the school schedule to allocate their Saturday hours to Wednesday.

2.3.3 Robustness checks

For the difference-in-difference strategy to accurately identify the effect of interest, we need to assume that, in the absence of the reform, the evolution of mothers' labor supply would have been the same for the treated and control group (parallel-trend assumption). In other words, we should check that our estimates are not capturing the effect of other factors that affect treated and control mothers in a different way at the same time as the reform takes place.

To support this assumption, besides the visual inspection of the pre-treatment trends in labor supply measures, we can conduct a series of robustness checks. First of all, we can analyze the dynamic impact of the reform. Figures 2.7 and 2.8 provide a graphical analysis of the treatment dynamics. In particular, they show the coefficients of the leads and lags in the treatment, estimated with this regression:

$$\begin{aligned} Y_{icmt} &= \gamma_m + \delta_t + \pi * X_{icmt} + \alpha * Yst\_Child\_btw\_6\_11_c \\ &+ \sum_{k \geq t-j} \beta_k * Yst\_Child\_btw\_6\_11 * Leads\_Lags_{ck} + u_{icmt} \end{aligned} \tag{2.2}$$

where j takes value 4 when the outcome is the number of days worked per week, and value 2 when it represents the decision to work on Wednesday. The first thing to be noticed is that the coefficients on the leads are jointly insignificant, in both regressions, with a corresponding p-value of 0.843 when the outcome is the number of days worked per week and 0.274 when this is the decision to work on Wednesday. This strongly suggests that we are truly identify the impact of the reform, rather than picking the effect of other elements that were affecting the treatment and control groups differently already before the introduction of this intervention. In addition, this analysis rules out significant anticipation effects. Importantly, these regressions allow us to implicitly perform a placebo test. In the first year of implementation of the reform, this should not have any impact on mothers living in municipalities that postponed its introduction in 2014. As these represent 80 percent of our sample, when we look at the impact of the reform on both groups of municipalities at the same time, this is exactly what we observe. None of the coefficients capturing the impact from September 2013 to August 2014 turns out significant in the two regressions, while, in a previous version of this paper, we showed that the reform did have an impact on mothers living in municipalities implementing the reform in 2013. [9]

Next, in tables 2.9, 2.10, 2.11 and 2.12, we change the size of the treatment and control group to show that our results are not sensitive to the definition we adopted. This robustness check can be performed both on the outcome measuring the number of days worked per week, as on the one concerning decision to work on Wednesday. In tables 2.9 and 2.11, we can see that restricting the treatment group does not alter substantially the magnitude of the effect, and the impact of the reform remains significant in almost all columns, for both outcomes. Tables 2.10 and 2.12 further show that, for both outcomes, restricting or expanding the control group does not affect either the magnitude or the significance of the reform coefficients.

In addition, as the variable measuring the number of days worked per week is available for the entire sample period, in table 2.13 we can check the impact of a series of placebo reforms on this outcome. In the first column of table 2.13 we report the baseline result. In the second one, we exclude from the sample the post-treatment period and we pretend that the reform was implemented at the beginning of 2013. In the third column, we consider the period spanning between 2009 and 2011 and look at the effect of a placebo reform introduced in January 2011. Finally, in the last column, we restrict the sample to comprise only women interviewed between 2009 and 2010 and we pretend that the reform took place in January 2011. Reassuringly, none of these placebo reforms appears to have a significant effect, suggesting that in our main regression we are not simply capturing the impact of factors that systematically affect treated and control mothers differently.

9. These results are available upon request.

Finally, in table 2.14 we show that the impact of the reform on both outcomes is not driven either by mothers living in municipalities that introduce the reform in 2013 or by those living in muncipalities that postpone the implemention to 2014. The effect is comparable across both groups of municipalities.

Overall, these tests seem to strongly support the validity of our identification strategy. [10]

2.4 Mechanisms behind the main results

2.4.1 Cost and demand of flexibility

The main peculiarity of the 2013 intervention is that, by making children's school schedule more regular, it actually decreases the value of flexibility for their mothers. This allows us to test for the first time Goldin's theory. According to it, we should expect that mothers who are potentially bearing a higher cost of choosing a flexible working schedule should be especially interested in regularizing it once its value drops. Table 2.15 provides some evidence to support this hypothesis. Although the probability to work on Wednesday seems to increase by the same amount for mothers facing a low cost and and a high cost of flexibility, the response in terms on number of days worked per week is stronger - though not significantly different between the two subgroups - for the latter than the former.

Consistent with this, we find suggestive evidence that the reform has a stronger impact on high-skilled women. As shown in table 2.15, the point estimate for the impact of the reform on the probability of working on Wednesday - and number of days worked per week - are larger for highly-educated women, though not statistically different from the coefficient on low-educated mothers. In turn, among the high-skilled women, those working in managerial positions, who already before the introduction of the reform were slightly more likely to work on Wednesday than the average woman with her youngest child in primary school, seem to respond more to the reform than mothers in other types of occupations. Though the coefficients are not

10. In a separate regression, we further exclude that our results are not driven by the mechanical effect of the reform on teachers. These results are available upon request.

statistically different from the ones on other occupations, the point estimates - especially the ones on the number of days worked per week - suggest that following the introduction of the reform, they are more likely to abandon a flexible schedule than women in other professions. Overall, this seems to suggest that high-skilled women tend to exhibit a higher elasticity to the demand for flexibility than low-skilled ones, which is consistent with them being more likely to face a higher cost of flexibility as well.

Importantly, table 2.15 provides suggestive evidence that high-skilled women, and especially the ones working in managerial positions take advantage of the introduction of the extracurricular activities to increase the overall number of hours worked per week, as well. The probability of working part-time, in particularly, decreases by 2 (highly educated mothers) to 5 percentage points (the managers) among the high-skilled mothers, while it basically does not change for the corresponding reference group - and this difference is statistically significant when comparing mothers in managerial positions versus those working in other intermediary or elementary occupations. In other words, the reform seems to trigger an important substitution effect for this subgroup of women that induces women to abandon any form of flexible schedule. However, note that mothers facing a low cost of flexibility, who were substantially more likely to work part-time in the pre-reform period are also more likely to abandon this form of flexibility in response to the introduction of the reform.

To conclude the heterogeneity analysis, it is important to add that we do not find any clear evidence of a differential effect by mother's age, number of children, firm size, or type of sector, being this private or public. However, we do find that women in temporary contracts take advantage of this reform to increase their working hours and make their schedule more regular, probably to signal their willingness of working hard to their employer. [11]

2.4.2 Impact on fathers

In principle this reform might affect the employment decisions of both parents. Therefore, to identify all the implications of this intervention, we also analyze fathers' response. As

11. All these results are available upon request.

shown in table 2.16, we find no evidence that men's employment decisions are influenced by a change in their children's school schedule. This result is to be considered together with the fact that, among parents in employment, 76 percent of fathers worked on Wednesday before the introduction of this reform, against 56 percent of mothers. These numbers show that even in a country in which a high proportion of women participate in the labor market, a strict division of roles persists within households with children, and that institutional constraints bind only for women. As a consequence, removing barriers to work for women might play the double role of enhancing the attachment to the labor market, and of contributing to change gender norms.

2.5 Discussion and conclusion

This paper studies women's employment decisions in a context where institutions limit their chances of having a regular working schedule. This setting allows us to bring several insights.

First, we observe that the possibility to adopt a flexible working schedule greatly hinges on the interplay between the cost of flexibility associated to women's occupation and their bargaining power at work.

Secondly, the relaxation of institutional constraints allows us to provide the first estimate of women's elasticity to the value of flexibility. In particular, we bring evidence that mothers take advantage of a fall in the value of flexibility to regularize their working schedule, especially if they work in occupations where the regular presence at work is particularly rewarded, such as mothers employed in managerial positions. Overall, this implies that women's demand for flexibility is clearly related to the presence of children, and to the persistence of traditional gender norms, while it does not depend on an intrinsic taste for it.

Third, this setting allows us to test whether women's own wage elasticity is low in a country characterized by high women's labor force participation. In this respect, we show that, on average, treated mothers do not increase total weekly hours of work in response to the implicit wage subsidy that comes together with the relaxation of institutional constraints. This may confirm that women's wage elasticity might indeed be weaker in countries with high female labor market participation rates, as an increasing number of studies suggest. However, we do not exclude that the wage subsidy implicit in the reform might simply be insufficient to trigger a substitution effect of work for leisure. Moreover, the fact that some municipalities chose to concentrate the extracurricular activities in a few days, rather than spread them along the week, might prevent mothers from taking advantage of them. Finally, at least in the first years of implementation, mothers might perceive the new extracurricular activities to be of low quality, when compared to the alternative after-school-care options. If this were the case, their response might change as their perception or the actual quality of the new service offered improves.

To conclude, two considerations are worth mentioning. First, so far we do not find evidence that the reform affects women's wages. On the one hand, this might depend on the fact that on average we do not observe any increase in total hours of work. On the other hand, any financial reward for a more regular presence at work might take some time to materialize. In the same way, it is possible that a more regular working schedule will eventually affect the career path of mothers, by allowing them to perform more tasks and occupations, and by expanding their chances of receiving on-the-job training and promotions (Landers, Rebitzer, and Taylor 1996). Clearly, we will keep on monitoring these potential long-term effects of the reform. Secondly, so far we are only considering how institutional constraints affect mothers' labor supply. However, the sudden availability of a larger pool of female employees willing to adopt a regular working schedule might also affect their co-workers and firms' decisions regarding the overall organization of the work environment. Upon the release of the appropriate data, it will be certainly important to study all these responses.

Tables and Figures

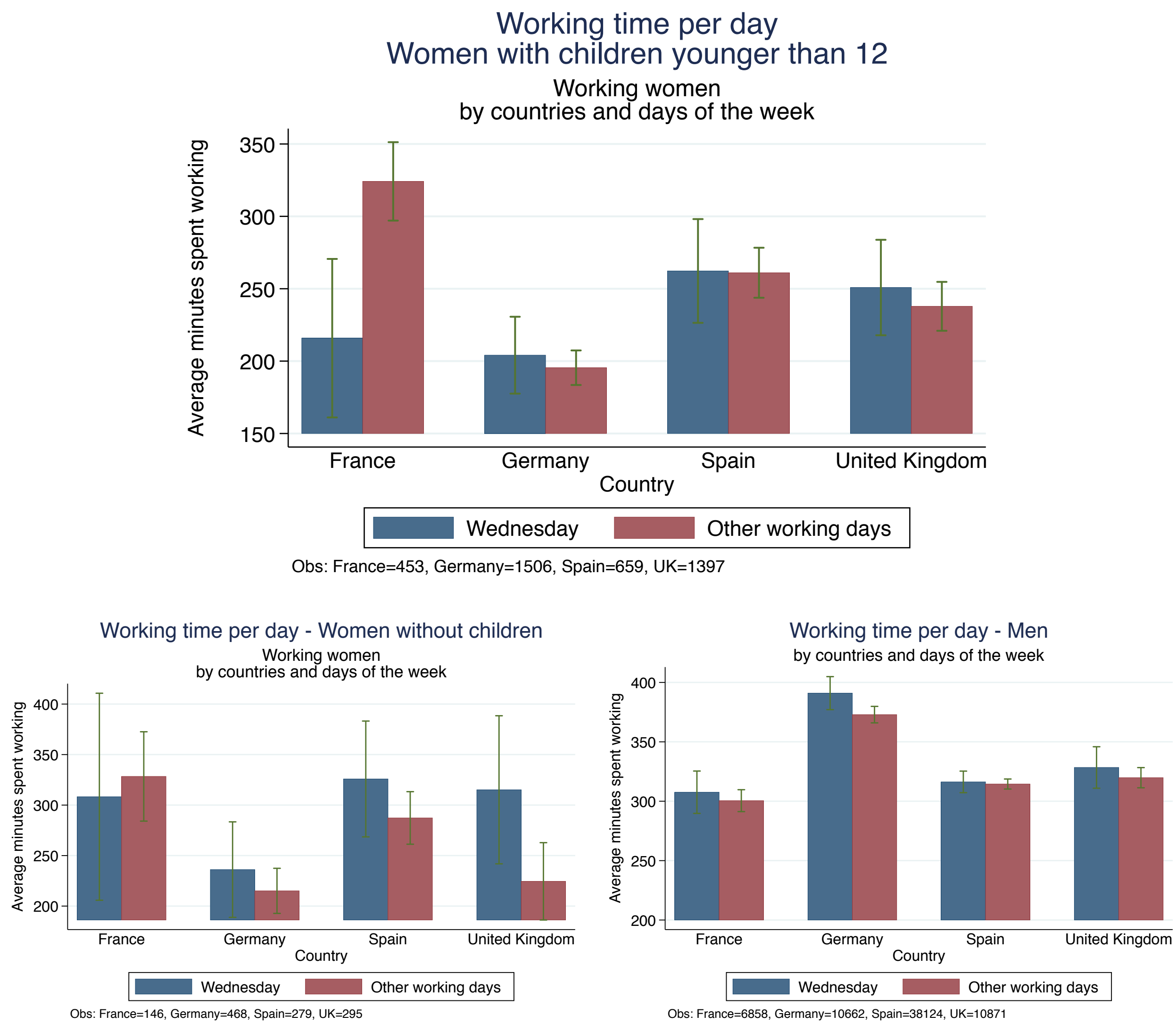

Figure 2.1 – Time Use across European countries

Note: the figures report bar graphs representing the average number of minutes spent at work by, respectively, mothers with children younger than 12 years old, women without children and men, in France, Germany, Spain, and the United Kingdom. Working time includes paid work, paid work at home, second job, and travel to/from work. To highlight the peculiarity of the French case, we show separately the working time declared for Wednesday from that reported for the other days of the week. The graph is constructed using the 1991-2010 averages of the Multinational Time Use Survey. Finally, we report 95 percent-confidence intervals obtained from the estimation of a regression of the outcome of interest on the treated category, with standard errors clustered at the country level.

Source: Multinomial Time Use Study, 1991-2010 averages.

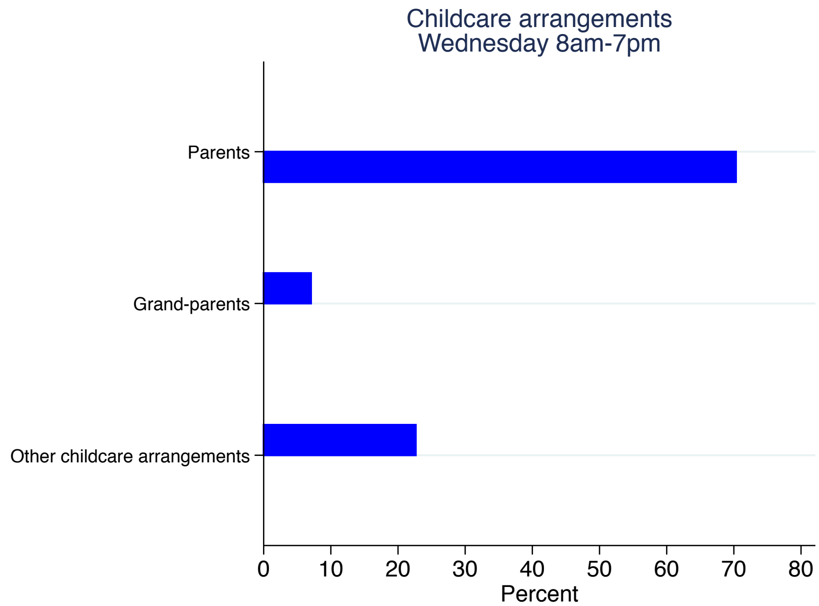

Figure 2.2 – Childcare arrangements for children between 0 and 6 - 2002/2013

Note: the figure shows which childcare arrangements families adopt to take care of their children when they are not in school on Wednesday prior to the introduction of the reform. The sample comprises 8461 parents with children aged 0 to 6 interviewed in 2002, 2007 and 2013 - prior to the introduction of the reform.

Source: CNAF survey on childcare arrangements.

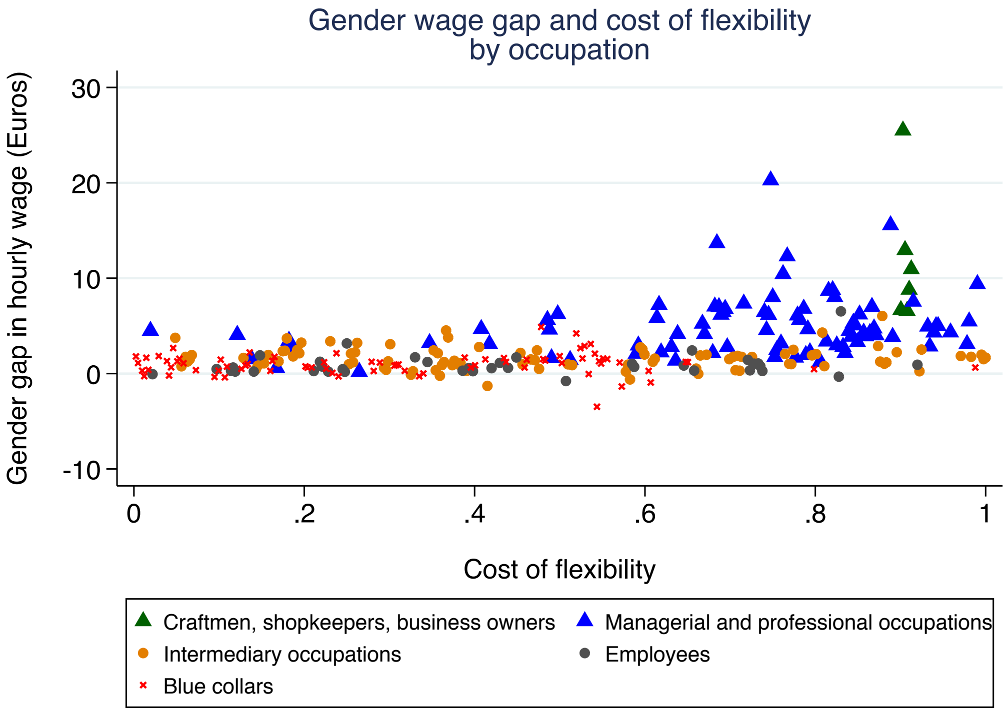

Figure 2.3 – Gender wage gap by occupation in France, 2009-2013

Note: the figure presents the correlation between the within occupation wage difference between men and women and the measure of cost of flexibility borrowed from Goldin (2014). In detail, this index is an average of the standardized scores given to five factors, namely time pressure, frequency of decision making, structured versus unstructured work, contact with others, establishing and maintaining interpersonal relationships. A detailed description of these characteristics and the score assigned to them is given in section 2.4.

Source: French Matched Employer-Employee data set, 2009-2013, and O*NET classification of occupations.

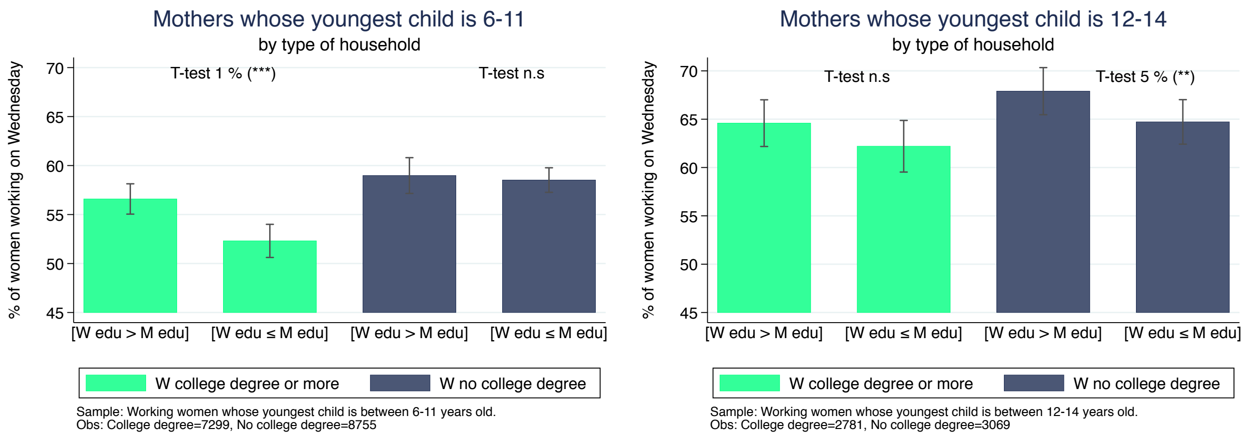

Figure 2.4 – Pre-reform period
Proportion of women working on Wednesday by type of household

Note: the figures report bar graphs representing the percentage of women working on Wednesday among mothers whose youngest child is between six and eleven, on the left, and mothers whose youngest child is between twelve and fourteen on the right. In each graph, we consider separately women with at least a college degree from those without college degree. Within each of these two groups, we compare women whose educational level is strictly higher than their partner's one, labelled "High M Low M", with women whose educational level is at most equal to their partner's one, called "Low W High M". All figures refer to the pre-reform period and are further displayed in tables 2.4 and 2.5. On each bar we report 95 percent-confidence intervals. Finally, for each educational level, we indicate the results of T-tests for the difference in means between the two types of household.

Source: French Labor force Survey 2009-2014.

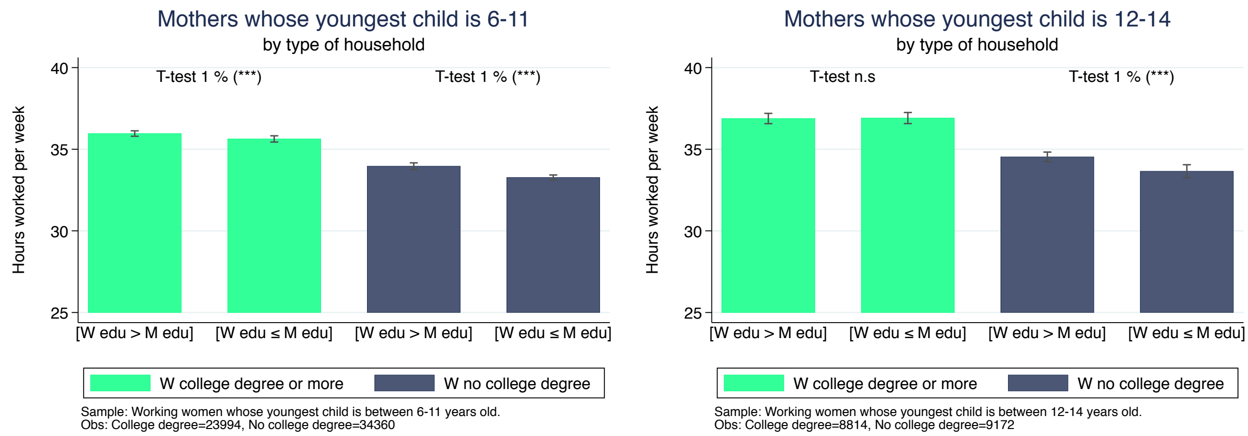

Figure 2.5 – Pre-reform period
Hours worked per week by type of household

Note: the figures report bar graphs representing the average number of hours worked per week among mothers whose youngest child is between six and eleven, on the left, and mothers whose youngest child is between twelve and fourteen on the right. In each graph, we consider separately women with at least a college degree from those without college degree. Within each of these two groups, we compare women whose educational level is strictly higher than their partner's one, labelled "High M Low M", with women whose educational level is at most equal to their partner's one, called "Low W High M". All figures refer to the pre-reform period and are further displayed in tables 2.4 and 2.5. On each bar we report 95 percent-confidence intervals. Finally, for each educational level, we indicate the results of T-tests for the difference in means between the two types of household.

Source: French Labor force Survey 2009-2014.

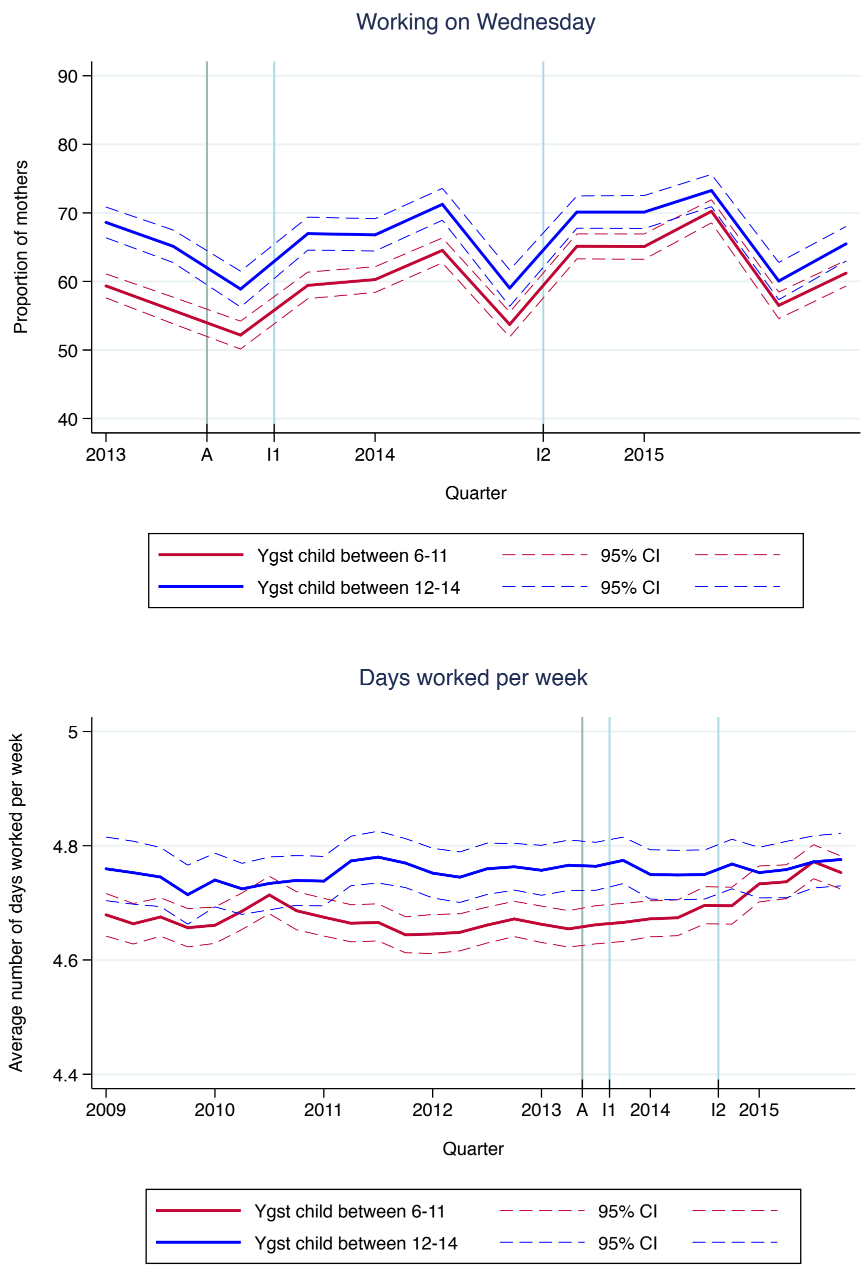

Figure 2.6 – Trends in mothers' labor supply measures by age of the youngest child

Note: the graphs show the evolution of different measures of labor supply over the period 2009-2015. The sample is restricted to mothers whose youngest child is between the age of six and fourteen. We represent in red treated mothers, that is those whose youngest child is between six and eleven years old. Mothers whose youngest child is in middle school age, or control mothers, are represented in blue. The vertical bar named "A" corresponds to April 2013, when municipalities announce in which year they will introduce the reform. The bar called "I" corresponds to September 2013, when 20 percent of municipalities implement the reform. The bar labelled "I2" corresponds to September 2014, when the rest of of municipalities implement the reform.

Source: French Labor Force Survey 2009-2015.

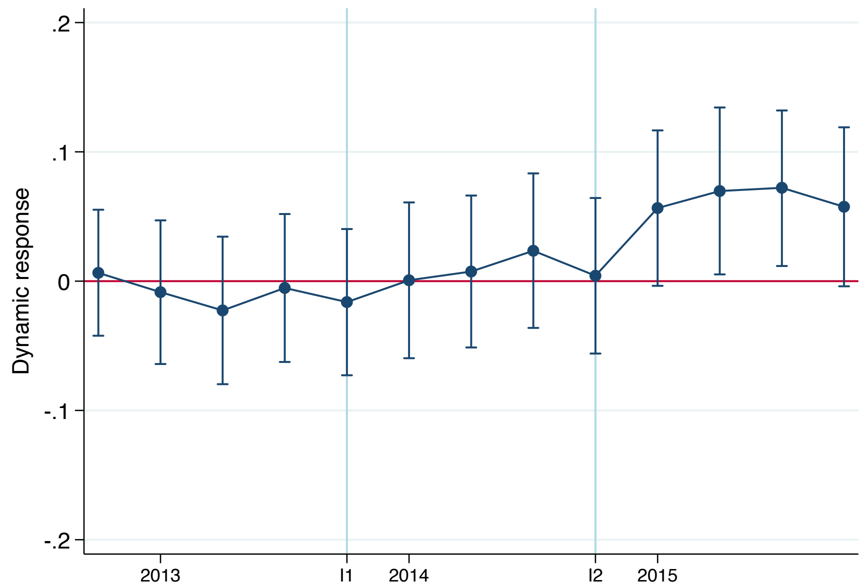

Figure 2.7 – Dynamic response to the reform

Note: in this graph we report the dynamic response to the reform concerning the days worked per week. The coefficients are obtained from the estimation of regression 2.2 on the years 2013-2015. We also report 95-percent confidence intervals. The estimation sample includes all mothers whose youngest child is between six and fourteen. The implementation dates I and I2 correspond to, respectively, the last quarter of 2013 and the last quarter of 2014.

Source: French Labor Force Survey 2009-2015.

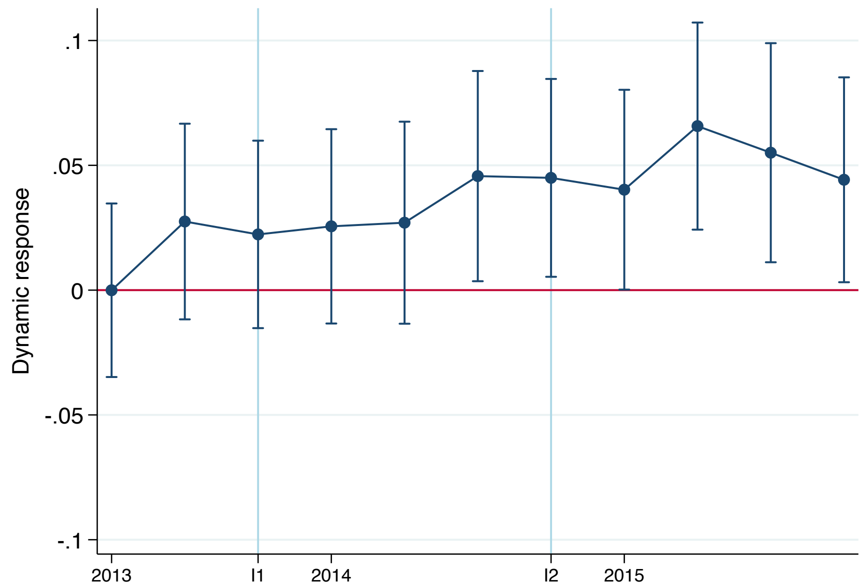

Figure 2.8 – Dynamic response to the reform

Note: in this graph we report the dynamic response to the reform concerning the decision to work on Wednesday. The coefficients are obtained from the estimation of regression 2.2 on the years 2013-2015. We also report 95-percent confidence intervals. The estimation sample includes all mothers whose youngest child is between six and fourteen. The implementation dates I and I2 correspond to, respectively, the last quarter of 2013 and the last quarter of 2014.

Source: French Labor Force Survey 2009-2015.

Table 2.1 – Descriptive statistics of mothers' characteristics by age of the youngest child

	Youngest child aged between				
	0-1	2-5	6-11	12-14	15-18
Age	31.21	34.68	40.56	44.71	46.92
	(5.26)	(5.47)	(5.26)	(4.58)	(4.21)
Married	0.92	0.87	0.81	0.79	0.79
	(0.27)	(0.33)	(0.39)	(0.40)	(0.41)
Immigrant	0.16	0.15	0.12	0.11	0.11
	(0.37)	(0.35)	(0.32)	(0.31)	(0.31)
College degree or more	0.43	0.40	0.35	0.29	0.26
	(0.49)	(0.49)	(0.48)	(0.45)	(0.44)
No college degree	0.57	0.59	0.65	0.70	0.73
	(0.49)	(0.49)	(0.48)	(0.46)	(0.44)
Number of children	1.93	2.02	1.95	1.52	1.11
	(1.02)	(0.93)	(0.79)	(0.59)	(0.32)
Labor Force participation	0.63	0.79	0.86	0.87	0.85
	(0.48)	(0.41)	(0.35)	(0.34)	(0.35)
Hours worked per week	34.09	33.87	34.38	34.88	35.09
	(9.57)	(10.21)	(10.89)	(11.33)	(11.42)
Part-time work	0.36	0.37	0.36	0.34	0.31
	(0.48)	(0.48)	(0.48)	(0.47)	(0.46)
Worked days	4.57	4.59	4.67	4.75	4.77
	(0.91)	(0.91)	(0.90)	(0.89)	(0.90)
Work on Wednesday	0.49	0.55	0.57	0.65	0.68
	(0.50)	(0.50)	(0.49)	(0.48)	(0.47)
Work on Thursday	0.60	0.71	0.74	0.75	0.74
	(0.49)	(0.45)	(0.44)	(0.43)	(0.44)
N	53,326	82,354	92,437	42,342	33,963

Source: French Labor Force Survey 2009-2015.
Note: the table presents summary statistics for mothers' characteristics, computed for each age-interval of their youngest child. The studied sample comprises all French mothers aged between 18 and 55 and interviewed in the FLFS before the implementation of the reform.

Table 2.2 – Descriptive statistics - Youngest child between 6-11

	No college degree	*N*	College degree or more	*N*	P-value T-test
Days worked per week	4.72	42,936	4.57	28,784	0.00
Hours worked per week	33.34	42,936	35.95	28,784	0.00
Work on Wednesday	58.83	11,011	55.29	8,646	0.00
Part-time	38.49	42,936	31.38	28,784	0.00
	Non managerial occupations	*N*	Managerial occupations	*N*	P-value T-test
Days worked per week	4.66	61,787	4.65	9,933	0.24
Hours worked per week	33.76	61,787	38.29	9,933	0.00
Work on Wednesday	57.29	16,898	57.15	2,759	0.89
Part-time	37.05	61,787	26.87	9,933	0.00
	Low cost of flexibility	*N*	High cost of flexibility	*N*	P-value T-test
Days worked per week	4.70	9,150	4.62	8,337	0.00
Hours worked per week	33.78	9,150	35.67	8,337	0.00
Work on Wednesday	60.30	9,150	54.07	8,337	0.00
Part-time	41.22	9,150	28.84	8,337	0.00
	Firm size ≤ 20	*N*	Firm size >20	*N*	P-value T-test
Days worked per week	4.58	19,447	4.69	39,778	0.00
Hours worked per week	33.22	19,447	35.20	39,778	0.00
Work on Wednesday	54.09	8,289	59.53	9,427	0.00
Part-time	37.21	19,447	32.33	39,778	0.00
	Public sector	*N*	Private sector	*N*	P-value T-test
Days worked per week	4.49	19,642	4.67	45,986	0.00
Hours worked per week	34.38	19,642	33.38	45,986	0.00
Work on Wednesday	48.86	5,366	59.59	12,551	0.00
Part-time	35.00	19,642	37.57	45,986	0.00

Source: French Labor Force Survey 2009-2014.

Note: this table reports pre-reform statistics regarding several measures of labor supply for mothers whose youngest child is between six and eleven. In the last column of the table, for each outcome considered, we report the p-value of the T-tests for the difference in means between the two groups.

Table 2.3 – Descriptive statistics - Youngest child between 12-14

	No college degree	*N*	College degree or more	*N*	P-value T-test
Days worked per week	4.79	22,777	4.67	11,051	0.00
Hours worked per week	33.82	22,777	37.09	11,051	0.06
Work on Wednesday	65.68	6,116	63.81	3,443	0.00
Part-time	37.17	22,777	27.00	11,051	0.00
	Non managerial occupations	*N*	Managerial occupations	*N*	P-value T-test
Days worked per week	4.74	29,334	4.77	4,494	0.03
Hours worked per week	34.16	29,334	39.64	4,494	0.00
Work on Wednesday	64.70	8,288	66.95	1,271	0.11
Part-time	35.67	29,334	21.94	4,494	0.00
	Low cost of flexibility	*N*	High cost of flexibility	*N*	P-value T-test
Days worked per week	4.81	4,680	4.72	3,767	0.00
Hours worked per week	34.45	4,680	36.11	3,767	0.00
Work on Wednesday	66.88	4,680	63.25	3,767	0.00
Part-time	38.18	4,680	27.97	3,767	0.00
	Firm size ≤ 20	*N*	Firm size >20	*N*	P-value T-test
Days worked per week	4.67	9,052	4.77	18,968	0.00
Hours worked per week	33.46	9,052	35.57	18,968	0.00
Work on Wednesday	63.01	3,996	66.37	4,580	0.00
Part-time	36.41	9,052	30.31	18,968	0.00
	Public sector	*N*	Private sector	*N*	P-value T-test
Days worked per week	4.63	9,323	4.72	21,636	0.00
Hours worked per week	34.97	9,323	33.60	21,636	0.00
Work on Wednesday	56.16	2,692	67.80	6,106	0.00
Part-time	30.50	9,323	37.04	21,636	0.00

Source: French Labor Force Survey 2009-2014.
Note: this table reports pre-reform statistics regarding several measures of labor supply for mothers whose youngest child is between twelve and fourteen. In the last column of the table, for each outcome considered, we report the p-value of the T-tests for the difference in means between the two groups.

Table 2.4 – Descriptive statistics by type of household - Youngest child between 6-11

	Low W High M	*N*	High W Low M	*N*	P-value T-test
College degree or more					
Days worked per week	4.49	11,193	4.62	12,756	0.00
Hours worked per week	35.63	11,214	35.96	12,780	0.01
Work on Wednesday	52.31	3,355	56.59	3,944	0.00
Part-time	36.66	11,247	30.26	12,817	0.00
No college degree					
Days worked per week	4.70	23,550	4.74	10,473	0.00
Hours worked per week	33.27	23,828	33.96	10,532	0.00
Work on Wednesday	58.52	5,959	58.98	2,796	0.68
Part-time	40.58	24,095	36.58	10,618	0.00
High cost of flexibility					
Days worked per week	4.62	3,685	4.60	3,318	0.24
Hours worked per week	35.72	3,685	35.71	3,318	0.97
Work on Wednesday	51.97	3,685	55.30	3,318	0.01
Part-time	31.11	3,700	27.60	3,330	0.00
Low cost of flexibility					
Days worked per week	4.68	4,550	4.73	2,781	0.04
Hours worked per week	33.46	4,551	35.14	2,781	0.00
Work on Wednesday	60.03	4,551	59.94	2,781	0.94
Part-time	44.59	4,609	37.54	2,800	0.00
Managerial occupations					
Days worked per week	4.57	5,098	4.74	3,161	0.00
Hours worked per week	37.24	5,100	39.25	3,163	0.00
Work on Wednesday	54.72	1,387	60.33	978	0.01
Part-time	33.89	5,114	21.25	3,167	0.00
Other occupations					
Days worked per week	4.65	29,656	4.66	20,075	0.13
Hours worked per week	33.47	29,953	34.40	20,156	0.00
Work on Wednesday	56.56	7,928	57.12	5,762	0.52
Part-time	40.26	30,243	34.99	20,281	0.00

Source: French Labor Force Survey 2009-2014.

Note: this table reports pre-reform statistics regarding several measures of labor supply for mothers whose youngest child is between six and eleven. For each category considered, being this education level, cost of flexibility at work or type of occupation held, we consider separately women whose educational level is strictly higher than their partner's one, labelled "High M Low M", and women whose educational level is at most equal to their partner's one, called "Low W High M". In the last column of the table, for each outcome considered, we report the p-value of the T-tests for the difference in means between the two types of household.

Table 2.5 – Descriptive statistics by type of household - Youngest child between 12-14

	Low W High M	*N*	High W Low M	*N*	P-value T-test
College degree or more					
Days worked per week	4.60	4,198	4.69	4,608	0.00
Hours worked per week	36.91	4,202	36.88	4,612	0.92
Work on Wednesday	62.20	1,270	64.59	1,511	0.19
Part-time	33.47	4,213	27.13	4,641	0.00
No college degree					
Days worked per week	4.78	12,308	4.80	5,352	0.23
Hours worked per week	33.65	12,404	34.53	5,386	0.00
Work on Wednesday	64.72	3,336	67.90	1,411	0.04
Part-time	40.04	12,509	35.79	5,423	0.00
High cost of flexibility					
Days worked per week	4.68	1,653	4.75	1,329	0.04
Hours worked per week	35.95	1,653	36.45	1,329	0.14
Work on Wednesday	62.43	1,653	63.43	1,280	0.57
Part-time	33.23	1,658	25.39	1,335	0.00
Low cost of flexibility					
Days worked per week	4.78	2,438	4.86	1,268	0.02
Hours worked per week	33.94	2,438	35.49	1,268	0.00
Work on Wednesday	65.42	2,438	68.77	1,268	0.04
Part-time	40.80	2,461	37.73	1,280	0.07
Managerial occupations					
Days worked per week	4.73	2,185	4.78	1,345	0.07
Hours worked per week	39.41	2,186	39.58	1,345	0.64
Work on Wednesday	65.92	584	66.08	454	0.96
Part-time	26.99	2,190	20.46	1,345	0.07
Other occupations					
Days worked per week	4.74	14,327	4.74	8,616	0.53
Hours worked per week	33.73	14,426	35.00	8,654	0.00
Work on Wednesday	63.76	4,023	66.21	2,468	0.05
Part-time	40.11	14,539	33.57	8,717	0.00

Source: French Labor Force Survey 2009-2014.

Note: this table reports pre-reform statistics regarding several measures of labor supply for mothers whose youngest child is between twelve and fourteen. For each category considered, being this education level, cost of flexibility at work or type of occupation held, we consider separately women whose educational level is strictly higher than their partner's one, labelled "High M Low M", and women whose educational level is at most equal to their partner's one, called "Low W High M". In the last column of the table, for each outcome considered, we report the p-value of the T-tests for the difference in means between the two types of household.

Table 2.6 – Childcare options - monthly cost

		Cost of a nursery		Cost of a FT baby sitter	
		Gross wage of both parents (in euros)			
		2800 (2*minimum wage)	5600	2800 (2*minimum wage)	5600
Number of children	1	295	342	747	747
	2	246	428	747	747
	3	197	513	747	747

Source: *Crèches de France*, *Casamape*.

Note: the table provides an estimate of monthly childcare costs by type of service, number of children, and household income, as at 2013.

Table 2.7 – Labor supply response to the reform - Youngest child between 6 and 11

	(1) Labor force participation	(2) Part-time	(3) Hours worked per week	(4) Days worked per week
Treatment	0.003	-0.015	0.190	0.048**
	(0.006)	(0.010)	(0.228)	(0.019)
Ygst child btw 6-11	-0.015***	0.035***	-0.794***	-0.093***
	(0.004)	(0.007)	(0.156)	(0.012)
Observations	168821	132684	132684	132684
Adjusted R^2	0.148	0.131	0.139	0.123
F	34.91	19.65	22.87	10.15
Pre-treatment means	85.75	35.64	34.39	4.616

Source: French Labor Force Survey 2009-2015.

Note: this table shows the coefficients capturing the effect of the reform, obtained from the estimation of regression 2.1. The different columns refer to the outcome considered, being respectively labor force participation, column 1, the decision to work part-time, column 2, number of hours worked per week, column 3, and number of days worked per week, column 4. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all mothers whose youngest child is between six and fourteen years old. In column 2, 3, 4, and 5 we only consider mothers who are employed at the time of the interview.

*** p<0.01, ** p<0.05, * p<0.1.

Table 2.8 – Labor supply response to the reform - Days of the week - Youngest child between 6 and 11

	(1) Monday	(2) Tuesday	(3) Wednesday	(4) Thursday	(5) Friday	(6) Saturday	(7) Sunday
Treatment	-0.005	-0.001	0.027***	-0.003	-0.001	-0.017**	-0.003
	(0.009)	(0.007)	(0.004)	(0.008)	(0.008)	(0.008)	(0.005)
Ygst child btw 6-11	-0.000	-0.007	-0.067***	-0.008	-0.006	-0.004	-0.002
	(0.008)	(0.007)	(0.000)	(0.007)	(0.007)	(0.007)	(0.005)
Observations	56382	56382	56382	56382	56382	56382	56382
Adjusted R^2	0.053	0.060	0.071	0.058	0.056	0.100	0.082
F	20.97	39.53	25.96	24.59	22.46	16.75	4.41
Pre-treatment means	69.97	76.91	57.27	74.07	74.18	20.67	7.61

Source: French Labor Force Survey 2013-2015.

Note: this table shows the coefficients capturing the effect of the reform, obtained from the estimation of regression 2.1. The different columns refer to the outcome considered, corresponding to probability of working each day of the week. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all mothers whose youngest child is between six and fourteen years old who are employed at the time of the interview. As the French Labor Force Survey starts including questions on the allocation of working time along the week only in 2013, the sample considered here only comprises women interviewed between 2013 and 2015.

*** p<0.01, ** p<0.05, * p<0.1.

Table 2.9 – Decision to work on Wednesday - Changing the definition of the treated groups

	6-14	7-14	8-14	9-14	10-14
Treated group 6-11	0.027***				
	(0.009)				
Treated group 7-11		0.025***			
		(0.010)			
Treated group 8-11			0.023**		
			(0.010)		
Treated group 9-11				0.020*	
				(0.011)	
Treated group 10-11					0.026*
					(0.011)
Observations	56382	49753	43399	37085	30831
Adjusted R^2	0.071	0.075	0.082	0.089	0.095
F	25.96	22.65	19.46	17.32	13.49

Source: French Labor Force Survey 2009-2015.
Note: this table shows the coefficients capturing the effect of the reform on the probability of working on Wednesday. They are obtained from the estimation of regression 2.1. The first column reports the coefficient of the main specification, where the estimation sample comprises all mothers whose youngest child is between 6 and 14 years old. From column 2 onward, we progressively restrict the control group. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household.
*** p<0.01, ** p<0.05, * p<0.1.

Table 2.10 – Decision to work on Wednesday - Changing the definition of the control groups

	6-13	6-14	6-15	6-16	6-17
Treatment vs 12-13	0.020**				
	(0.010)				
Treatment vs 12-14		0.027***			
		(0.009)			
Treatment vs 12-15			0.030***		
			(0.008)		
Treatment vs 12-16				0.028***	
				(0.008)	
Treatment vs 12-17					0.031***
					(0.008)
Observations	50246	56382	62177	67876	73138
Adjusted R^2	0.073	0.071	0.069	0.066	0.064
F	23.37	25.96	30.02	33.85	37.28

Source: French Labor Force Survey 2009-2015.
Note: this table shows the coefficients capturing the effect of the reform on the decision to work on Wednesday. They are obtained from the estimation of regression 2.1. The first column reports the coefficient of the main specification, where the estimation sample comprises all mothers whose youngest child is between six and fourteen years old. From column 2 onward, we progressively enlarge the control group. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household.
*** p<0.01, ** p<0.05, * p<0.1.

Table 2.11 – Days worked per week - Changing the definition of the treated groups

	6-14	7-14	8-14	9-14	10-14
Treated group 6-11	0.048**				
	(0.019)				
Treated group 7-11		0.056***			
		(0.020)			
Treated group 8-11			0.056***		
			(0.021)		
Treated group 9-11				0.054**	
				(0.023)	
Treated group 10-11					0.041
					(0.027)
Observations	132684	116990	101657	86803	72130
Adjusted R^2	0.123	0.130	0.141	0.154	0.169
F	10.15	9.39	7.94	6.27	4.92

Source: French Labor Force Survey 2009-2015.
Note: this table shows the coefficients capturing the effect of the reform on the number of days worked per week. They are obtained from the estimation of regression 2.1. The first column reports the coefficient of the main specification, where the estimation sample comprises all mothers whose youngest child is between 6 and 14 years old. From column 2 onward, we progressively restrict the treatment group. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household.
*** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.12 – DAYS WORKED PER WEEK - CHANGING THE DEFINITION OF THE CONTROL GROUPS

	6-13	6-14	6-15	6-16	6-17
Treatment vs 12-13	0.042**				
	(0.021)				
Treatment vs 12-14		0.048**			
		(0.019)			
Treatment vs 12-15			0.056***		
			(0.018)		
Treatment vs 12-16				0.055***	
				(0.017)	
Treatment vs 12-17					0.058***
					(0.017)
Observations	118539	132684	146081	158955	167914
Adjusted R^2	0.128	0.123	0.117	0.111	0.107
F	8.82	10.15	10.90	11.98	12.38

Source: French Labor Force Survey 2009-2015.

Note: this table shows the coefficients capturing the effect of the reform on the number of days worked per week. They are obtained from the estimation of regression 2.1. The first column reports the coefficient of the main specification, where the estimation sample comprises all mothers whose youngest child is between six and fourteen years old. From column 2 onward, we progressively enlarge the control group. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household.

*** p<0.01, ** p<0.05, * p<0.1.

Table 2.13 – Days worked per week - Placebo reforms

	Baseline	Placebo Jan 2013	Placebo Jan 2011	Placebo Mars 2010
Treatment	0.047**			
	(0.019)			
Placebo reform		-0.014	0.026	0.033
		(0.025)	(0.021)	(0.028)
Observations	132684	90761	61019	35744
Adjusted R^2	0.123	0.157	0.192	0.219
F	10.15	10.45	10.20	8.59
Sample	2009-2015	2009-Sept 2013	2009-2011	2009-2010

Source: French Labor Force Survey 2009-2015.

Note: this table shows the impact of a series of placebo reforms on the number of days worked per week, for mothers whose youngest child is between six and eleven. The first column reports the impact of the 2013 reform. In the second column, we exclude from the sample the post-treatment period and we pretend that the reform was implemented at the beginning of 2013. In the third column, we consider the period spanning between 2009 and 2011 and look at the effect of a placebo reform introduced in January 2011. Finally, in the last column, we restrict the sample to comprise only women interviewed between 2009 and 2010 and we pretend that the reform took place in January 2011.

*** p<0.01, ** p<0.05, * p<0.1.

Table 2.14 – Impact of the reform by group of municipalities

	Days worked per week			Working on Wednesday		
	(1)	(2)	(3)	(4)	(5)	(6)
	All municipalities	2013 municipalities	2014 municipalities	All municipalities	2013 municipalities	2014 municipalities
Treatment	0.048**	0.072*	0.059**	0.027***	0.042*	0.035***
	(0.019)	(0.038)	(0.026)	(0.009)	(0.022)	(0.012)
Observations	132684	29496	103188	56382	12305	44077
Adjusted R^2	0.123	0.091	0.132	0.071	0.061	0.073
F	10.15	3.04	8.77	25.96	7.05	20.69

Source: French Labor Force Survey 2009-2015.

Note: this table shows the impact of the reform on the number of days worked per week and on the decision to work on Wednesday, for mothers whose youngest child is between six and eleven. Columns (1) and (4) report the baseline results for all municipalities. Columns (2) and (5) display the impact of the reform on mothers living in municipalities that implement it in Septembre 2013. Columns (3) and (6) show the effect of this intervention on mothers living in municipalities that postponed its introduction to September 2014.

*** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.15 – LABOR SUPPLY RESPONSE TO THE REFORM BY SUBGROUP

	Days worked per week		**Working on Wednesday**		**Hours worked per week**		**Part-time**	
	Estimate	Pre-treatment mean	Estimate	Pre-treatment mean	Estimate	Pre-treatment mean	Estimate	Pre-treatment mean
Panel A. Educational level								
No college degree	0.025	4.72	0.021*	0.552	-0.026	33.95	-0.006	0.384
	(0.024)		(0.012)		(0.302)		(0.013)	
College degree or more	0.067**	4.57	0.031**	0.588	0.503	35.95	-0.027*	0.313
	(0.028)		(0.014)		(0.355)		(0.015)	
P-value difference	0.256		0.604		0.258		0.295	
N	132,684		56,382		132,684		132,684	
Panel B. Cost of flexibility								
Low cost of flexibility	0.039	4.70	0.029**	0.602	0.318	33.78	-0.037**	0.412
	(0.031)		(0.013)		(0.407)		(0.017)	
High cost of flexibility	0.055*	4.62	0.029**	0.541	0.006	35.68	0.022	0.284
	(0.030)		(0.014)		(0.361)		(0.016)	
P-value difference	0.716		0.998		0.580		0.018	
N	49,927		49,927		49,927		49,927	
Panel C. Type of occupations								
Non managerial occupations	0.0375*	4.66	0.024**	0.572	0.140	33.76	-0.009	0.370
	(0.021)		(0.009)		(0.241)		(0.010)	
Managerial occupations	0.108***	4.65	0.036*	0.571	0.790	38.29	-0.050***	0.268
	(0.037)		(0.019)		(0.481)		(0.019)	
P-value difference	0.07		0.580		0.199		0.044	
N	132,684		56,382		132,684		132,684	

Source: French Labor Force Survey 2009-2015.

Note: the table reports the impact of the reform on labor supply decisions of different subgroups. To conduct this analysis, we choose to estimate a regression on the entire sample in which all regressors are interacted with the subgroups considered, except for municipality fixed effects. Otherwise, all regressions include the standard covariates, namely age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. We also checked that the effect of the treatment was statistically different across the subgroups considered. For each subgroup, we present the coefficient of the treatment interacted with the subgroup considered, as well was the P-value of difference of the impact of the treatment across the two subgroups. Finally, we provide the pre-treatment mean of each outcome for the each subgroup considered in each panel. The analysis by cost of flexibility can only be conducted from 2013 onwards.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 2.16 – Fathers' labor supply response to the reform - Youngest child between 6 and 11

	(1) Labor force participation	(2) Part-time	(3) Hours worked per week per week	(4) Days worked per week	(5) Work on Wednesday
Treatment	-0.009	0.000	-0.025	-0.001	0.003
	(0.004)	(0.006)	(0.242)	(0.014)	(0.007)
Ygst child btw 6-11	-0.003	0.007***	-0.499***	-0.013	-0.020*
	(0.002)	(0.002)	(0.161)	(0.010)	(0.006)
Observations	134000	121771	121771	121771	51810
Adjusted R^2	0.082	0.161	0.097	0.131	0.056
F	8.06	4.23	15.04	2.73	27.81
Pre-treatment means	95.81	3.92	42.14	5.06	77.67

Source: French Labor Force Survey 2009-2015.

Note: this table shows the coefficients capturing the effect of the reform, obtained from the estimation of regression 2.1 on fathers. The different columns refer to the outcome considered, being, respectively, labor force participation, column 1, the decision to work part-time, column 2, number of hours worked per week, column 3, number of days worked per week, column 4 and decision to work on Wednesday, column 5. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all fathers whose youngest child is between six and fourteen years old. In column 2, 3, 4, and 5 we consider only fathers who are employed at the time of the interview.

*** p<0.01, ** p<0.05, * p<0.1.

Appendix

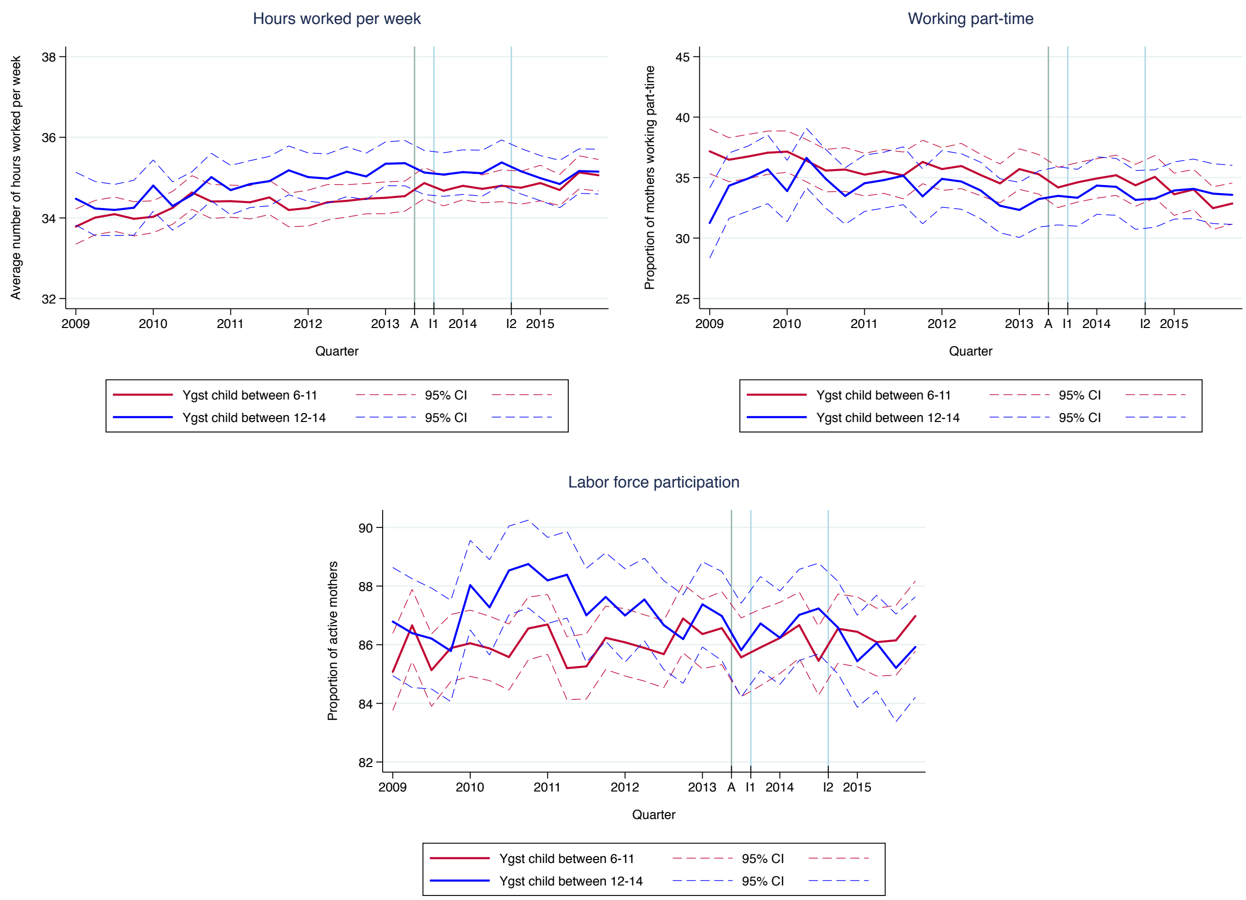

Figure 2.9 – Trends in mothers' labor supply measures by age of the youngest child

Note: the graphs show the evolution of different measures of labor supply over the period 2009-2015. The sample is restricted to mothers whose youngest child is between the age of six and fourteen. We represent in red treated mothers, that is those whose youngest child is between six and eleven years old. Mothers whose youngest child is in middle school age, or control mothers, are represented in blue. The vertical bar labelled "A" corresponds to April 2013, when municipalities announce in which year they will introduce the reform. The bar called "I" corresponds to September 2013, when 20 percent of municipalities implement the reform. The bar named "I2" corresponds to September 2014, when the rest of municipalities implement the reform.

Source: French Labor Force Survey 2009-2015.

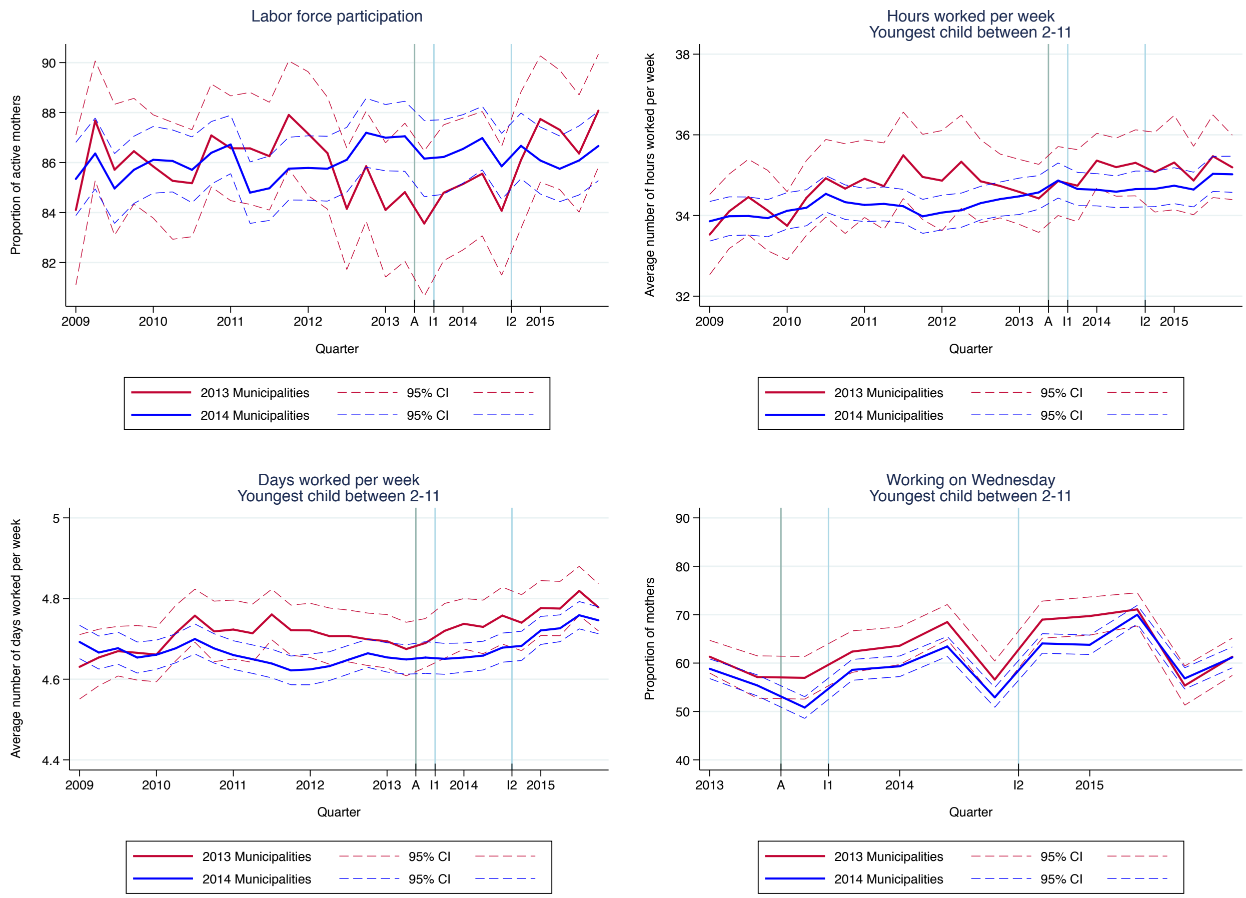

Figure 2.10 – Trends in mothers' labor supply measures across different municipalities

Note: the graphs show the evolution of three labor supply measures between 2009 and 2015, for mothers whose youngest child is between two and eleven years old. We compare mothers living in municipalities that introduce the reform in 2013, in red, to those living in municipalities that postpone the implementation of the reform to 2014, in blue. The labor supply measures we consider are labor force participation, the number of hours worked per week, the number of days worked per week and the decision to work on Wednesday. The vertical bar labelled "A" corresponds to April 2013, when municipalities announce in which year they will introduce the reform. The bar called "I" corresponds to September 2013, when 20 percent of municipalities implement the reform. The bar named "I2" corresponds to September 2014, when the rest of municipalities implement the reform.

Source: French Labor Force Survey 2009-2015.

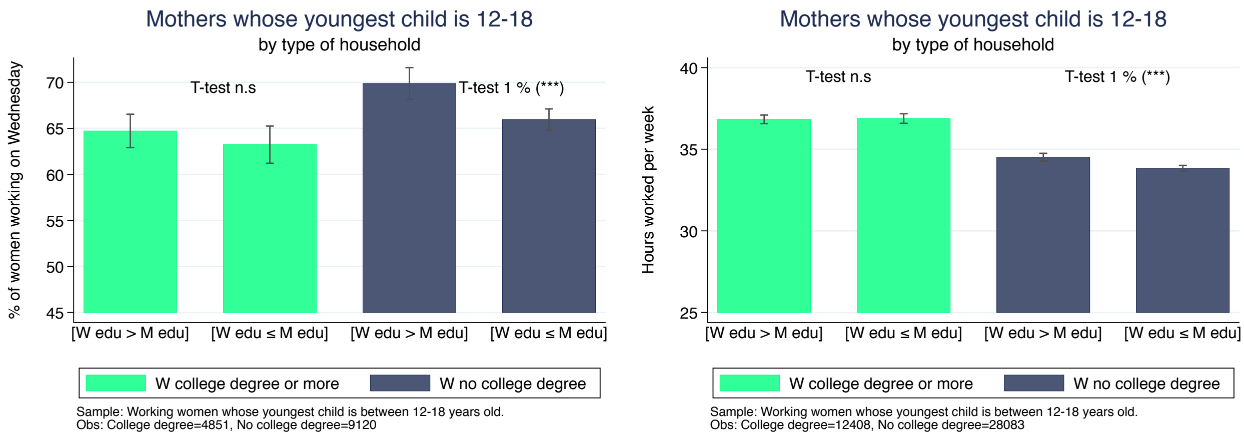

Figure 2.11 – Pre-reform period - Women's employment decisions by type of household - Youngest child between 12-18

Note: the figures report bar graphs representing the percentage of women working on Wednesday and the average number of hours worked per week among mothers whose youngest child is between twelve and eighteen. In each graph, we consider separately women with at least a college degree from those without college degree. Within each of these two groups, we compare women whose educational level is strictly higher than their partner's one, labelled "High M Low M", with women whose educational level is at most equal to their partner's one, called "Low W High M". All figures refer to the pre-reform period and are further displayed in table 2.17. On each bar we report 95 percent-confidence intervals. Finally, for each educational level, we indicate the results of T-tests for the difference in means between the two types of household.

Source: French Labor force Survey 2009-2014.

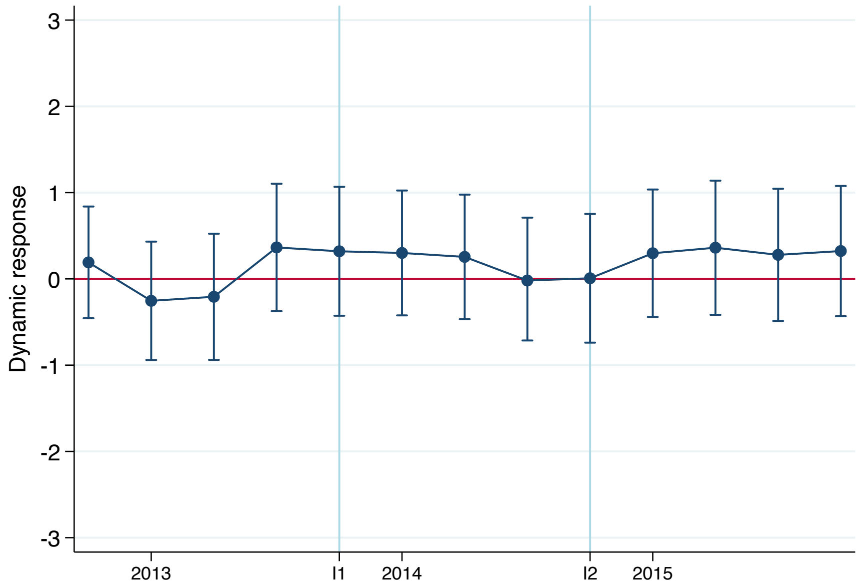

Figure 2.12 – Dynamic response to the reform

Note: in this graph we report the dynamic response to the reform concerning the hours worked per week. The coefficients are obtained from the estimation of regression 2.2 on the years 2013-2015. We also report 95-percent confidence intervals. The estimation sample includes all mothers whose youngest child is between six and fourteen. The implementation dates I and I2 correspond to, respectively, the last quarter of 2013 and the last quarter of 2014.

Source: French Labor Force Survey 2009-2015.

Figure 2.13 – Dynamic response to the reform

Note: in this graph we report the dynamic response to the reform concerning the decision to work part-time. The coefficients are obtained from the estimation of regression 2.2 on the years 2013-2015. We also report 95-percent confidence intervals. The estimation sample includes all mothers whose youngest child is between six and fourteen. The implementation dates I and I2 correspond to, respectively, the last quarter of 2013 and the last quarter of 2014.

Source: French Labor Force Survey 2009-2015.

Table 2.17 – Descriptive statistics by type of household - Youngest child between 12-18

	Low W High M	*N*	High W Low M	*N*	P-value T-test
College degree or more					
Days worked per week	4.58	5,915	4.68	6,475	0.00
Hours worked per week	36.88	5,920	36.83	6,488	0.83
Work on Wednesday	63.23	2,192	64.72	2,659	0.28
Part-time	32.77	5,933	26.21	6,516	0.00
No college degree					
Days worked per week	4.79	19,511	4.81	8,364	0.03
Hours worked per week	33.84	19,666	34.51	8,417	0.00
Work on Wednesday	65.95	6,388	69.88	2,732	0.00
Part-time	38.31	19,840	33.97	8,470	0.00
High cost of flexibility					
Days worked per week	4.69	3,028	4.78	2,439	0.00
Hours worked per week	36.30	3,028	36.91	2,439	0.02
Work on Wednesday	64.89	3,028	64.66	2,439	0.86
Part-time	32.74	3,042	23.60	2,445	0.00
Low cost of flexibility					
Days worked per week	4.76	4,510	4.89	2,337	0.00
Hours worked per week	33.64	4,511	35.70	2,337	0.00
Work on Wednesday	66.13	4,511	70.52	2,337	0.00
Part-time	40.17	4,556	34.44	2,355	0.00
Managerial occupations					
Days worked per week	4.72	3,685	4.78	2,387	0.00
Hours worked per week	39.44	3,687	39.71	2,388	0.34
Work on Wednesday	67.22	1,092	67.55	795	0.88
Part-time	25.70	3,693	19.14	2,393	0.00
Other occupations					
Days worked per week	4.74	26,014	4.76	15,192	0.02
Hours worked per week	33.86	26,172	34.95	15,257	0.00
Work on Wednesday	64.98	7,490	67.30	4,596	0.01
Part-time	38.56	26,388	32.34	15,349	0.00

Source: French Labor Force Survey 2009-2014.

Note: this table reports pre-reform statistics regarding several measures of labor supply for mothers whose youngest child is between twelve and eighteen. For each category considered, being this education level, cost of flexibility at work or type of occupation held, we consider separately women whose educational level is strictly higher than their partner's one, labelled "High M Low M", and women whose educational level is at most equal to their partner's one, called "Low W High M". In the last column of the table, for each outcome considered, we report the p-value of the T-tests for the difference in means between the two types of household.

Table 2.18 – Labor supply response to the reform - Youngest child between 2 and 11

	(1) Labor force participation	(2) Part-time	(3) Hours worked per week	(4) Days worked per week	(5) Working on Wednesday
Treatment	0.005	-0.000	-0.057	0.020	0.0261***
	(0.005)	(0.008)	(0.186)	(0.015)	(0.007)
Youngest child btw 2-11	-0.015***	0.033***	-0.773***	-0.095***	-0.0664***
	(0.004)	(0.006)	(0.145)	(0.011)	(0.008)
Observations	308137	221064	221064	221064	93544
Adjusted R^2	0.195	0.099	0.108	0.094	0.060
F	131.51	34.93	36.35	25.89	50.93

Source: French Labor Force Survey 2009-2015.

Note: this table shows the coefficients capturing the effect of the reform, obtained from the estimation of regression 2.1. The different columns refer to the outcome considered, being, respectively, labor force participation, column 1, the decision to work part-time, column 2, number of hours per week, column 3, number of days worked per week, column 4, and decision to work on Wednesday, column 5. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all mothers whose youngest child is between two and fourteen years old. In column 2, 3, 4, and 5 we only consider mothers who are employed at the time of the interview.

*** p<0.01, ** p<0.05, * p<0.1.

Chapter 3

The impact of female role models on the gender gap in science: Evidence from the "Girls in Science" Initiative [1]

1. This chapter is based on a joint work with Thomas Breda, Julien Grenet and Marion Monnet. I am grateful to the Institut des politiques publiques (IPP) and to the L'Oréal Foundation, in particular to Diane Baras for continuous support. This paper greatly benefited from discussions and helpful comments from Lena Edlund, Ruth Fortmann, Sandra McNally, and Amanda Pallais.

Abstract

This paper reports the results of a large scale randomized experiment showing that a light-touch in-class intervention of external female role models can influence students' attitudes and contribute to a significant change in their choice of field of study. We first document gender differences in attitudes toward science, as well as the prevalence of stereotypical opinions with respect to women in science among high school students. Both factors are important predictors of the decision to enroll in a science track at the end of year 10 and after high school graduation. Using random assignment of students in year 10 and year 12 - two decisive years in terms of tracking choices - to a one-hour intervention, we investigate the causal impact of role models on aspirations, attitudes, and educational investment. External female role models significantly reduce the prevalence of stereotypes associated to jobs in science, both for female and male students. Building on college applications data, we find that the change in opinions toward scientific occupations is reflected in students' applications at the end of the treatment year. Using exhaustive administrative data, we do not find significant effect of the treatment on the choices of year 10-students, but the proportion of female students enrolled in selective science programs after high school graduation increases by about 3 percentage points, which corresponds to a 30 percent-increase with respect to the baseline. The share of female and male students going to selective STEM program increase by respectively 38% and 28% in the treated classes compared to the control classes. These effects are essentially driven by higher achieving students. Using semi-parametric analysis, we investigate how the type of ambassadors is differently relevant for students of different age. We provide suggestive evidence that a treatment emphasizing the returns to scientific education might be more relevant for students in year 10. Finally we investigate heterogeneity with respect to school environment and find that also the best students in year 12 in lower-level high schools respond to the intervention by changing their choice for post-secondary education.

JEL codes: C93, I24, J16

Keywords: role models; gender; science; stereotypes; track choice.

Introduction

Despite important convergence between the economic situation of men and women over the last decades, there is still substantial gender inequality in labor market outcomes in all developed countries. Women now complete more college degrees than men in almost all OECD countries (OECD 2016a), but they remain under-represented in many technical degrees such as Science, Engineering and Mathematics (Turner and Bowen 1999). Evidence from different high-income countries suggests that gender differences in entry into science careers account for a significant part of the gender pay differential among college graduates (Brown and Corcoran 1997, Weinberger 1999, Arcidiacono 2004, Ellison and Swanson 2009, Hastings, Neilson, and Zimmerman 2013, Kinsler and Pavan 2015, Kirkeboen, Leuven, and Mogstad 2016). These different educational choices made by women and men used to be traditionally explained by gender differences in abilities, either innate or acquired. Recently, a number of studies have shown that these differences tend to be small and do not predispose a gender more than the other for any type of studies, including mathematics and science. Moreover, students' test scores and past achievements can only explain a negligible part of the large gender gap in choosing a science major (Eagly 1995, Halpern 2013, Spelke 2005, Hyde 2005).

Many scholars now consider that social norms and gender stereotypes play a key role in explaining gender differences in educational investment. Parents, schools and teachers are often said to convey stereotypes and social norms that influence educational choices, contributing to maintain a strong gender segregation across school majors in the long run. These social pressures and gender stereotypes might not necessarily translate into explicit discrimination (Ceci and Williams 2011, Breda and Ly 2015, Breda and Hillion 2016), but rather seem to be mostly interiorized and thereby influence academic self-perception, behavior in competitive environments (Niederle and Vesterlund 2010, Gneezy, Niederle, and Rustichini 2003), and likelihood to be prone to self-censorship. While the impact of peers and "horizontal exposure" on aspirations gained greater attention in the recent literature (Anelli and Peri 2013, Landaud, Ly, and Maurin 2016) , surprisingly little is known about the impact of exposure to role models on students' attitudes and schooling decisions (Bertrand and Duflo 2017). The recent literature mostly investigated whether diversity in leadership positions can reduce discrimination (Beaman, Chattopadhyay, Duflo, Pande, and Topalova 2009 and Beaman, Duflo, Pande, and Topalova 2012), but few experiments focus on how role models, by reshaping social identity, might affect preferences and educational choices.

Our paper investigates whether female scientists and professionals working in scientific fields can serve as role models to lower the prevalence of the general stereotype associating quantitative science with men. A large body of work has established that female science professors and teachers increase women's enrollment in scientific majors (Canes and Rosen 1995, Rothstein 1995, Neumark and Gardecki 1998, Bettinger and Long 2005, Carrell, Page, and West 2010). These results have been commonly interpreted as the impact of role models. However, these studies cannot disentangle between the pure role model effect and differences in teaching practices. Female and male teachers or professors can adopt teaching styles and behave differently with their students, with, for example, female professors paying more attention to female students. Differences in educational choices might have been attributed to teachers' gender rather than to simple differences in teaching practices.

Our approach might also have interesting policy implications. Indeed, female science teachers and professors are a scarce resource, [2] and a policy that would consist in allocating all of them to female students in single-sex classes would bring up a series of issues and concerns. Instead, it is easier to set up short interventions by external female role models that would punctually intervene in classes. If effective, such interventions, that to our knowledge have not been evaluated through random assignment, can easily be scaled up and would offer a promising avenue to reduce the impact of gender stereotypes at school. [3] They would also

2. In France in 2013, 36.83% of mathematics teachers recruited via the external *Agrégation* exam (*Concours externe d'Agrégation du second degré*), were women, and 51% or the external CAPES (*Certificat d'Aptitude au professorat de l'enseignement du second degré*), see Direction de l'évaluation, de la prospective et de la performance, 2013.

3. A recent paper by Burgess (2016) shows that GCSE performance of pupils improved substantially following Michelle Obama's visit to an English school.

offer theoretical insights as they would prove the effectiveness of role models in changing gender norms, whereas the interpretation of the existing literature on teachers' gender remains unclear.

Recent observational studies and lab experiments started documenting the impact of exposure to role models on attitudes. In a laboratory experiment, Dasgupta and Asgari (2004) manipulate exposure to biographical information about famous female leaders and present evidence from a follow-up survey that when women are in social contexts that exposed them to female leaders, they are less likely to express automatic stereotypical beliefs about their in-group. They conclude that the long-term effect of social environments on automatic gender stereotyping is also affected by the frequency of exposure to women leaders, such as female faculty. O' Brien, Hitti, Shaffer, Van Camp, Henry, and Gilbert (2016) found that girls in the role model choice condition experienced a significant increase in sense of fit in science and also tended to have stronger role model identification. Encouraging girls to actively choose and write about a favorite role model may help to maximize the impact of exposure to role models. In a still ongoing study on academics in economics, Blau, Currie, Croson, and Ginther (2010) use the CSWEP [4] data to investigate the impact of a 2-day mentoring workshop at the American Economic Association conference and provide evidence that this type of program improves women's grant and publications records, which is an important step towards tenure.

A subsequent question is whether interventions emphasizing the difference between stereotypical or non-stereotypical traits associated to a woman working in science can affect students' perceptions. It is possible that role models who counter competing stereotypes such as "women can be good at mathematics" or "be feminine", but not both, are less effective. So far, the recent literature in psychology, mostly relying on small trials, is inconclusive. Betz and Sekaquaptewa (2012) used both "feminine" and gender-neutral role models to investigate this issue. They found that feminine STEM role models actually reduce middle school girls' current mathematics interest, self-rated ability and success expectations relative to gender-neutral STEM role models. Their interpretation is that "feminine" STEM role models' combination of

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femininity and success seemed particularly unattainable to girls who did not identify with STEM subjects. Cheryan, Siy, Vichayapai, Drury, and Kim (2011) draw somehow different conclusions. They investigate whether the gender of role models can have in itself an effect on success beliefs. Using upper-level undergraduates as role models, they find little evidence for that. However, women who interacted with non-stereotypical role models believed they would be more successful in computer science than those who interacted with stereotypical role models. Differences in women's success beliefs were mediated by their perceived dissimilarity from stereotypical role models. When attempting to convey to women that they can be successful in STEM fields, role model gender may be less important than the extent to which role models embody current STEM stereotypes.

As pointed out by Lockwood and Kunda 1997, positive effects of role models might vary according to how minority group members perceive their own ability and how personally relevant and attainable they consider the achievement of the role models. The issue of *relevance* of role models is also addressed by one of the very few field experiments provided by Nguyen (2008), whose paper is related to ours, although in the context of a developing country. [5] This study evaluates three interventions designed to increase perceived returns to education in rural Madagascar, through statistical information, role models, or both. Both programs containing statistical information have positive impact on school attendance, performance on tests, future school enrollment, and total educational attainment. This article finds that role models have small effects on average, but that parents seem to care about the information the role model brings. In particular, role models from an underprivileged background improved average test scores, while role models from privileged background had no impact.

The present paper reports the results of a large scale randomized experiment showing that a simple program of role models can influence students' attitudes and contribute to a significant change in their choice of field of study. The "Girls in science" initiative aims

5. The program evaluated in Dinkelman and Martínez A (2014) designed to provide financial aid information also contains an aspect of motivation and inspiration inherent in the messages provided by the "role models" in a DVD. The authors mention that they cannot separate out the importance of providing information about financial aid from the importance of a role model effect.

at promoting careers in science, especially for young girls. This program is funded by the private foundation of a large French firm and initially started in October 2014. It covers the region of Paris and several other educational districts (*Montpellier*, *Aix-Marseille*, *Caen*, *Dijon*, *Grenoble*, etc.). Before 2015, up to 12,000 students benefitted from the program. The program consists in a one-hour intervention of women working in science (called hereafter "ambassadors") in high-school classes in year 10 (*Seconde*), before irreversible track choices have to be made, and in year 12 with science elective (*Terminale S*), before admission in higher education. The ambassador both talks about her own experience and provides information about science careers in general and the under-representation of women in science. Prior to the beginning of the interventions, all ambassadors received a full-day training session. The training consisted in a workshop on the under-representation of women in science and a workshop to improve oral communication skills. Ambassadors are given a toolbox for their intervention containing a set of slides and two short videos. They were however free to use it or not. In 97 high schools of the greater Parisian region, high school principals were asked to preselect pairs of classes for year 10 and for year 12. We randomized about half of the classes, in which students received the visit of an ambassador. One to six months after the visit, we measured attitudes toward women in science of students from the treated and control groups. The program directly aims at lowering stereotypes with respect to women in science. This is in line with the *role incongruity* theory developed by Eagly and Karau (2002), according to which if the inconsistency between the female gender stereotype and qualities associated with being a scientist diminishes, so will prejudice towards female scientists. Exposure to role models may also increase also self-confidence and effort, and lead to better outcomes for the minority group, here female students in science. This channel might be of particular importance as gender differences in overconfidence and competitiveness explains a large share of the gender gap in earnings expectations (Zafar 2013).

At the end of the treatment year, we find that students in the treatment group have significantly less stereotypical views on careers in science and on the role of women in science. Both male and female students react to the intervention, suggesting that female role models might be relevant for both genders. We also find that treatment increases the salience of the topic of the under-representation of women in scientific occupation, and thereby also increases the prevalence of the opinion according to which women do not like science, or that women's progress in scientific careers is slower. We interpret these results as potentially reflecting how students rationalize information on the under-representation of women in science: if segregation in occupations exists while students learn that women have equal innate abilities in science than men, they might attribute these differences in occupation choices either to discrimination or to differences in preferences. Building on college applications data we find that the change in opinions toward scientific occupations is reflected in students' applications at the end of the treatment year. Using exhaustive administrative data, we show that the proportion of female students enrolled in selective science programs after high school graduation increases by 2.8 percentage points, which corresponds to a 30 percent-increase with respect to the baseline mean. The share of female and male students going to selective STEM program increases by respectively 38% and 28% in the treated classes compared to the control classes. These effects are essentially driven by higher achieving students. Using semi-parametric analysis, we investigate how the type of ambassadors is differently relevant for students of different age. We provide suggestive evidence that a treatment emphasizing the returns to scientific education might be more relevant for students in year 10. Finally, we investigate heterogeneity with respect to school environment, and find that the best students in year 12 in lower-level high schools respond to the intervention by changing their choice for post-secondary education.

The first section presents the institutional context of the experiment, the second section describes the program and the experimental design. In the third section, we present a descriptive analysis documenting the interaction between social norms, the prevalence of stereotypes and the choice of field of study. We then present the measure of the effects of the intervention, and potential mechanisms in section four. The final section concludes and presents directions for future research.

3.1 Institutional context

The French educational system is divided into three stages: elementary education, for children aged 6-11; secondary education - in turn divided into middle school (*collège* from year 6 to year 9) and high school (*lycée* from year 10 to year 12) - that terminates with the *baccalauréat*, normally undertaken at the age of 18. With this diploma pupils could access higher education. The French high school system is organized as follows: in year 9 (*Troisième*), the majority of students choose to go to General Track (*Seconde générale ou technologique*), the others select Vocational Track (CAP, BEP). At the end of year 10 (*Seconde*), those who choose the General track can choose to select Science track (*Première S*), Humanities (*Première L*) or Social sciences (*Première ES*) for the two last years of high school (year 11 and 12). This is an important choice given that the curriculum and the high school examinations are very specific to each track. This track choice will condition the educational opportunities and career prospects after high school. In practice, it is almost impossible to enter an engineering or medical school after non-scientific studies in high school. In year 11, and if they choose the science track, they have to decide on their elective class between mathematics, physics, biology or engineering.

The *diplôme national du brevet* (DNB) exam takes place at the end of year 9, while *baccalauréat* takes place at the end of year 12 (except for exams in French which take place at the end of year 11). For both examinations, students take one exam per subject. Passing the *baccalauréat* is a prerequisite to enter post-secondary education. After high school graduation, students can choose to apply for undergraduate programs at university, for which admission is in theory a right for all students. At university, they enroll in *Licence* for a three year-program. There are 45 different subjects gathered in four groups: 1) Arts, Humanities and languages, 2) Humanities and social sciences, 3) Law, economics and management, 4) Science, technolohy and medical. High school graduates can also choose to apply to selective undergraduate programs in *Classes préparatoires aux grandes écoles* (CPGE). These two-year programs are dedicated to prepare students to take the national entry exams to the most prestigious schools (*Grandes Écoles*). Other vocational training programs offer selective tracks for two years (*Section de technicien supérieur*, STS, or *Institut universitaire de technologie*, IUT). Finally, there is a range of specialized schools (architecture, arts, veterinary, paramedical, journalism, other schools of engineering) to which students can apply immediately after high school graduation.

Admission in CPGE is conditional on students' performance during the last two years of high school. Applications take place in March before the *baccalauréat* examination (except for French). These CPGE programs are either specialized in science, economics and business, or humanities. Within the scientific CPGE programs, students can choose between pure mathematics and physics programs (MPSI), physics and chemistry (PCSI), or biology/geoscience (BCPST). The proportion of female students in each of these programs varies dramatically. Female students represent almost 70% of the cohort of students in biology/geoscience CPGE, 30% in physics and chemistry CPGE, and about 20% in mathematics and physics CPGE. [6] Importantly, in the French context, top higher education is very much STEM-oriented, with the most prestigious schools being scientific, such as *l'Ecole polytechnique* or *l'Ecole Normale Supérieure*.

Most majors are non-selective at university. Medical curriculum in France is non-selective for the first year. During the first year, called PACES (*première année commune aux études de santé*), students prepare to pass a selective national exam. Then, they can access medical, dental, pharmaceutical studies, as well as midwifery schools, depending on their ranking at the exam, and only if they pass the threshold defined by the *numerus clausus*. The first part of the exam takes place in December, three months after the beginning of the academic year. Students who rank in the bottom 15% in December usually change major for the second semester and can apply to non-selective majors in university (biology, economics-business, law), paramedical schools, schools of engineering, two-year colleges, or vocational training. They can also choose to resit the year after. The final exam is very selective: less than 20% of students registered at the beginning of the academic year pass the exam at the end of the

6. See Ministère de l'Enseignement supérieur et de la Recherche

year.

3.2 Program and experimental design

3.2.1 Experimental sample

The experiment took place in the educational districts (*académies*) of Paris, Versailles and Créteil, which includes all suburbs and cities located in the great Parisian region. This area includes two of the largest districts of France, and represents in total over 736,000 students in high schools, or 19% of the French total.[7]

In Spring 2015, the Ministry for Education decided to support an experimental program that would take place in these educational districts. The Ministry designated three representatives (one for each educational district) that would be the corresponding person between high schools and the evaluation team. In June 2015, official letters were sent to high schools' principals to inform them that they would be contacted in September by the team of researchers to offer them to participate in the experiment. From September 2015 to November 2015 about 300 high schools of the three educational districts were invited to take part in the experiment, out of which 97 volunteered. Their location is presented on map 3.1. They represent 10% of the year 10- and 14% of the year 12-students in the three districts. The universe of the experiment is the 17,296 students (11,881 year 10-students and 5,415 year 12-students) of those 97 high schools. The experimental sample is representative of the population of year 10- and year 12-students in the Parisian region in terms of proportion of non-French students, students receiving a scholarship, and number of female students (Table 3.1). Low SES students and high SES students are slightly over-represented in the experimental sample compared to France, but are in line with the characteristics of the three educational districts.

7. Each educational district represents respectively 9.1% for Versailles, 7.1% for Créteil and 2.8% for Paris of the French total (Ministère de l'Éducation Nationale, 2014).

3.2.2 Randomization

In the Fall of the 2015-2016 academic year, principals of schools who volunteered to the program were required to provide six classes, two pairs of classes in year 10 and one pair of classes in year 12, [8] as well as a preferred time slot and day of the week for the intervention. These pairs were subject to random assignment within each school. In total, 291 classes received the visit of an ambassador and 286 classes served as a the control group. Each ambassador had to choose three different schools for three interventions in each school (in general two in year 10 and one in year 12). Ambassadors were not randomly allocated to a school but decided upon the school and time slot using an online system on a first-come first-served basis. [9] Random assignment successfully balanced the characteristics of students in the treated and control groups in the experimental sample, as Table 3.2 confirms.

Under the Stable Unit Treatment Value Assumption that selected students in control classes remain unaffected by the intervention of the ambassador, the comparison between treated and control students provides an estimate of the average-treatment-effect parameter of the impact of the female role model on stereotypes and track and college major choices. In the results section, we provide additional results to account for the potential spillover of students in the control group.

3.2.3 Intervention

In the 2015-2016 academic year, the experimental program had a total of 56 ambassadors, 35 are privately employed by the firm (*collaboratrices*) and volunteered into the program, and 21 are Ph.D. students or post-doctoral researchers who received a research fellowship from the firm's foundation, and participated in the program as part of their contract (cf. Table 3.4). All

8. Some schools decided to provide pairs of year 10 only, or more than two pairs of classes per years.

9. Ideally, we would have wanted to randomly allocate each ambassador to a school, but this was not feasible as the ambassadors participated to the program on a voluntary basis and outside their regular working hours. A more motivated ambassador could choose the "best" schools early on, but this does not threaten our identification hypothesis as the randomisation is made within schools. Moreover, as new schools were added gradually to the program, several rounds of online registration were open. Ambassadors were all contacted four times in total, on October 21, November 24, December 7, 2015 and February 3, 2016.

interventions took place from November 17, 2015, to March 3, 2016. [10] Each intervention lasted one hour. During the intervention, the ambassador presented two short videos of three-minutes each. The first video called "Science, beliefs or reality?" uses students' interviews in order to debunk myths about careers in science such as: occupations in science are more difficult, working in science requires more years of schooling, but also stereotypes attached to scientists (scientists are shy, lonely) and information on the under-representation of women in science. The second one called "All equals in science" describes the gender stereotypes usually attached to women in science, but also provides information on brain plasticity and how interactions and social environment shape both men's and women's ability and tastes. The ambassador also used a set of slides and a video projector in order to moderate the discussion with the class.

During the training session, some ambassadors suggested that additional material could be sent in order for them to strengthen their argument. Therefore, different ambassadors were attributed different sets of slides. For a subset of 15 ambassadors, the set of slides was subject to random assignment between November 20 and December 8, 2015. As presented in Table 3.3, 7 ambassadors received the new set of slides including extensive information of wages and employment prospect in science, and 8 ambassadors kept the former slides. The enriched set of slides contained 15 additional slides with explicit examples of career prospects for humanities versus science after graduation, such as differences in wage rates, unemployment rates, and evidence of gender segregation in occupations yielding the highest earnings. The slides also emphasized the differences within science between STEM and non-STEM fields. Finally, the slides contained detailed information on the under-representation of female students in scientific track, and provides evidence on the lack of self-confidence of female students in completing mathematics problems. The new set of slides was sent to ambassadors with a dedicated email summarizing the main messages that were added, but we could not impose the requirement to use this information during the presentation. Therefore,

10. 17% of the students received the visit in November, 24% in December, 38% in January, 20% in February and 1% in March.

the comparison between classes who received the standard set of slides or the new slides with information on wages in this subsample of treated classes provides an estimate of the intention-to-treat parameter of the impact of the pure female role model effect compared to information provision. In order to monitor the magnitude of the selection into treatment, we asked ambassadors in a post-visit survey whether the in-class discussion covered different topics, including wages. [11] Among the ambassadors who received the standard set of slides, the topic of wages in science was not tackled for 20% of the interventions. This figure drops to less than 2% for the subsample of ambassadors who received the new set of slides, which suggests that the new set of slides encouraged ambassadors to discuss career opportunity and earnings expectations.

3.2.4 Data and descriptive statistics

Data for this project comes primarily from administrative data at the individual level, a post-treatment survey of treated and control students, and a survey of ambassadors after each of the three sessions of interventions. The student administrative dataset contains for each student information on past achievement, such as the rank in mathematics and French based on the grades received at the end-of-year national exam (*Diplôme National du Brevet*), as well as socioeconomic background, elective courses taken in year 10 (in particular if the student chose a scientific elective course). For year 12-students, we use data obtained from the system *Admission Post-Bac* (APB), a centralized application platform launched by the Ministry for Secondary Education, on which all high school graduates list their preferred choices for secondary education. This dataset contains the comprehensive list of choices for secondary education made by high school graduates, their admission outcomes, as well as information on their academic performance during year 11 and year 12, and final grades at the *baccalauréat* (BAC) national exam. Around 97% of the students in our experimental sample are identified in this database. Finally for each student of the sample the exhaustive administrative data

11. The exact phrasing of each topic were "jobs in science pay", "science is also for girls", and "science are fulfilling".

provide information on students' actual situation one year after the treatment year (2016-2017) if they were in year 10, and if they enrolled in selective programs (CPGE) or vocational training (*Section de technicien supérieur*, STS) after high school graduation.

We conducted a post-treatment survey in all treated and control classes between one to four months after the intervention. Each questionnaire was individualized and anonymized for each student, and administered in exam conditions. The date the questionnaire was administered was subject to a random assignment, with two waves of survey. The post-treatment survey was designed to collect a rich set of information on students' tastes, personality traits, choices and stereotypes.[12] The first part of the questionnaire contains questions on extracurricular activities (in particular, whether the student does competitive sports, plays video games, etc.), a self-assessment of the student's own performance in different subjects (cf. Tables 3.32 and 3.33), whether the student likes these subjects, but also how the student judges his/her own ability in the subject compared to other male/female students.[13] The second part contains detailed information on attitudes toward science. We asked students whether they like science in general, whether they would consider having a job in science, whether they find some scientific jobs interesting, and whether they would imagine themselves working in different occupations.[14] We also collected information on the intensity of stereotypes with respect to differences between men and women in general and in scientific jobs.[15] We asked question in order to measure self-confidence in science ("I am worried when I think about mathematics", "I am lost in front of a mathematics problem") and with respect to peers ("My level in mathematics is greater/lower/equal to female/male students in my class"). Students

12. The structure of the questionnaire could potentially influence students' response rate and answers. Therefore, we randomly assigned the order of several items (mathematics/French, man/woman) to prevent potential bias.

13. We also randomized these items.

14. We asked whether students could imagine themselves working in various science-related occupations, some in STEM such as computer scientist, engineer, renewable energy technician, or industrial designer, some in non-STEM such as pharmacist, doctor, chemist, or researcher in biology, and some non-scientific occupations such as therapist, or lawyer.

15. Students had to choose between 1 "Totally agree" to 4 "Totally disagree" for various statement such as "Men are more gifted in mathematics than women", "Women's and men's brains of men and women are different". For science, statements include "Jobs in science are solitary", "There are more men in science-related jobs", "It is hard to maintain work-life balance"

from the control group received a slightly different version of the questionnaire, including questions designed to measure potential spillover (cf. Appendix 3.29).

Classes selected into treatment could potentially be more involved ex-post, and more willing to fill out the questionnaire, typically if the professor who attended the visit is also the one present in class when the survey is conducted. Table 3.30 reports the total completion rate and the completion by high school year and gender on the day the questionnaire was administered to students. The completion rate is slightly larger for year 10-students in the treated group compared to the control group, but the difference is small (2 points). There is no difference for year 12-students. Table 3.31 in Appendix 3.5 confirms that differences in response rate between the treated and control groups are always small and very few are statistically significant.

Finally we sent a post-visit survey to each ambassador after each visit. The main descriptive statistics are presented in Table 3.37. We collected general feedback but also monitored compliance with randomisation by asking ambassadors to report the name of each class. The interventions almost always took place in the presence of a teacher (89%) and sometimes with another adult (35%). Ambassadors reported organizational problems for 14% of the visits (intervention started late, principal on-leave, etc.), but when asked about the overall conditions of the intervention, over 90% of the interventions were considered "good" or "very good".

3.3 Social norms and the choice of science

3.3.1 Gender differences in self-confidence and the prevalence of stereotypes across genders

We begin by describing gender differences in psychological traits and tastes among high school students. This descriptive analysis builds upon a rich literature in sociology that provides qualitative and quantitative evidence of the social construction of gender differences throughout school education (in the French context, see for example Duru-Bellat 1990, Delalande 2003, Baudelot and Establet 2016 and Blanchard, Orange, and Pierrel 2016). Using our post-treatment survey, we are also able to document the prevalence of stereotypical views with respect to women in science for these students. Table 3.36 gives for the students of the control group in our experimental sample, the sample means of several measures of preferences, self-perception and attitudes, by gender and high school year, as well as the T-test of the difference by gender. Items related to extracurricular activities confirm the existence of a gender-differentiated taste for competition. While certain extracurricular activities seem as frequent for boys and girls (using Facebook, watching scientific programs on TV at least once a week), female students are significantly less likely to report playing sports, and in particular competitive sports at least once a week (with a 20 percentage point-difference). There is no gender difference in reported tastes for subjects such as English or philosophy, but we observe strong gaps in favor of male students when it comes to mathematics (up to 14 points of difference for year 10-students and 6 points for year 12-students), physics-chemistry, or sports. On the contrary, female students declare more often liking French or history. Interestingly, the gender gap in tastes vanishes for history-geography as adolescents get older, and reverses for biology-geoscience (women liking more this field than men in year 12), as the students are *de facto* selected based on their implicit taste for science in the subsample.

Self-confidence and self-assessment. Several indicators confirm the well-documented gender differences in self-confidence (Gneezy, Niederle, and Rustichini 2003, Niederle and Vesterlund 2007). Female students systematically report lower levels in mathematics compared to male students (between 10 and 13 points difference) when asked about their own academic performance. They do so when asked in comparison to other female *and* in comparison to male students, for both years. Our data confirm however that female students largely outperform male students in French on the samples of both year 10- and year 12-students, while the small gap in performance (less than 3 percentile rank-difference) in mathematics in favor of male students among the year 10-students is small and not significant anymore for year 12-students.

The entire distribution of grades in mathematics and French by gender is provided in Figures 3.21 and 3.20 and corroborates this observation: the distributions of grades in mathematics are virtually similar for both genders, in year 10 and 12. However, female students are significantly more likely than male students to report feeling lost in front of a mathematics problem (between 15 and 20 points more), and feeling worried when thinking about mathematics in general (19 points). When asked about the factors that matter for them in choosing a field of study for further education, female students are more likely to report "other majors are difficult" as an important reason, or that they want to feel "comfortable". To precisely quantify how much students underestimate or overestimate their level, controlling for their performance, we estimate the following models on the sample of control students:

$$Y_i = \alpha + \beta \text{girl} + \gamma \text{rank} + \epsilon_i \tag{3.1}$$

$$Y_i = \alpha + \beta \text{girl} + \gamma \text{rank} + \delta \text{rank*girl} + \epsilon_i \tag{3.2}$$

Y_i is the answer to the question i) "On average my level in mathematics is..." (*all* specification), ii) "On average my level in mathematics is...compared to the average of *boys*" for female respondents and "to the average of *girls*" for male respondents (*opposite sex* specification), and iii) "On average my level in mathematics is...compared to the average of *boys*" for male respondents and "to the average of *girls*" for female respondents (*same sex* specification). [16] In model (i), the variable *rank* corresponds to students' actual percentile rank in mathematics at DNB national exam in the experimental sample. In model (ii) *opposite sex*, *rank* corresponds to students' relative distance to the median rank of the subsample of opposite gender within the class. In model (iii) *same sex*, *rank* corresponds to students' relative distance to the median rank of the subsample of same gender within the class. Results are reported in Tables 3.32 and 3.33. Controlling for their percentile rank at DNB national exam, female students in year 10 always underestimate their level in mathematics in absolute term. The higher their

16. Answers to these question range from 1 "Very weak" to 5 "Very Good".

rank, the lower they underestimate (coefficient δ). They underestimate their level both with respect to boys and girls of their class. Results are basically the same for female students in year 12.

Stereotypical views. We do not observe differences in stereotypes with respect to jobs in science (wages, study length, work-life balance) for students in year 10, while these stereotypes seem more pronounced for female students than for male students in year 12. Stereotypes related to women's intrinsic qualities and tastes are more prevalent for male students: almost 30% of male students in year 10 consider that "men are naturally more gifted in mathematics than women", compared to 18% of female students of the same age. The figures are virtually the same for year-12 students. Male students are also more likely to report that "women like science less than men", but female students in year 10 are more likely to consider progress for women in science slower than for men (around 60% compared to 52% for male respondents). Finally, when asked about positive traits that describe men/women scientists, we first observe that on average students report very positive perceptions. However, stereotypes are often higher for female respondents when they respond to questions on men scientists, and systematically higher for male respondents when they respond to questions on women scientists, except for the adjective "social".

3.3.2 Correlation between stereotypes and choice of field of study

We present hereafter a comprehensive analysis of the factors correlated with the choice of field of study using the results of our post-treatment survey, and restricting our analysis to the control group. To our knowledge, this is the first attempt to document on a large, socially diverse sample, how attitudes, tastes and stereotypes relate to choice of field of study, for female and male students separately. Our analysis suggests that the correlation between taste for science and choices is stronger for year 10-students than for year 12-students. The latter group is composed of students that form a more homogenous and selected population. The relative persistence of a correlation between stereotypes associated to jobs in science and women in science, even after controlling for percentile rank at DNB, suggests that an intervention targeting these specific issues might be relevant to trigger some changes in the decision making process of these students.

We use a simple multivariate OLS regression model where the dependent variable is the choice of tracks for year 10-students and the college major choice for year 12-students, and we look at the contribution of several variables, separately for both genders. First, we include controls for the ability of the student measured by her percentile rank at DNB exam. Indeed, we know that there is a positive correlation between past performance in mathematics and probability to enroll in science track, as shown in Figures 3.16 and 3.17.

We also include controls on the family composition of the student (presence of older siblings, brothers and sisters separately, whether the mother and the father of the respondent work in science), and socioeconomic background. Science track is considered as a prestigious choice, and Figures 3.18 and 3.19 confirms the role played by socioeconomic background in this choice. Students from high socioeconomic status are significantly more likely to choose a degree in science than students from underprivileged background. These gaps amount to almost 20 percentage points for students in year 10, and 10 points for students at the end of high school. Finally, we also include in our regression high school characteristics.[17] Results are presented graphically in Figure 3.2, where we only retained variables for which the effect was large enough[18] and statistically significant.

As expected, the taste for science and whether students would consider a job in science[19] are strongly correlated with their decision to pursue studies in science. For instance, for female students in year 10, the coefficients of these variables in the regression on the probability to choose science track are respectively 0.14 and 0.41 (both statistically significant at the one percent-level), while for male students the associated coefficients are 0.24 and 0.28 (also statistically significant). The coefficient is slightly smaller but still statistically significant

17. In detail, the share of low socioeconomic status in the high school, for each high school year separately.
18. The magnitude of the coefficient for each variable is larger than 0.01.
19. 47% of female students would consider a job in science in year 10, against 60% of male students. This difference is statistically significant at a one percent-level. In year 12, the average is 74% and the gender gap is reduced by half.

for year 12-students, both male and female. Importantly, female and male students differ in their baseline means in year 10: 66% of female students declare liking science, versus 80% of male students, [20] while this difference vanishes when we focus on year 12-students. However, around 85% of female and male students declare that certain jobs in science are interesting, and the difference between the groups is not statistically significant.

Perceptions of jobs in science seem also to be a variable significantly associated with the choice of field of study. In year 10, male students who agree with the statement that "jobs in science are dreary" are less likely to choose science track, with an associated coefficient of -0.05. This coefficient is slightly smaller but still statistically significant for female students in year 12. We also observe that female students in year 12 who agree with the statement that "jobs in science are solitary" are less likely to be observed in a selective science program the year after, even after controlling for past performance in mathematics. For female students in year 10, agreeing with the statement according to which "wages are high in science" is positively correlated with the choice of science track (coefficient of 0.03), but it is not the case for male students. Importantly, there is no statistical difference between genders for this question. [21] Finally, in year 10, female students who agree with the statement that "women are discriminated in science" are less likely to opt for science, with a negative coefficient of -0.039. This coefficient is not statistically significant for older students. Interestingly, the stereotype threat does not seem at play here: those female students who agree with the fact that "there are more men than women in science" are actually more likely to choose and be admitted in these programs.

We observe that controlling for ability does not completely cancel out the correlation between stereotypes and choices of field of study. For year 12-students, female students who declare that men are more gifted than women in mathematics are less likely to choose science selective programs (-0.053). This coefficient does not have a straightforward interpretation though, as it might reflect both stereotypes and the respondents' own performance in

20. A T-test reveals that the gender difference is statistically significant at the one percent-level, cf. Table 3.36.
21. The group mean is 64%.

mathematics that prevents them from entering these selective institutions.

Synthetic measures of stereotypes. We constructed four scores in order to synthesize these different dimensions: one capturing taste for science, [22] one capturing knowledge about jobs in science, [23] one capturing stereotypes associated with jobs in science. [24] and one capturing gender stereotypes associated with science. [25] For each of these groups, we first excluded students who did not answer at least one of the questions of the group, and we aggregated all the responses of the group. We then standardized these scores by year. The factors that come out significant in the regression are presented in Figure 3.3. For year-10 male students, only the score capturing the taste for science is significantly correlated with the choice of science: a one standard deviation-increase in this normalized score increases the probability of choosing a science track by 20 percentage points. For female students, the score on knowledge about jobs in science is also positively correlated with science track, with an associated coefficients of 0.016. Interestingly, for students in year 12 the coefficient of the taste-associated score is still statistically significant but significantly reduced, both for female and male students. However, the score related to science stereotypes becomes statistically significant, with an associated coefficient of -0.021 for male students and -0.013 for female students.

Factor analysis. In order to analyze whether some variables measuring stereotypes are linearly related to a number of unobservable factors, we then perform a factor analysis on the control group. Classically, we proceed in two stages, after standardizing all variables. First, one set of loadings is calculated using the principal component method, which yields theoretical variances and covariances that fit the observed ones as closely as possible. Loadings having an eigenvalue greater than 1 are retained. In the second stage, the first loadings are

22. We use the following variables: the student agrees with the statement "I like science", "Some jobs in science are interesting", and "I would consider jobs in science".

23. We use the following variables: the student agrees with the statement "There are better wages in science" and "There are more men in science-related jobs".

24. We use the following variables: the student agrees with the statement "Studies in science are long", "Jobs in science are dreary", "It is hard to maintain work-life balance" and "Jobs in science are solitary".

25. We use the following variables: the student agrees with the statement "Men are more gifted in mathematics", "The brains of men and women are different", "Women like science less than men" and "Women are discriminated in science".

"rotated" in order to arrive at another set of loadings which are more consistent with our prior on the potential link between variables.[26] Results are presented in Table 3.13. We find that the variables measuring stereotypes can be accounted for by seven underlying factors. The first one is related to *self-confidence*, as it is mostly correlated with variables capturing students' perceptions of their own ability, and their attitudes toward a mathematics problem. The second one is related to the *taste/distaste for science*, for example whether students find interesting jobs in science, and science in general. The third one can be summarized as capturing *stereotypes with respect to preferences and abilities*, so those related to intrinsic qualities or tastes associated differently to women or men. The fourth factor relates to stereotypes associated to the *social dimension of jobs in science*, namely whether these jobs are solitary, and whether it is difficult to conciliate family life and work, while the fifth factor relates to stereotypes associated to the more *economic dimension of jobs in science*, including the duration of studies and wages. Finally, the last factor of interest relates to the *under-representation of women*. Factor 7 is residual, as shown in the seventh column of Table 3.13. The last column of the table displays the uniqueness of each variable, namely the variance that is *unique* to the variable and not shared with other variables.

Figure 3.3 presents the correlation between the choice of field of study and these factors. As expected, the underlying factor related to the taste for science is a strong predictor of the choice of science track. We obtain virtually similar results to those obtained when using the four scores that we contructed *ad hoc*. The lack of self-confidence is negatively correlated with the choice of science, and so is the factor related to distaste for science, particularly for female students.

In this descriptive analysis, we highlight two important results. First, there are important differences across gender in the relative importance of subjective factors correlated to the choice of field of study, even after controlling for sociodemographic characteristics and past performance. Secondly, these factors do not affect uniformly students' choices according to their high school year. Students in year 12 in science are a selected and potentially more

26. We use the standard orthogonal *varimax* rotation procedure to produce the final factor weights.

homogenous population in terms of taste for science. Therefore, information on science and on stereotypes related to women in science might be particularly relevant for these students. The female student who is at the margin between choosing to enroll or not in a selective science program and, absent the intervention, would have chosen a non-scientific curriculum, now could decide to opt for science after high school graduation.

3.4 Impact of the intervention

3.4.1 Impact of the intervention on stereotypes

One of the objectives of the program is to change students' perceptions of women in science. Our results suggest that the treatment has a significant and rather large impact on the prevalence of several stereotypes. We estimate the average treatment effect using a linear probability model with high school fixed effects separately for each year and each gender:

$$Y_{ics} = \alpha + \beta Treatment_{cs} + \gamma_s X_s + \epsilon_{ics} \tag{3.3}$$

where i corresponds to the student, c to the classroom and s corresponds to the high school. Standard errors are clustered at the high school-level. In alternative specifications, we cluster standard errors at the level of the pair and results do not vary substantially.[27] Estimates are presented in Tables 3.5 and 3.6. Each table reports, for each outcome and gender, the mean of the control group (column C), the average treatment effect (column T-C), the standard deviation and the number of observations. In general, the visit significantly reduced stereotypes attached to jobs in science (study length, work-life balance, whether these jobs are solitary or dreary), particularly for female students. The magnitude of the effect ranges from 8 to 18% of the baseline mean for these outcomes. The visit also affected opinions on women and men in science, both for students in year 10 and 12. A significantly lower share of treated students report that the brains of men and women are different at birth. At the same time, the

27. Results available upon request.

probability of agreeing with the fact that women are under-represented in science increases by 23%. Interestingly, we note that students are also more likely to agree with the statement according to which "Women are discriminated in science" (+0.12 points which corresponds to a 20%-increase) and "Women like science less than men" (+0.06 which corresponds to a 20%-increase). One potential explanation for these results is the rationalization process behind the under-representation of women in science. Students are being told during the visit that i) women are under-represented in science, but that ii) they are equally capable as men to succeed, because they do not underperform in mathematics, and do not have different innate cognitive skills. One way for them to rationalize these two messages would be therefore to assume that if segregation in occupations persists, this must be related either to discrimination or differences in preferences.

We use our synthetic measure of stereotypes to summarize the treatment effect on stereotypes. For students in year 10, the treatment decreases the score capturing general stereotypes related to jobs in science by almost 20 percentage points for male students and by 14 percentage points for female students (both coefficients are statistically significant at the one percent-level). For students in year 12, the impact of the treatment is also particularly large, with a decrease of 25 percentage points for male students and 14 percentage points for female students. In year 10, treatment increases the score by more than ten percentage points, both for male and female students. However, for year 12-students the magnitude of the coefficient is much smaller and not statistically significant.

Perception of female/male scientists. Finally, we measure the impact of the intervention on the way students perceive female and male scientists. Male and female scientists are more often described as *creative* by female students from the treated group in year 10 (see Table 3.9). Treatment increases the perception that scientists in general are *social*. Female students in the treated group are more likely to declare that both female and male scientists are *social* (an increase between 9 and 15% with respect to the baseline). For male students in year 10, the effect is only significant when asked about male scientists (see Table 3.10).

Finally, male students in the treated group are slightly more likely to find male scientists *interesting* (+0.037, which corresponds to a 4%-increase). Finally for year 10, we find that treatment decreases the propensity to agree with the statement that women scientists are *respected*, both for male and female students. This is somehow coherent with the results on women's slower progress in scientific jobs: students might infer that if they do not progress as fast as men, they are *de facto* less respected.

Changes observed in the prevalence of stereotypes are the most direct effect of the program. These results suggest that a one hour-intervention can significantly impact students' attitudes. However, the intensity of the treatment can potentially vary overtime. If students have been surveyed shortly after the intervention, we expect that they will be more responsive to questions on gender stereotypes and that these issues will be more salient for them. To investigate this issue we ensure that the treatment effect does not vary substantially whether students answered the survey shortly after the intervention (one to two months between treatment and survey) or later after the intervention (three to four months, and five to six months) in Tables 3.14 and 3.15. The sample size is significantly reduced in the three groups, particularly for the third group (five to six months between intervention and survey) which is left with less than 800 observations. Therefore we observe that the point estimates are less often statistically significant for this last sample, but on average they do not vary substantially across these different samples.

3.4.2 Impact of the intervention on tastes for science and on track choices

In terms of choices of field of study as expressed by students in the questionnaire, the treatment seems to have limited impact, as presented in Tables 3.34 and 3.35. Female students in year 10 in the treated group are slightly more likely to report social sciences as a potential track choice for year 11 (Table 3.11) and less likely to report medical and dental as a preferred field of study (-0.029). Surprisingly, treated male students tend to report more biology and humanities as a preferred field of study.

Impact on self-confidence. The impact of treatment on the key factors of choices put forward by students reveals a potential (but modest) impact on self-confidence. Female students in the treated group are slightly less likely to report "Other majors are difficult" as a reason to decide on track choice, while there is no significant effect on male students of the same age. However, "having male peers" becomes a more important factor of choices for treated male students. We suspect that the intervention, by associating prestigious tracks and the under-representation of women, might increase the salience of the issue of the peer composition in terms of gender. We observe a similar pattern for older students, who are more likely, both women and men, to report the gender of their peers as an important factor of choice. Finally, we notice that the treatment increases the probability for female students to consider wage prospect as an important factor of choice.

Perception of jobs in science. While the impact of the treatment on the expressed choice of field of study seems limited, we observe that the intervention has a positive effect on the perception of certain scientific occupations. As presented in Table 3.7, for female students in year 10, the probability of foreseeing themselves being an engineer increases by 2.6 percentage points (equivalent to 10% of the baseline mean) and in the same proportion for industrial designer. Combining together all STEM jobs, the positive effect of the treatment amounts to 6% of the baseline probability. For year-12 students, there is no significant effect, except a slight decrease in the probability of foreseeing themselves being a therapist or a doctor (Table 3.8). Effects on male students are insignificant.

Choices. During the academic year, students in year 12 apply for admission in higher education through an online centralized allocation system (*Admission post-bac*, later APB). Applications start on January 20. Students can make up to twelve choices by type of institutions (university, selective programs, two-year college/vocational training, art schools, architect schools, business schools, schools of engineering) and 24 choices in total. They can modify the ranking of their choices up to May 31. Selective programs (such as *classes préparatoires aux grandes écoles* (hereafter CPGE), or schools of engineering) rank students' applications based on average academic grades obtained during year 11 and during the first quarter of year 12, without knowing how students ranked their choices. In practice, the procedure can take up to three phases. At each phase, students receive one offer, the best available choice based on their preferred choice. If the candidate obtains his/her first choice, all the other choices are automatically cancelled. Otherwise, the candidate waits until the second phase to receive a new offer. The first choice is therefore crucial for the admission process. The first phase ends on June 13, the second one on July 1 and the final one on July 19. Around 90% of students know by the end of June where they have been admitted. On average, less than 10% of candidates receive a better offer between the first and the third phase of the procedure. In our data set, around 40% of students are admitted to their first choice. Using data from this centralized system, we observe each student's choices, ranking, and admission outcomes.

We measure the treatment effect on reported choices of year 12-students in the APB application system. We make sure that attrition (which corresponds to around 3% of our sample) is balanced between treated and control groups. Results are reported in Table 3.18. Female students from the treated group were more likely to choose a degree in science for their first choice (+0.044, which corresponds to 8% of the baseline), in particular selective science programs and STEM programs (+0.032, which corresponds to a 32% increase with respect to the baseline). The impact of the treatment on male students is positive but not statistically significant. The category slightly negatively impacted is scientific two-year college BTS (-0.013, non significant) and other non scientific selective programs CPGE (-0.031). We do not observe any statistically significant impact on male students. Finally, we do not observe any effect on the total number of choices, or on the probability of choosing a scientific major at university. Therefore, we cannot conclude that the intervention simply expands the choice set of students, or that they substitute university for more selective programs. In all likelihood, the best female students who were at the margin between deciding to enroll in scientific and non-scientific selective programs opted for science after receiving the treatment.

3.4.3 Impact of the intervention on grades

The program provides extensive information on career in science but it did not contain *per se* any specific academic content that could further boost students' school performance. In that sense, it was is not likely to affect students' school performance substantially. However, role models could potentially increase students' motivation and therefore their willingness to provide effort in order to be admitted in the most selective programs. We investigate the treatment effect on students' performance at the *baccalauréat* for the sample of year 12-students, based on their past achievement in mathematics at DNB national exam. These grades are typically used by the assignment software that ranks students' applications for higher education choices. We do not find any significant effect on the percentile rank in mathematics and the total percentile rank, as shown in Figure 3.7. The figure shows the treatment effect on performance at the *baccalauréat* final exam, on the population of students in year 12, by percentile rank of past performance in mathematics. The rank of past performance in mathematics is obtained from grades in mathematics one year before the intervention (non-blind score). Similar results are obtained when we use rank at DNB mathematics final exam instead. The intervention does not seem to incentivize students to increase their effort, or to specialize more in science, by dedicating more time to mathematics. Therefore, we can reasonably interpret any impact on the choice of field of study as a change in terms of perceptions or preferences, and not as an increase in students' choice set induced by better school performance.

3.4.4 Impact of the intervention on admission outcomes

The program has significant effects on students' applications at the end of the treatment year, and virtually no effect on academic performance. This however should not necessarily translate into different assignments for the treated students compared to the control students. Using administrative data, we are able to observe students in year 10 from the treated and control groups one year after the intervention, and therefore we can estimate the impact of the treatment on their assignment the following academic year.

The complete list of results are presented in Tables 3.16. For year 12-students, we can confront results obtained from APB application data, which provides us with admission outcomes (results in Table 3.19), and from administrative data in which we identify students in selective programs after high school graduation (Table 3.17). [28] Our results suggest that the treatment has very little effect on the choice of science track after year 10. For year 12-students, Table 3.17 confirms results described in Table 3.19: the treatment has a significant impact on the decision to apply for a science selective program after high school graduation (CPGE science), in particular STEM, and to be admitted, as seen in Figure 3.8. The effect is large in magnitude: it corresponds to a 30%-increase with respect to the baseline.

Role of past performance and socioeconomic status. Scientific tracks are considered the most competitive and prestigious ones. Admission to science track in year 11 relies upon grades obtained in scientific courses during the first half of the academic year. Admission to selective programs (CPGE) after high school graduation is conditional on past grades in year 11, and during the first quarter of year 12. Therefore, high-achieving students, who can be allowed to enter these programs and who are the margin between applying or not applying to them, are therefore more likely to select these programs high in their list of choices, and to be admitted. We investigate this hypothesis by looking at heterogeneity according to past performance in mathematics. Results presented in Figure 3.5 are consistent with this hypothesis. The choice of science track after year 10 does not seem to vary with the level in mathematics at DNB exam for female students, while male students from the highest quartile in the treated group are significantly more likely to be observed in science track after year 10. In year 12, female students in the highest quartile in terms of results in mathematics at DNB exam are significantly more likely to be observed in science selective program after high school graduation, while male students with an average rank in mathematics at DNB (in the

28. This administrative data set has been made accessible by the Ministry for Education. Therefore, only college majors physically located in high schools - such as selective programs CPGE - are observed in this dataset.

second quartile) tend to respond more to the treatment. Given that results in mathematics are strongly correlated with students' socioeconomic statuts, it is not surprising to find that the treatment has also heterogenous effects with respect to students' socioeconomic background, as shown in Figure 3.6. While the intervention has no significant effect on admission in science track after year 10 for the whole treated group, the share of female students who choose science track after year 10 is significantly higher in the treated group among students with a high socioeconomic status.

3.4.5 Impact on the gender gap

A key finding of the intervention is that female role models impact both female and male students' applications at the end of high school, and the magnitude of the effect is rather comparable. The impact on the gender gap is therefore *a priori* ambiguous. Figures 3.25 and 3.26 plot the evolution of the gender gap, by quartiles of grade in mathematics at DNB final exam and by socioeconomic status, by interacting our treatment dummy with a dummy equal to one if the respondent is a female student. These results suggest that the treatment does not have a statistically significant differentiated effect according to the gender, and therefore on the absolute gender gap. However, the baseline means for female and male students are very different. Table 3.29 presents the impact of the intervention on the share of female students per class who get admitted in CPGE science. The change corresponds to a 38% increase, which is ten points higher than for the male students. Therefore, in relative terms, the impact is larger for the population of female students.

3.4.6 Potential mechanisms

The program has a significant impact on students' choice of field of study after high school graduation. This effect could be mediated either by the profile of ambassadors and whether it is relevant to students (the "role model" component of the intervention), or more by the content of the presentation (the informational component of the intervention). We try to disentangle between these channels by investigating the heterogeneity of the effect with respect to the type of ambassadors, and by looking at the impact of a second treatment (slides with information on wages). One potential caveat of our design is the risk of contamination, because the treatment unit is the class. Students from the control group might have been directly or indirectly affected by the intervention, if they discussed with their peers from treated classes. Moreover, we might potentially attribute the observed differences between treated and control students to our treatment, while high schools often implement other programs dedicated to provide information on higher education and science. Although it is unlikely that these other interventions were targeted to the same treated classes as in our experiment, we investigate how school environment might affect our results. Finally, our analysis shows so far that high-achieving treated students tend to respond more to the intervention by adjusting their choice, and eventually are more likely to be admitted in selective STEM programs than control students. Whether these results are driven by students' own abilities or their school environment is not clear. To explore these issues, we investigate heterogeneity both between and within high schools. Sorting in high schools is endogenous, therefore we do not identify causal link between the quality of students and the response to treatment. However, this analysis provides insight as to how students might set realistic aspirations depending on their own academic performance and their high school of origin.

3.4.6.1 Types of role model and relative relevance

The effect of role models might vary according to how group members perceive their own ability, and how personally relevant the role model is for them (Lockwood and Kunda 1997). In that respect, the background of role models could matter (Nguyen (2008)). Unfortunately, we cannot vary much the profile of ambassadors, and their allocation to high schools was not subject to random assignment. However, we provide hereafter suggestive evidence that ambassadors' professional characteristics might be differently relevant to different students. Ambassadors who are researchers, that is Ph.D students or postdoc, are on average younger, therefore closer to students who can more easily identify to them, but they work in specialized fields and in very competitive environments. Hence, it is not clear how attainable students might consider the achievements of these role models. On the other hand, professionals working in the firm whose foundation is supporting the program have on average higher wages, more experience, and less purely academic background. The effect of these different types of role model is *a priori* ambiguous.

We adopt a semi-parametric approach in order to investigate the heterogeneity of the effect with respect to the type of ambassadors. We plot ambassadors' fixed effects for a series of outcomes. These fixed effects are obtained from a regression where treatment has been interacted with each ambassadors' individual dummy variable, and that includes high school fixed effects, in order to capture potential selection of ambassadors in specific types of high schools. The distributions are virtually identical across ambassadors' characteristics for the impact on self-confidence, and for the reduction of the prevalence of stereotypes with respect to gender difference in preferences, under-representation of women, and of stereotypes with respect to the *economic* dimension of jobs in science. Interestingly, professionals tend to lower the prevalence of stereotypes associated with the *social* dimension of jobs in science for female students in year 10, while researchers have a greater impact on the factor capturing the distaste for science, as shown in Figure 3.12.

Figure 3.11 plots the distribution of ambassadors fixed effects on, respectively, the probability of being observed in science track the year after the intervention for the sample of year 10-students, and on the probability of being observed in selective science programs (CPGE science) the year after the intervention for year 12-students. The distributions are virtually identical for the outcome "science track" for students in year 10. It seems that for the outcome "selective STEM program" for students in year 12, the distribution of professionals' fixed effects slightly dominates. This is confirmed by a simple comparison on the treatment effect by subgroups, as presented in Figure 3.9. We then look at ambassadors' main field of specialization. We classify ambassadors in STEM or non-STEM fields (see Table 3.4). This classification partially overlap with the difference between professionals and researchers, but ambassadors in pure STEM subjects represent only 25% of the sample. Figure 3.10 presents the heterogeneity of the effect along that dimension, and confirms that professionals have on average a higher impact in our sample, although again this result should be taken with caution, given the non-random allocation of ambassadors.

3.4.6.2 Second treatment: information on wages

The intervention has both an information and a role model component. It is not clear which component has the greatest impact, and for whom. On the one hand, students in year 12 are usually more informed about the returns to education, and we saw in the descriptive section that the prevalence of stereotypes associated to the *economic* dimension of jobs in science is more correlated to the choice of science for year 10-students than for year 12-students. On the other hand, students in year 12 are potentially closer to the entry on the labor market and wage-related information might potentially be more relevant to them. To test this assumption, we compare the effect of the regular set of slides as initially designed (treatment 1) and of the set of slides including extensive information of wages and employment prospect in science (treatment 2). We provide suggestive evidence that treatment 2 (information on wages) has a larger effect on female students in year 10 (Table 3.24) with a 9 percentage point increase in the probability of being observed in science track one year after treatment. This corresponds to a 30%-increase with respect to the control mean. To investigate whether the difference between the two treatments is statistically significant, we look at the net effect of treatment 2 by interacting the treatment with a dummy variable indicating that ambassadors received the new set of slides. Table 3.26 confirms that treatment 2 has a significant net effect on the probability of being observed in science track, and that these results are actually driven by female students. Given the sample size, these results have to be to interpreted with caution, but they suggest that providing ambassadors with additional information on wages and employment prospect in science may strengthen the intervention to year 10-students. This is confirmed by Table 3.27. We observe that treatment 2 significantly reduces the prevalence of stereotypes associated with the *economic* dimension of stereotypes with respect to jobs in science for year-10 students. This is in line with the descriptive analysis presented in section

3.3.2, where we find that the factor associated with the *economic* dimension of stereotypes with respect to jobs in science is significantly correlated with the choice of science track for female students in the control group.

3.4.6.3 Spillover effects on non-selected students and school environment

We investigate how potential spillovers on non-selected students can affect our results. On the one hand, if treated students have discussed the visit with friends in the control group, and how the intervention changed their perceptions of science, our estimate could be downward biased. On the other hand, if students from the control group felt neglected from not being selected to attend the visit, their attitudes could potentially be negatively affected, and our estimate of the causal impact of role models upward biased. We cannot precisely disentangle these two mechanisms, but we can investigate whether treatment effect varies in magnitude according to a measure of the level of within-school spillover. The level of spillover is computed from the share of students per pair in the control class who report that they were told about an intervention happening in the high school, either by students from the school or by teachers. We grouped classes in two groups (high or low level of spillovers) according to the median of this proportion in the sample. In the future, in order to better control for potential spillovers, we plan to match our treated classes to the corresponding control classes one year earlier.

We also want to account for other interventions taking place the same year in high schools, although there is *a priori* no reason to believe that these other interventions were targeted to the same treated classes as in our experiment. We account for the presence of other interventions happening the same year by restricting our sample to high schools where more or less than half of the students have been potentially exposed to another visit. Results are presented in 3.20 and 3.21, and suggest that the impact on stereotypes does not vary much across educational contexts. However, the impact on admission outcomes seems larger for classes with relatively high level of spillovers, and in schools who organized other interventions during the academic year, which does not threaten the validity of our results. Tables 3.23

and 3.22 show that spillovers tend to be observed in high schools with a high share of high socioeconomic status, and that on average high schools that received other interventions have a higher share of high socioeconomic status students.

3.4.6.4 Aspirations and selective tracks

High-achieving students are more responsive to the intervention in terms of college major choice. A subsequent question is whether students' own abilities, more than their own environment, moderate their reaction to treatment, both in terms of choices and admission. In particular, selective programs know candidates' high schools of origin and their reputation when they apply.

Comparison between high schools. We therefore look at heterogeneous responses to the intervention both within and between high schools. We split our sample based on high schools' average rank in mathematics at DNB national exam. "Top high schools" correspond to high schools where the average rank in mathematics at DNB national exam for year 12-students is greater than the median of our experimental sample. In "bottom high schools", the average rank is below the median. Figure 3.13 reports the first choice for post-secondary education of female students in year 12, in both "top" and "bottom" high schools. The intervention seems to provoke different changes in the distribution of choices between high schools. Treatment induces female students from "top" high school to choose science selective program (CPGE) as a first choice, while female students from "bottom" high schools tend to opt more for medical studies as a first choice. As previously discussed, enrolling in the first year PACES that prepares to the admission exam in medical school is theoretically possible for all students who have a scientific *baccalauréat*. However the national exam at the end of PACES is very selective.

Comparison between and within high schools. To investigate both within and between school heterogeneity, we choose to rank students within high schools, based on their percentile rank in mathematics at *baccalauréat* final exam (blind scores). As discussed above in section 3.4.3, the treatment does not seem to affect the rank in mathematics at the *baccalauréat* exam. However, to address potential endogeneity issues, we replicate the exercise by choosing non-blind score in mathematics one year before treatment, and blind score in mathematics at DNB national exam three years before, and find virtually the same results (see Figures 3.22 and 3.23 in appendix). Figures 3.14 and 3.15 report the treatment effect on the probability of choosing and being admitted in selective science program and in medical curriculum for female students, according to high schools' average level and ability.

The proportion of female students who choose selective STEM program (CPGE) increases on average in the treated classes from "top high schools", while it does not in high schools at the bottom, except for female students at the very top of the grade distribution. In the same schools, treatment induces on average female students to choose more often medical studies as their first choice. For these students, the intervention of role models has differential effects: depending on their academic performance, they choose either selective STEM (for the best students), or non-selective PACES for medical schools.

The impact on the first choice for post-secondary education is essentially reflected in admission outcomes. Figure 3.15 shows that girls from "top high schools" are less likely to be observed in PACES for medical school, but more likely to be admitted in these STEM selective programs. Given the high selectiveness of these programs, only the best students from less performant high schools are admitted. On average, we observe a slight increase in admission in PACES for medical school, although not significant for the whole sample. These results suggest that the intervention induced a fraction of these students to opt for science, but through a non-selective track. Therefore, role models might have differential impact on students from less advantaged high schools, who set realistic aspirations given their own performance and background. Whether these students who enter PACES for medical schools pass the exam at the end of the next academic year and continue into medical schools is unfortunately not known in our data.

3.5 Conclusion and discussion

Based on a large-scale randomized experiment, this paper supports the hypothesis that stereotypical views affect schooling decisions of female students, and can be mitigated through a light-touch in-class intervention of external female role models. We first document gender differences in attitudes toward science, as well as the prevalence of stereotypical opinions with respect to women in science among high school students. Both factors are important predictors of the decision to enroll in science track at the end of year 10 and after high school graduation. Using random assignment of students in year 10 and year 12 - two decisive years in terms of tracking choices - to a one-hour intervention, we investigate the causal impact of role models on aspirations, attitudes, and educational investment. External female role models significantly reduce the prevalence of stereotypes associated to jobs in science, both for female and male students, as well as stereotypes related to innate gender differences in cognitive abilities. However, it simultaneously increases the salience of the under-representation of women, and therefore the belief that women have a less pronounced taste for science, or that they tend to progress slower than men in the same occupations. This suggest that students rationalize gender segregation among occupations as reflecting differences in tastes (potentially socially constructed) or discrimination. However, role models impact the projection of students in scientific jobs in the future.

These results translate into different academic choices for year 12-students in the treated group. Using administrative data one year after treatment, we provide evidence that treatment affects college major choices and eventually admission outcomes for female students. Treated female students enroll 30% more in selective science programs after high school graduation than control students. High-achieving students are more likely to respond to the intervention in terms of college major choices. This type of intervention is typically relevant for these students who are at the margin for deciding to enroll in science curriculum. Interestingly, reducing the prevalence of stereotypes among male students does not affect their self-confidence and does not discourage them from applying to science majors.

We provide suggestive evidence that the profile of ambassadors might affect the magnitude of the treatment effect, in particular ambassadors working in the private sector more than young researchers seem particularly efficient at affecting the choice of STEM for students in year 12. Moreover, providing information on the economic return to scientific studies might be more relevant to students in year 10 who have not yet selected themselves into science track. This result might contribute to improve interventions designed to provide information on returns to college education. Further research is needed to investigate whether varying the profile of ambassadors (gender, ethnicity) might target a larger share of students.

Currently, our study has several limitations. Upon the release of appropriate data, we would like to study the long-term impact of the interventions on students' performance at the end of high school, and on the performance of those students who decided to enroll in selective science programs (one and two year after). However, our data do not allow us to track students from the treated and control groups at university, and to observe their labor market outcomes. Secondly, we attempted to provide a variation of the treatment in terms of information provision on the economic returns of scientific majors. In our experimental design, this second treatment is measured in terms of intention-to-treat, as ambassadors could decide to use these slides or not. We provide only suggestive evidence that younger students are more receptive to this information. It would be interesting to further address variations of the key messages put forward for younger students, who are in general less responsive to the role model in terms of academic choice. Finally, our results suggest that both female and male students were affected by the intervention of female role models, but more specifically, high-achieving students. More research is needed to see which role model could be more relevant to address the need of lower achieving students, or if such an intervention is simply not an appropriate tool for this type of students.

Tables and Figures

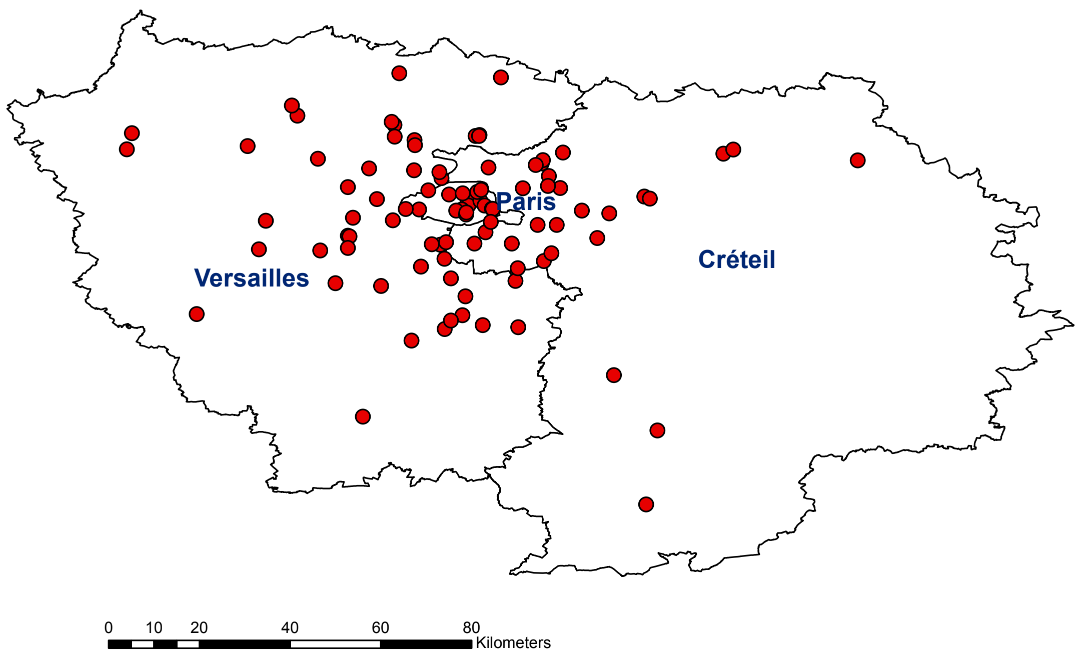


Figure 3.1 – Location of high schools in the experimental sample

The figure shows the location of high schools in the experimental sample from the three educational districts *Créteil*, *Paris*, and *Versailles*.

Source: Authors' own data and https://www.data.gouv.fr

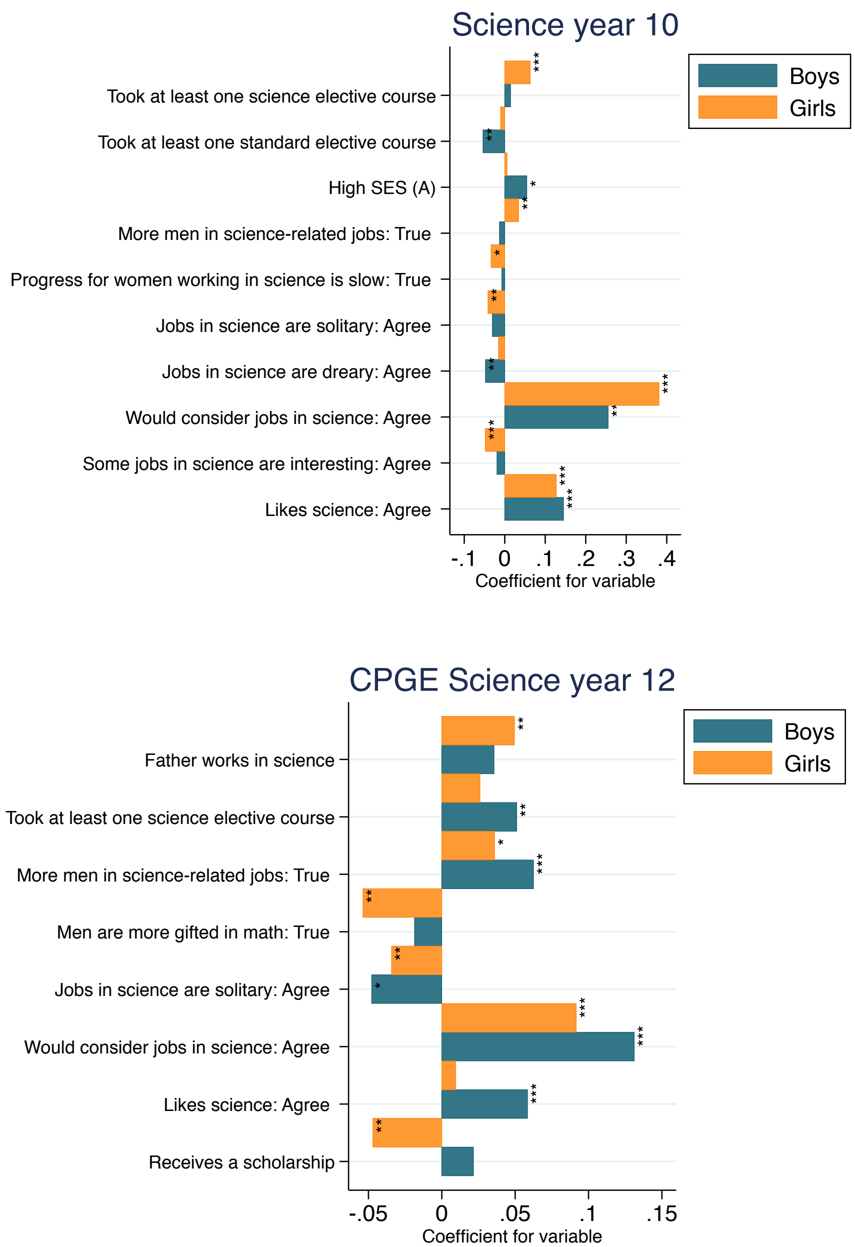


Figure 3.2 – Correlations between choices and intensity of stereotypes

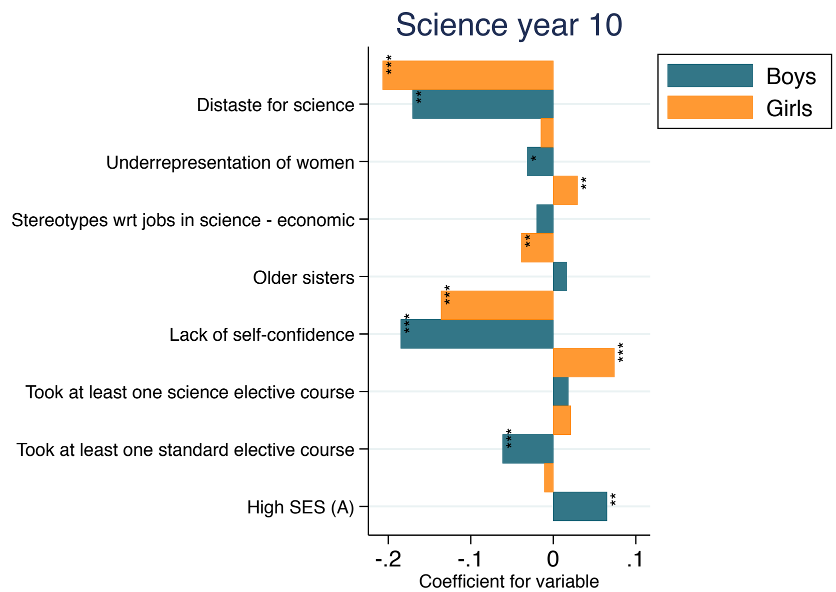
The figure shows the contribution of different measures of stereotypes and sociodemographic characteristics on the choice of field of study for the students of the control group. Each coefficient is obtained from a multivariate regression with high school fixed effects, where the dependent variable is the probability of being observed in science track the year after the intervention for the sample of year 10-students (first graph), and probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students (second graph). Only factors with sizable (greater than 0.01) and significant effects are retained. Standard errors are clustered at the high school level.

Source: Authors' own data.

Figure 3.3 – Correlations between choices and intensity of stereotypes - scores

The figure shows the contribution of different measures of stereotypes using standardized scores, and sociodemographic characteristics on the choice of field of study for the students of the control group. Each coefficient is obtained from a multivariate regression with high school fixed effects, where the dependent variable is the probability of being observed in science track the year after the intervention for the sample of year 10-students (first graph), and probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students (second graph). Only factors with sizable (greater than 0.01) and significant effects are retained. Standard errors are clustered at the high school level.

Source: Authors' own data.



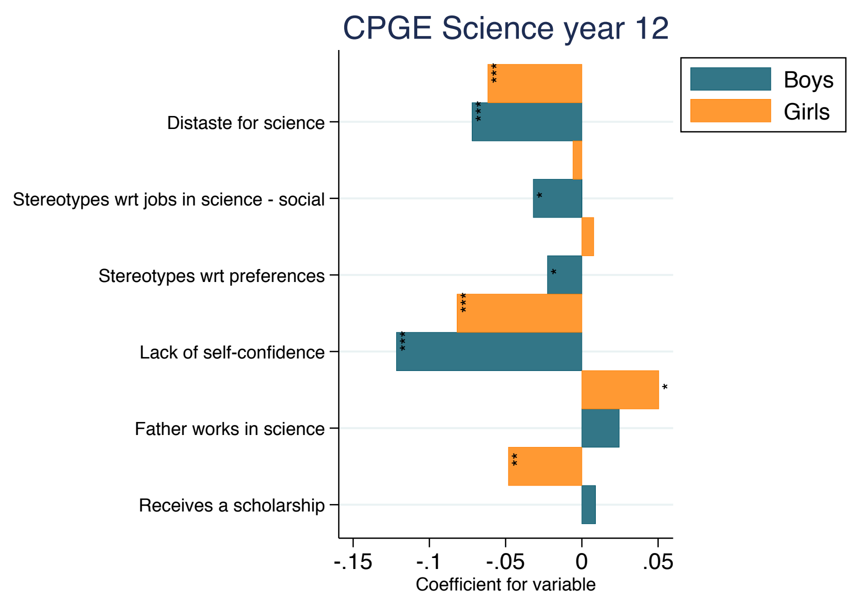


FIGURE 3.4 – CORRELATIONS BETWEEN CHOICES AND INTENSITY OF STEREOTYPES - FACTOR ANALYSIS

The figure shows the contribution of different measures of stereotypes using the results of a factor analysis on the control group (presented in Table 3.13), and sociodemographic characteristics on the choice of field of study for the students of the control group. Each coefficient is obtained from a multivariate regression with high school fixed effects, where the dependent variable is the probability of being observed in science track the year after the intervention for the sample of year 10-students (first graph), and probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students (second graph). Standard errors are clustered at the high school level.

Source: Authors' own data.

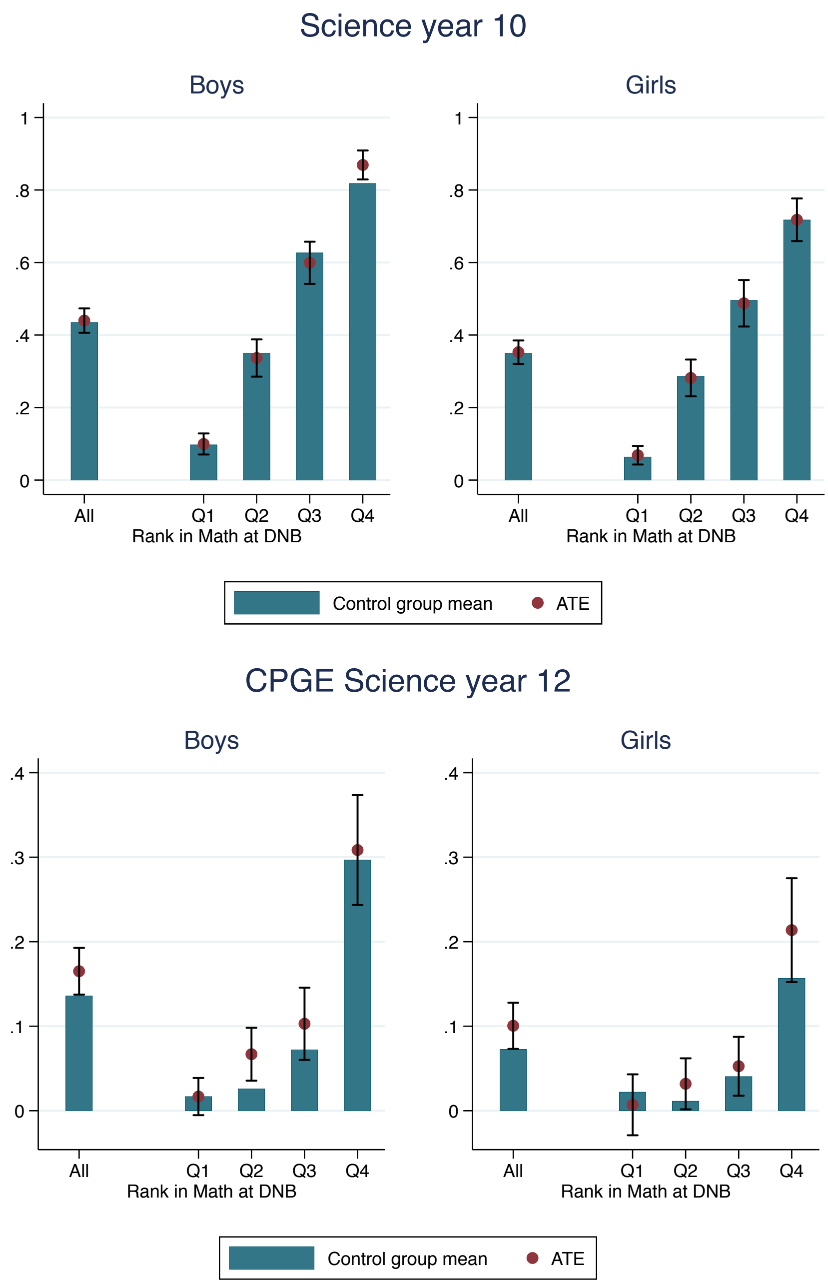


Figure 3.5 – Treatment effect on choice by quartile of grade in mathematics at DNB

The figure shows the treatment effect on the choice of field of study according to students' past performance in mathematics at DNB final exam. In the first graph, the variable of interest is the probability of being observed in science track the year after the intervention for the sample of year 10-students. In the second graph, it is the probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

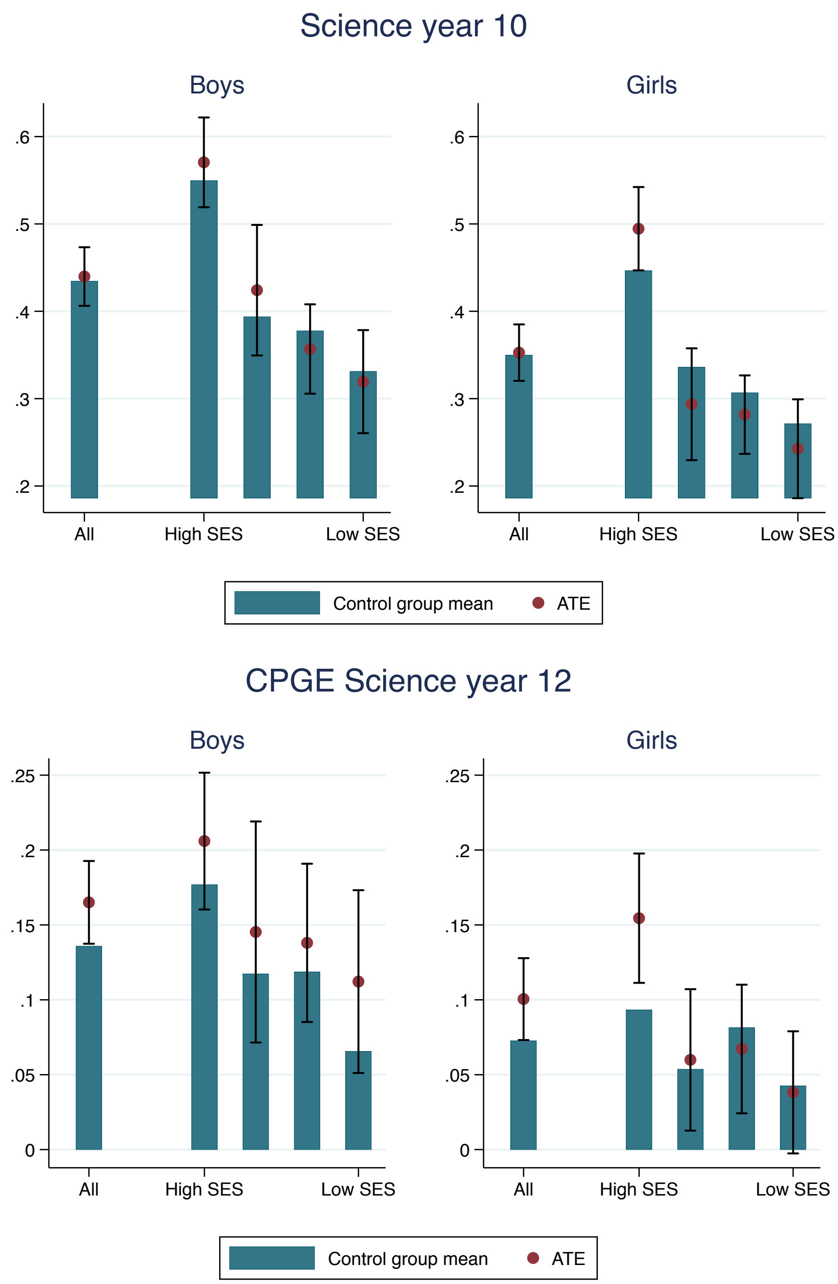


Figure 3.6 – Treatment effect on choice by socioeconomic status

The figure shows the treatment effect on the choice of field of study according to students' socioeconomic status. In the first graph, the variable of interest is the probability of being observed in science track the year after the intervention for the sample of year 10-students. In the second graph, it is the probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

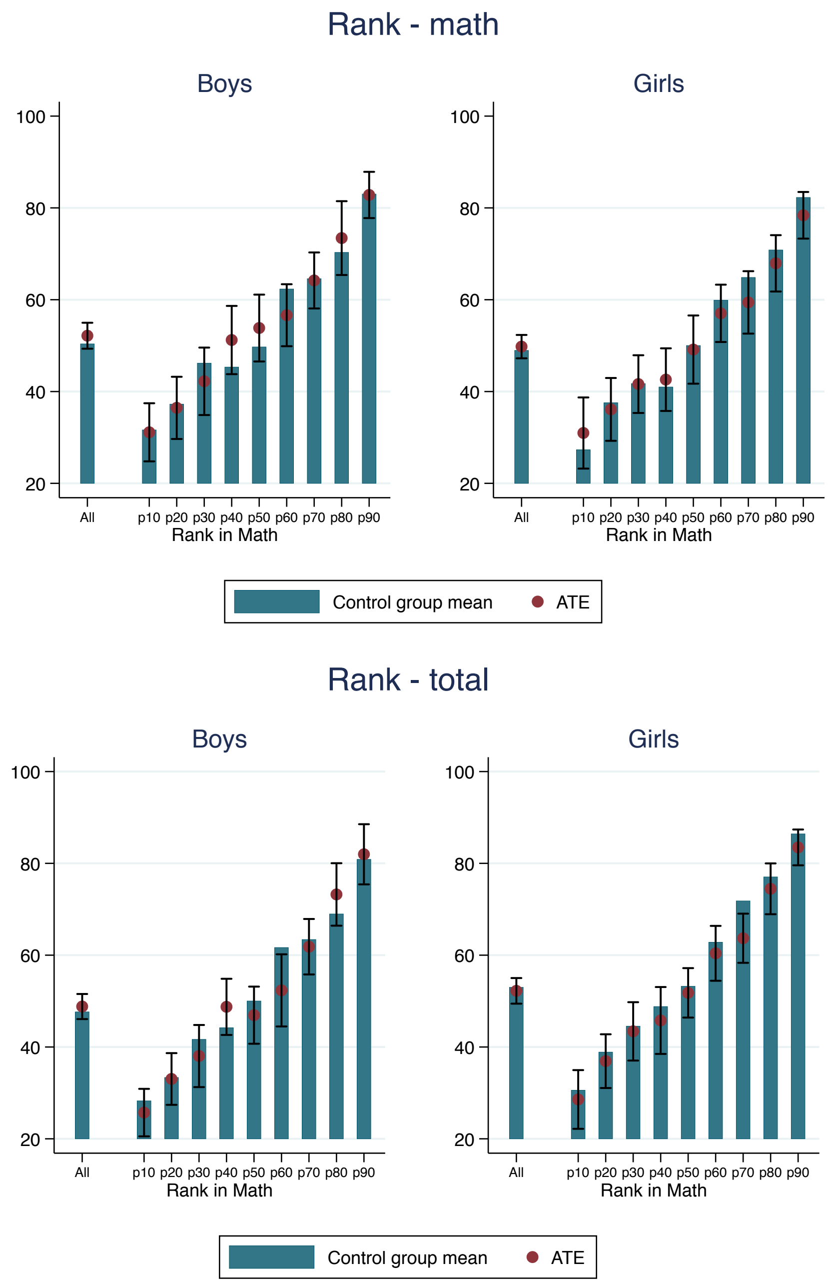


FIGURE 3.7 – TREATMENT EFFECT ON GRADES AT BAC

The figure shows the treatment effect on performance at the *baccalauréat* final exam, for the sample of students in year 12, by percentile rank of past performance in mathematics. The rank of past performance in mathematics is obtained from grades in mathematics one year before the intervention (non-blind score). Similar results are obtained when we use rank at DNB mathematics final exam instead. In the first graph, the variable of interest is the rank for the BAC final exam in mathematics (blind score). In the second graph, it is average total rank. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

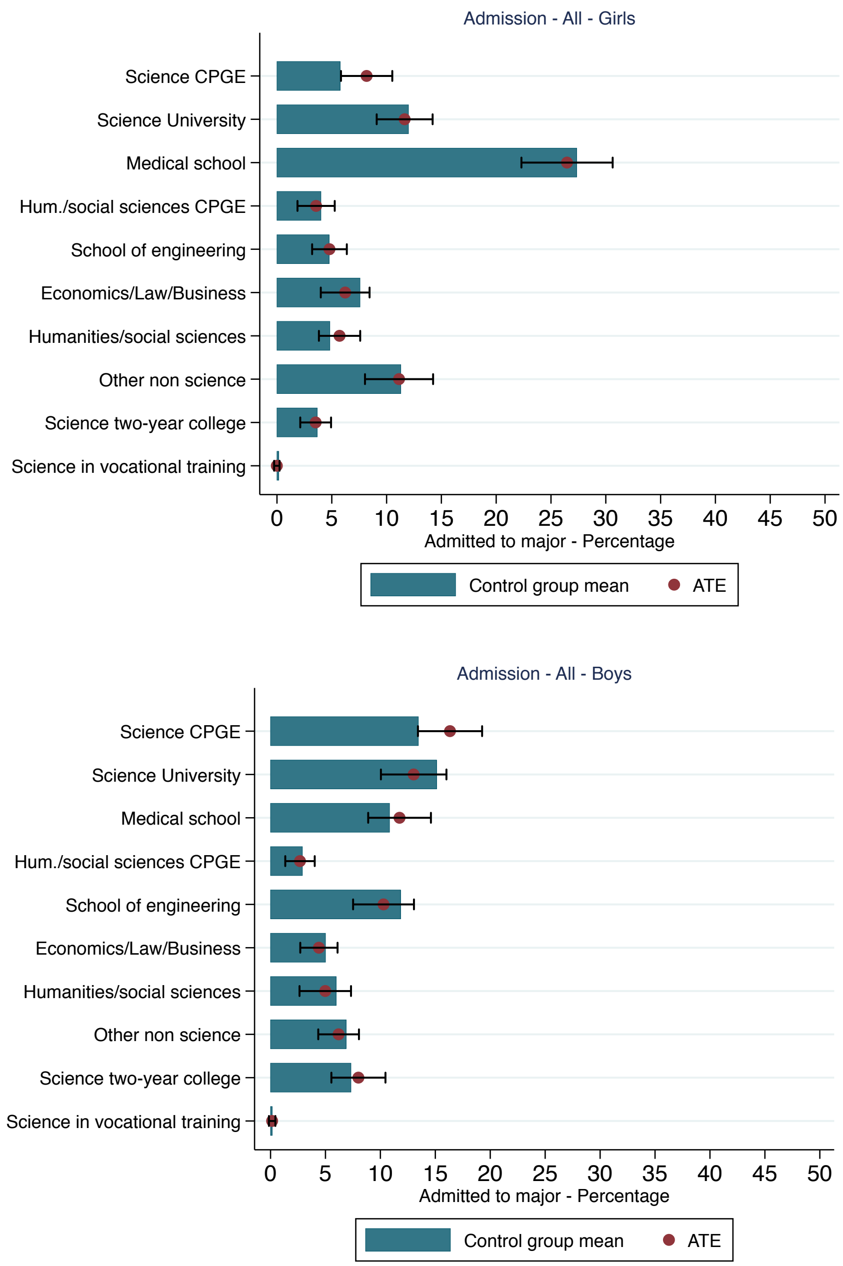


Figure 3.8 – Treatment effect on admission outcomes

The figure shows the treatment effect on admission outcomes for the sample of students in year 12. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

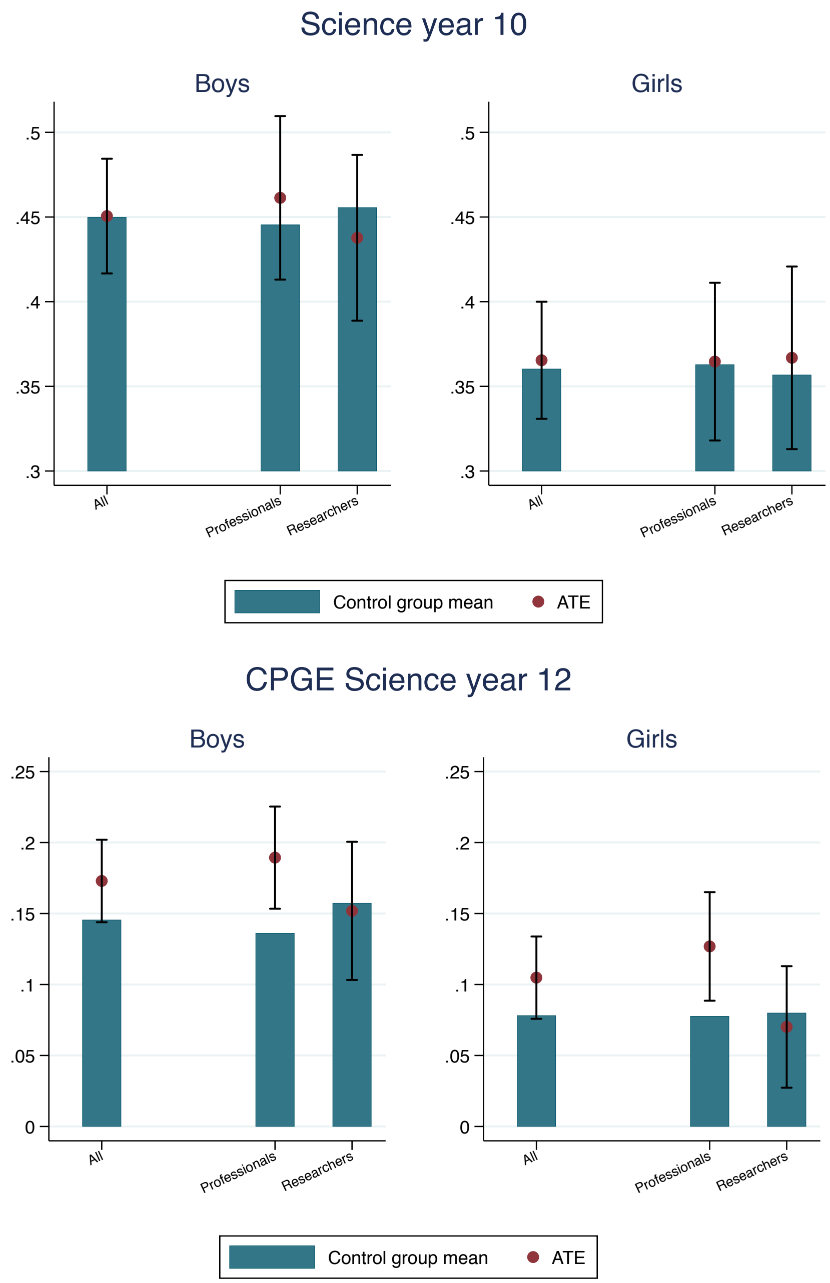


Figure 3.9 – Treatment effect on choice by type of ambassadors - occupation

The figure shows the treatment effect on the choice of field of study according to ambassadors' occupation (privately employed professionals or researchers in Ph.D.program or post-doc). In the first graph, the variable of interest is the probability of being observed in science track the year after the intervention for the sample of year 10-students. In the second graph, it is the probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

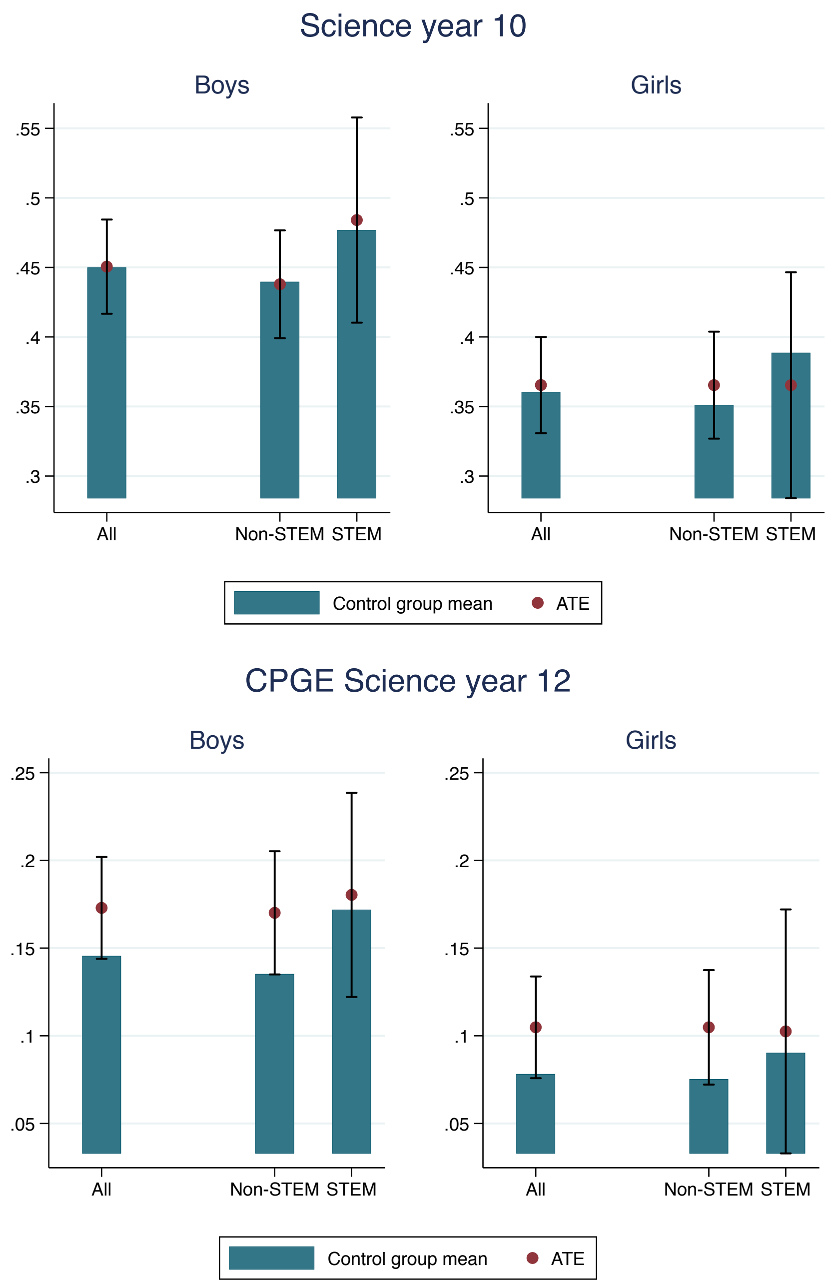


Figure 3.10 – Treatment effect on choice by type of ambassadors - field

The figure shows the treatment effect on the choice of field of study according to ambassadors' main subject (STEM or non-STEM). In the first graph, the variable of interest is the probability of being observed in science track the year after the intervention for the sample of year 10-students. In the second graph, it is the probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

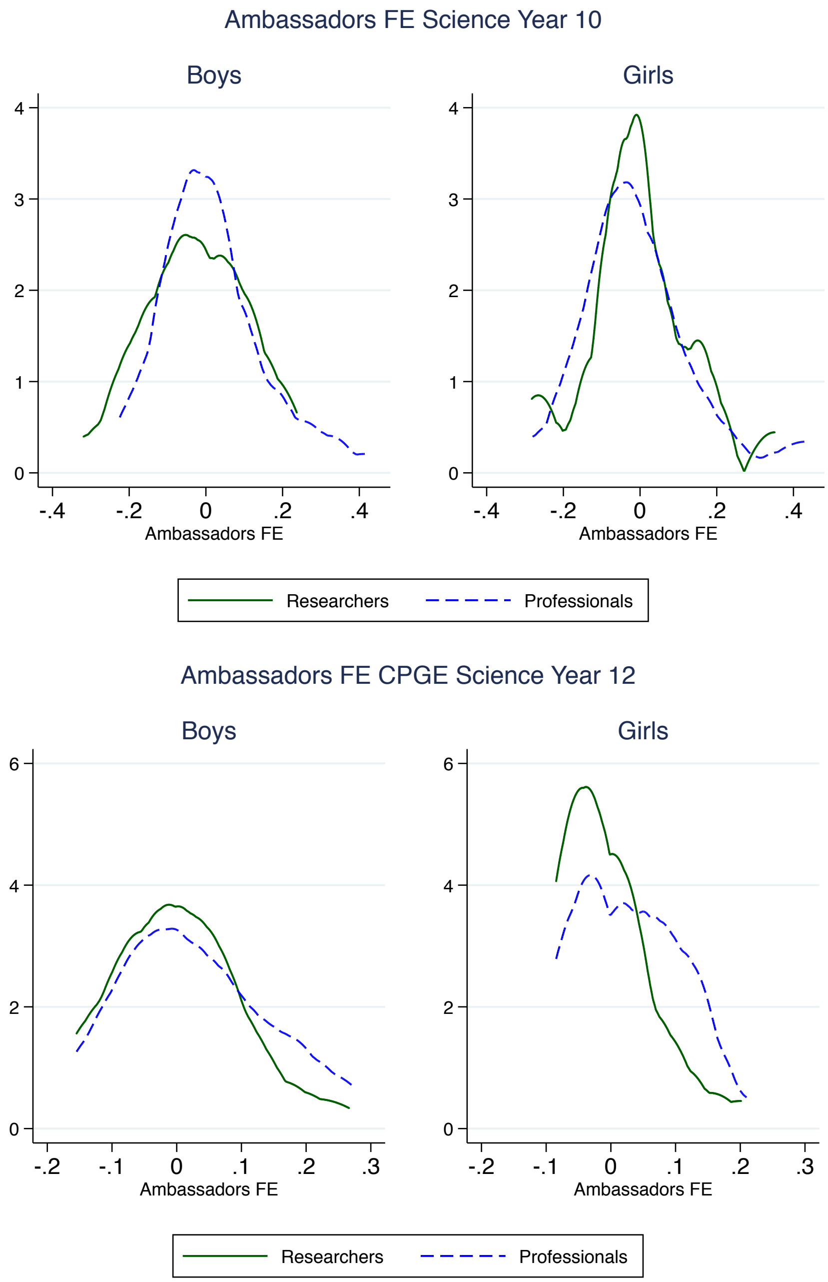


FIGURE 3.11 – AMBASSADORS FIXED EFFECT

The figure plots the distribution of ambassadors fixed effects according to the type of ambassadors on, respectively, the probability of being observed in science track the year after the intervention for the sample of year 10-students, and on the probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students. Ambassadors' fixed effects are obtained from a regression where treatment has been interacted with each ambassadors' individual dummy variable, and that includes high school fixed effects.

Source: Authors' own data.

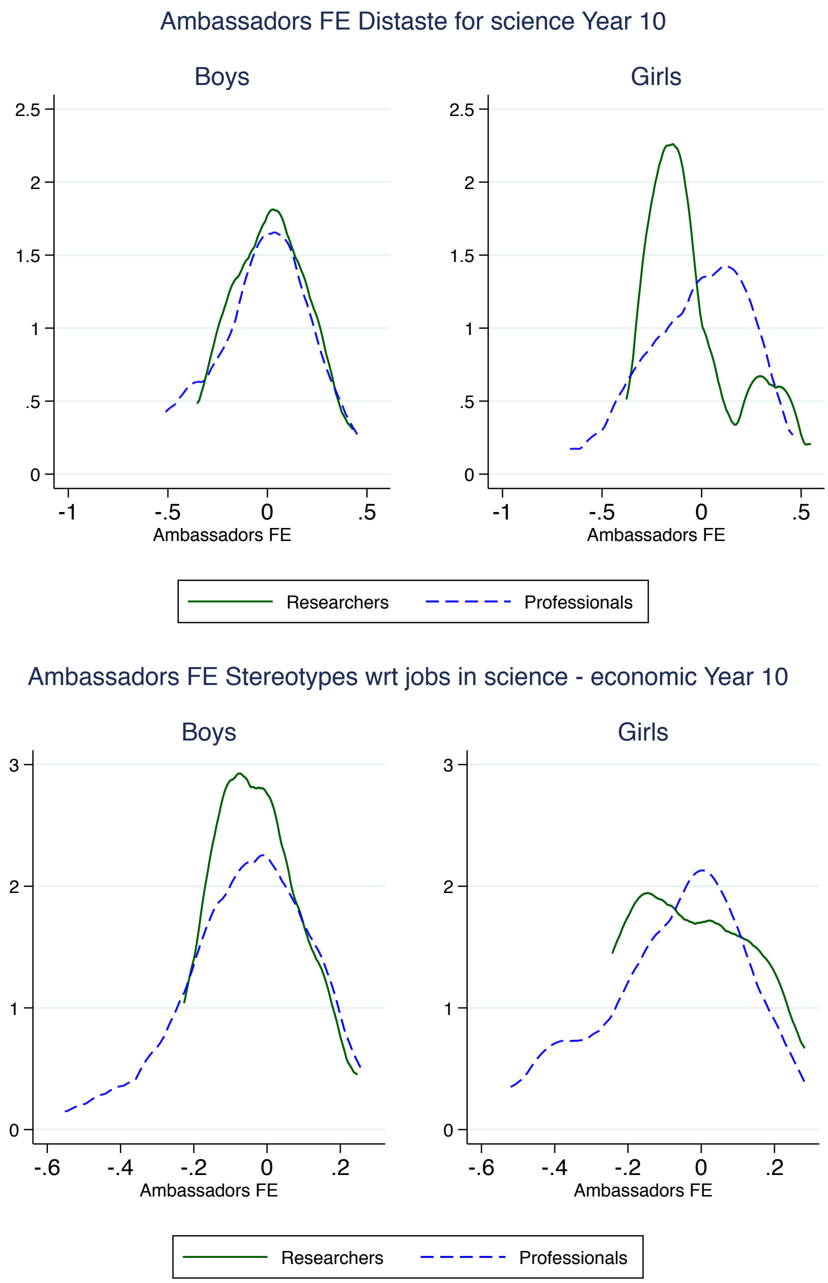


Figure 3.12 – Ambassadors fixed effect - stereotypes

The figure plots the distribution of ambassadors fixed effects according to the type of ambassadors on, respectively, the factor of "distaste for science", as obtained from the factor analysis presented in Table 3.13, and on the prevalence of stereotypes associated to the *social* dimension of jobs in science, for the sample of year 10-students. Ambassadors' fixed effects are obtained from a regression where treatment has been interacted with each ambassadors' individual dummy variable, and that includes high school fixed effects.

Source: Authors' own data.

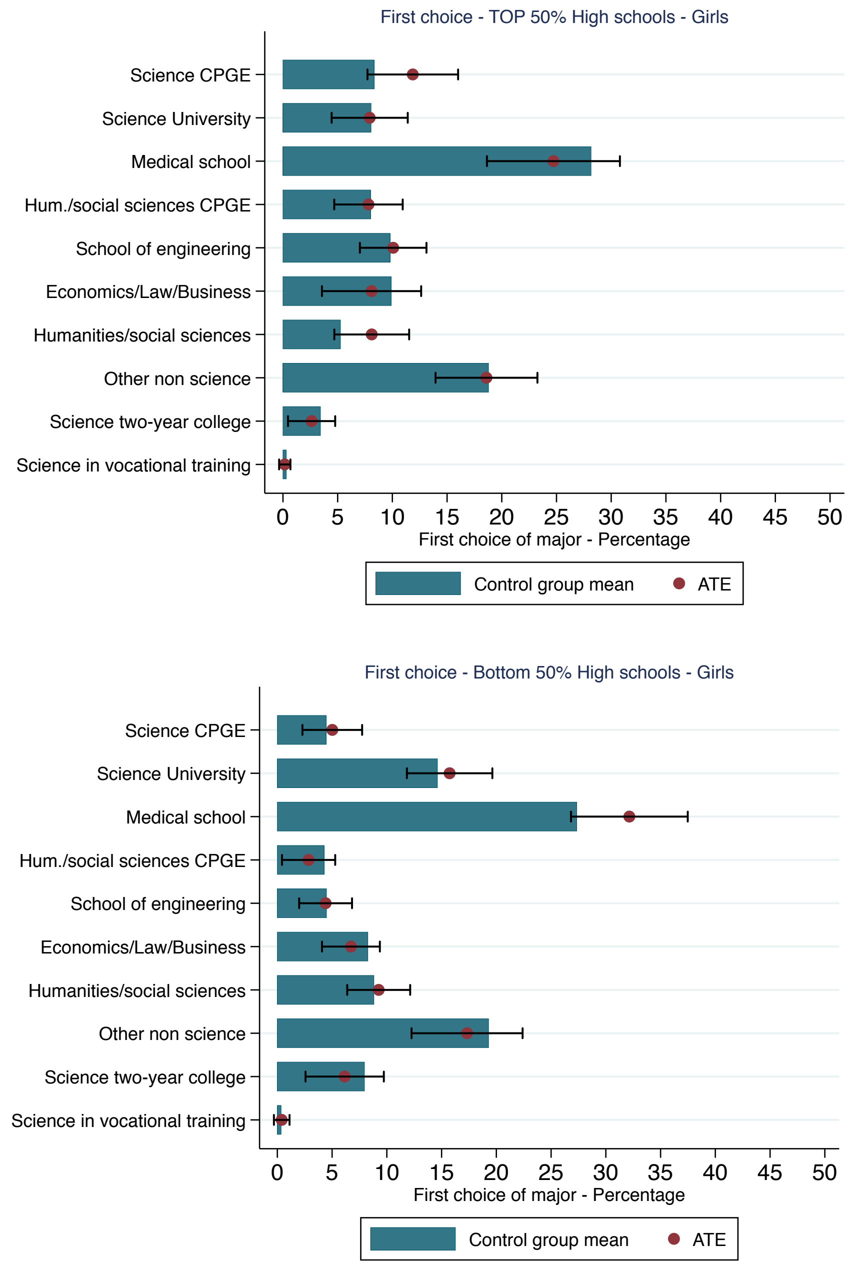


Figure 3.13 – Impact of treatment on first choice for post-secondary education by school environment

The figure reports, for female students, the treatment effect on the first choice for post-secondary education. In the first graph, the sample is restricted to year 12-students in high schools where the average rank in mathematics at DNB national exam is greater than the median, and in the second where the average in lower than the median. Results are presented for the whole group, and by percentile rank in mathematics at *baccalauréat* final exam (blind scores) computed at the class-level. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

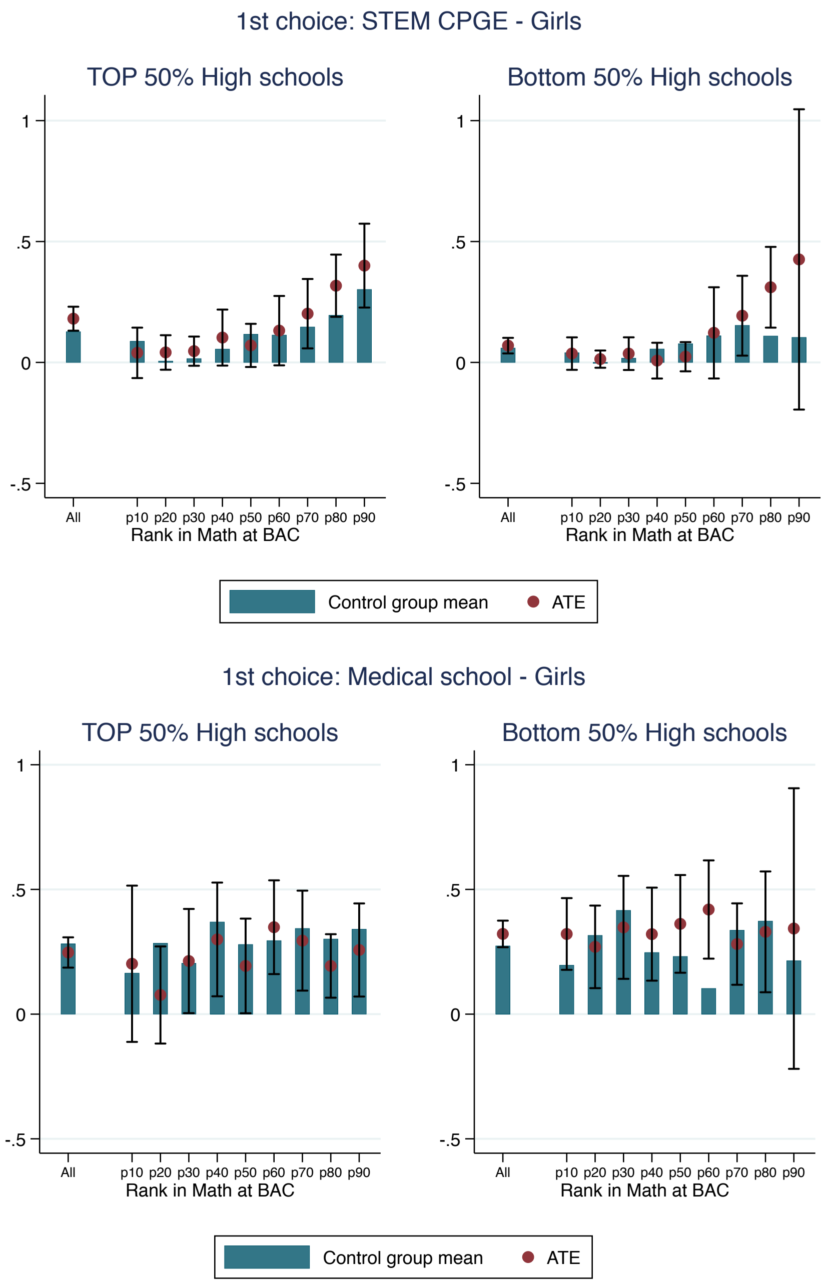


Figure 3.14 – Impact of treatment on first choice by school environment and ability

The figure reports, for female students, the treatment effect on the probability of choosing STEM selective program or medical studies as a first choice for post-secondary education. In the first and the third graph, the sample is restricted to year 12-students in high schools where the average rank in mathematics at DNB national exam is greater than the median, and in the second and fourth graph where the average in lower than the median. Results are presented for the whole group, and by percentile rank in mathematics at *baccalauréat* final exam (blind scores). Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

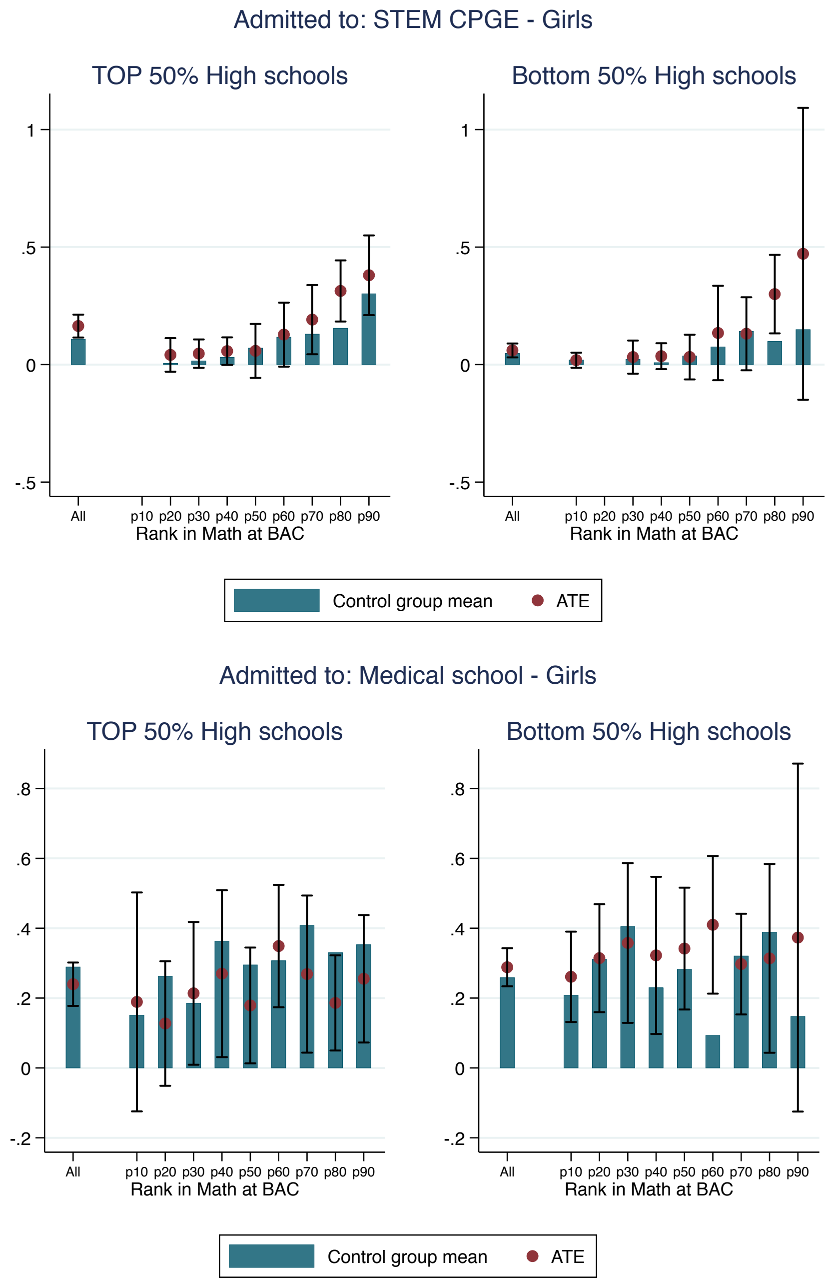


Figure 3.15 – Impact of treatment on admission by school environment and ability

The figure reports, for female students, the treatment effect on the probability of admission in selective science program, and on the probability of admission in medical studies, according to high schools' average level. In the first and the third graph, the sample is restricted to year 12-students in high schools where the average rank in mathematics at DNB national exam is greater than the median, and in the second and fourth graph where the average in lower than the median. Results are presented for the whole group, and by percentile rank in mathematics at *baccalauréat* final exam (blind scores). Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

Table 3.1 – Descriptive statistics

	France	All three educational districts	Experimental sample
Number of high schools	2,356	1,819	97
Number of students in grade 10	539,910	115,327	11,881
Number of students in grade 12 with science	178,489	38,573	5,415
Female	0.517	0.508	0.515
Non-French	0.033	0.058	0.055
Receives a scholarship	0.137	0.112	0.115
High SES (A)	0.321	0.489	0.469
Rather high SES (B)	0.151	0.212	0.237
Rather low SES (C)	0.281	0.387	0.405
Low SES (D)	0.216	0.316	0.331
At least one parent unemployed	0.031	0.035	0.036

Note: This table presents descriptive statistics comparing several high school characteristics for France, the three educational districts where the experiment took place, and the final experimental sample.
Source: Ministère de l'Éducation Nationale, *Académies* of *Créteil*, *Paris* and *Versailles*, and authors' own data.

Table 3.2 – Descriptive statistics treated/control groups

	Control group	Treated group	Difference T-C	P-value
Girl	0.523	0.508	-0.015	0.045
Non-French	0.056	0.056	0.000	0.943
Receives a scholarship	0.119	0.119	-0.001	0.894
High SES (A)	0.456	0.465	0.009	0.219
Rather high SES (B)	0.238	0.239	0.001	0.914
Rather low SES (C)	0.414	0.401	-0.013	0.082
Low SES (D)	0.336	0.340	0.004	0.560
At least one parent unemployed	0.035	0.038	0.004	0.204

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Table 3.2 – continued from previous page

	Control group	Treated group	Difference T-C	P-value
Average rank DNB in math - blind score	50.023	50.172	0.150	0.731
Average rank DNB in French - blind score	49.764	50.389	0.624	0.152

Note: This table presents descriptive statistics for the treated and control groups.
Source: Authors' own data.

Table 3.3 – Descriptive statistics - Type of slides

	All ambassadors		Randomized ambassadors	
	Regular set of slides	Slides with information on employment and wages	Regular set of slides	Slides with information on employment and wages
Number of ambassadors	56	36	7	8
Number of students	3707	4401	1149	1033
Percentage of students	45.72	54.28	52.66	47.34

Source: Authors' own data.

Table 3.4 – Characteristics of ambassadors

	N	Percent
Post-doc/Ph.D. students	21	43.71
Privately employed	35	56.29
STEM	13	25.72
Non-STEM	43	74.28
Total	56	100.00

Source: Authors' own data.

Table 3.5 – Effect of treatment on stereotypes Year 10

Panel: Year 10	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Opinions on science								
Likes science: Agree	0.665	-0.007	0.018	5734	0.796	-0.002	0.014	5113
Some jobs in science are interesting: Agree	0.848	0.015	0.011	5719	0.858	-0.005	0.010	5085
Would consider jobs in science: Agree	0.468	0.004	0.018	5645	0.594	0.015	0.015	5029
Better wages in science: Agree	0.631	0.008	0.017	5650	0.660	0.023	0.014	5031
Studies in science are long: Agree	0.838	-0.087***	0.012	5720	0.849	-0.073***	0.011	5075
Jobs in science are dreary: Agree	0.281	-0.024*	0.014	5673	0.308	0.005	0.015	5065
Hard to maintain work-life balance: Agree	0.293	-0.021*	0.012	5717	0.274	-0.014	0.012	5067
Jobs in science are solitary: Agree	0.323	-0.058***	0.015	5709	0.300	-0.055***	0.014	5066
Opinions on women/men in science								
More men in science-related jobs: True	0.631	0.151***	0.014	5722	0.624	0.171***	0.016	5084
Men are more gifted in math: True	0.183	-0.020	0.012	5729	0.294	-0.047***	0.014	5059
Brains of M/W are different: True	0.206	-0.046***	0.011	5686	0.202	-0.043***	0.010	5052
Women like science less than men: True	0.154	0.059***	0.013	5714	0.191	0.110***	0.016	5062
Progress for women working in science is slow: True	0.606	0.120***	0.015	5674	0.524	0.162***	0.014	5048
Synthetic measure of stereotypes								
Score: taste for science	-0.109	0.017	0.037	5767	0.141	0.015	0.033	5128
Score: facts on science	-0.023	0.258***	0.030	5784	0.016	0.277***	0.039	5161
Score: stereotypes on science	-0.002	-0.199***	0.032	5770	-0.026	-0.140***	0.038	5147
Score: stereotypes on women in science	-0.075	0.104***	0.035	5783	0.064	0.113***	0.035	5146

Note: This table presents the average treatment effect on the persistence of stereotypes ba. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.6 – Effect of treatment on stereotypes Year 12

Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Opinions on science								
Likes science: Agree	0.915	-0.002	0.012	2443	0.929	0.013	0.011	2483
Some jobs in science are interesting: Agree	0.960	0.012*	0.007	2446	0.939	0.022**	0.010	2481
Would consider jobs in science: Agree	0.716	0.037**	0.017	2439	0.763	0.029	0.018	2467
Better wages in science: Agree	0.527	0.064**	0.024	2430	0.570	0.030	0.021	2463
Studies in science are long: Agree	0.664	-0.106***	0.020	2442	0.722	-0.091***	0.019	2477
Jobs in science are dreary: Agree	0.172	-0.020	0.016	2440	0.232	-0.030	0.021	2473
Hard to maintain work-life balance: Agree	0.225	-0.049**	0.021	2445	0.165	-0.012	0.014	2475
Jobs in science are solitary: Agree	0.234	-0.093***	0.016	2434	0.204	-0.047***	0.017	2477
Opinions on women/men in science								
More men in science-related jobs: True	0.719	0.113***	0.021	2453	0.721	0.139***	0.019	2476
Men are more gifted in math: True	0.162	-0.036**	0.017	2447	0.272	-0.032	0.021	2463
Brains of M/W are different: True	0.150	-0.029**	0.014	2437	0.184	-0.039**	0.019	2473
Women like science less than men: True	0.074	0.044***	0.012	2444	0.149	0.065***	0.019	2471
Progress for women working in science is slow: True	0.623	0.090***	0.026	2431	0.596	0.073***	0.023	2463
Synthetic measure of stereotypes								
Score: taste for science	-0.024	0.061	0.045	2454	0.024	0.046	0.046	2489
Score: facts on science	-0.026	0.261***	0.054	2463	0.029	0.251***	0.048	2502
Score: stereotypes on science	-0.005	-0.257***	0.045	2460	0.005	-0.142***	0.047	2496
Score: stereotypes on women in science	-0.134	0.064	0.044	2461	0.145	0.030	0.054	2498

Note: This table presents the average treatment effect on the persistence of stereotypes ba. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.7 – Effect of treatment on the preferred jobs - Year 10

Panel: Year 10	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Would consider this job on a 1-to-10 scale								
Could like being a pharmacist	0.251	-0.003	0.013	5711	0.153	-0.003	0.011	5061
Could like being a computer scientist	0.135	0.000	0.011	5710	0.536	0.021	0.014	5076
Could like being a engineer	0.276	0.026*	0.014	5713	0.667	-0.004	0.016	5090
Could like being a lawyer	0.487	-0.016	0.015	5720	0.302	0.002	0.012	5058
Could like being a doctor	0.453	-0.032*	0.017	5726	0.346	-0.005	0.014	5074
Could like being a therapist	0.539	-0.021	0.013	5717	0.283	-0.014	0.012	5069
Could like being a renewable energy technician	0.083	0.010	0.008	5708	0.302	0.020	0.014	5055
Could like being a chemist	0.256	0.011	0.014	5716	0.367	0.006	0.019	5058
Could like being a researcher in biology	0.314	-0.015	0.014	5721	0.323	0.016	0.014	5062
Could like being an industrial designer	0.290	0.031*	0.016	5672	0.332	0.041***	0.015	5044
Could like being in a job in STEM*	0.496	0.032*	0.017	5784	0.808	0.013	0.014	5161
Could like being in a job in non-STEM science*	0.629	-0.018	0.016	5784	0.596	-0.009	0.016	5161
Could like being a in a non scientific job*	0.693	-0.023*	0.013	5784	0.429	-0.008	0.013	5161

Note: This table presents the average treatment effect on preferred jobs. Items with a * correspond to oucomes that have been constructed from several variables of the questionnaire. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.8 – Effect of treatment on the preferred jobs - Year 12

Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Would consider this job on a 1-to-10 scale								
Could like being a pharmacist	0.376	-0.010	0.022	2442	0.199	0.018	0.021	2472
Could like being a computer scientist	0.175	-0.009	0.017	2439	0.500	-0.001	0.025	2474
Could like being a engineer	0.468	0.014	0.024	2442	0.721	0.013	0.020	2481
Could like being a lawyer	0.384	-0.030*	0.018	2440	0.273	0.004	0.022	2471
Could like being a doctor	0.587	-0.005	0.022	2448	0.377	0.019	0.023	2476
Could like being a therapist	0.489	-0.037*	0.021	2439	0.324	-0.034	0.021	2473
Could like being a renewable energy technician	0.183	-0.020	0.016	2439	0.354	0.017	0.021	2469
Could like being a chemist	0.381	-0.004	0.025	2436	0.348	-0.007	0.019	2477
Could like being a researcher in biology	0.507	0.019	0.021	2444	0.379	-0.016	0.023	2476
Could like being an industrial designer	0.271	0.025	0.017	2431	0.346	0.011	0.020	2470
Could like being in a job in STEM*	0.635	0.015	0.020	2463	0.849	0.000	0.015	2502
Could like being in a job in non-STEM science*	0.817	-0.015	0.019	2463	0.636	0.014	0.022	2502
Could like being a in a non scientific job*	0.615	-0.028	0.018	2463	0.440	-0.019	0.024	2502

Note: This table presents the average treatment effect on preferred jobs. Items with a * correspond to oucomes that have been constructed from several variables of the questionnaire. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.9 – Effect of treatment on stereotypes associated to female/male scientists - Year 10

Panel: Year 10	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Quality attributed to a male scientist								
Men scientists - *interesting*	0.765	-0.004	0.017	2804	0.811	0.008	0.017	2511
Men scientists - *elegant*	0.582	-0.038*	0.022	2695	0.580	-0.007	0.022	2402
Men scientists - *respected*	0.905	0.003	0.012	2766	0.897	-0.016	0.011	2494
Men scientists - *exemplary*	0.663	-0.042**	0.016	2768	0.699	0.002	0.019	2482
Men scientists - *creative*	0.585	0.045**	0.019	2894	0.685	0.019	0.018	2588
Men scientists - *social*	0.442	0.018	0.021	2894	0.521	0.039*	0.021	2588
Men scientists - *extravert*	0.394	-0.011	0.018	2894	0.488	0.000	0.017	2588
Quality attributed to a female scientist								
Women scientists - *interesting*	0.908	-0.008	0.011	2835	0.862	-0.006	0.014	2474
Women scientists - *elegant*	0.692	0.030*	0.017	2702	0.680	-0.020	0.020	2363
Women scientists - *respected*	0.868	-0.026*	0.014	2791	0.819	-0.044***	0.016	2452
Women scientists - *exemplary*	0.781	-0.023	0.017	2760	0.717	-0.002	0.020	2437
Women scientists - *creative*	0.689	0.065***	0.019	2890	0.770	-0.002	0.018	2573
Women scientists - *social*	0.608	0.034*	0.019	2890	0.624	0.054***	0.019	2573
Women scientists - *extravert*	0.442	-0.036*	0.020	2890	0.414	0.005	0.018	2573

Note: This table presents the average treatment effect on stereotypes traditionally associated to female/male scientists. The gender of the scientist has been randomized in the questionnaire and associated to several stereotypical traits. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.10 – Effect of treatment on stereotypes associated to female/male scientists - Year 12

Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Quality attributed to a male scientist								
Men scientists - *interesting*	0.883	-0.006	0.020	1202	0.865	0.037*	0.020	1233
Men scientists - *elegant*	0.546	-0.024	0.030	1155	0.573	-0.018	0.029	1181
Men scientists - *respected*	0.951	0.009	0.013	1193	0.920	-0.013	0.017	1214
Men scientists - *exemplary*	0.696	-0.032	0.027	1190	0.722	-0.022	0.029	1215
Men scientists - *creative*	0.666	0.025	0.025	1225	0.755	0.024	0.024	1255
Men scientists - *social*	0.413	0.062*	0.035	1225	0.523	0.059**	0.023	1255
Men scientists - *extravert*	0.327	0.025	0.026	1225	0.431	-0.024	0.026	1255
Quality attributed to a female scientist								
Women scientists - *interesting*	0.967	0.001	0.011	1225	0.896	-0.001	0.018	1204
Women scientists - *elegant*	0.737	-0.004	0.027	1180	0.656	-0.021	0.032	1171
Women scientists - *respected*	0.865	0.000	0.020	1212	0.809	-0.011	0.024	1194
Women scientists - *exemplary*	0.844	-0.014	0.021	1202	0.739	-0.027	0.028	1186
Women scientists - *creative*	0.812	0.023	0.018	1238	0.763	0.012	0.022	1247
Women scientists - *social*	0.634	0.056**	0.026	1238	0.609	0.026	0.034	1247
Women scientists - *extravert*	0.404	-0.023	0.027	1238	0.344	0.009	0.029	1247

Note: This table presents the average treatment effect on stereotypes traditionally associated to female/male scientists. The gender of the scientist has been randomized in the questionnaire and associated to several stereotypical traits. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.11 – Effect of treatment on the preferred fields of study - Year 10

Panel: Year 10	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Major choices (intention)								
Considers science majors	0.468	-0.011	0.018	5565	0.640	-0.002	0.017	4913
Number of Choices*	1.198	-0.005	0.011	5570	1.194	-0.006	0.012	4915
Choice (intention): Other	0.005	0.003	0.002	5784	0.015	-0.007**	0.003	5161
Date Choice	1.732	0.023	0.025	5632	1.708	-0.004	0.022	5008
Hasn't started thinking about choice	0.019	0.008*	0.005	5632	0.033	-0.001	0.005	5008
Parents strongly support choice	0.197	-0.012	0.011	5736	0.220	-0.003	0.013	5111
Hesitates about choice	0.423	0.010	0.014	5764	0.392	-0.016	0.015	5128
Major choices for year 10 (intention)								
Choice (intention): Première S	0.452	-0.005	0.019	5713	0.562	0.000	0.018	5082
Choice (intention): Première L	0.170	-0.012	0.013	5713	0.051	-0.003	0.007	5082
Choice (intention): Première ES	0.369	0.025*	0.014	5713	0.296	0.008	0.015	5082
Choice (intention): Première Tech	0.147	-0.015	0.014	5713	0.197	-0.013	0.015	5082
Choice (intention): Première Pro	0.011	0.003	0.003	5713	0.022	-0.002	0.004	5082
Choice (intention): Première Tech STI2D	0.013	0.004	0.004	5770	0.167	-0.013	0.015	5149
Choice (intention): Première Tech ST2A	0.026	-0.009	0.009	5770	0.011	0.000	0.004	5149
Choice (intention): Première Tech STMG	0.109	0.001	0.010	5770	0.109	0.009	0.012	5149
Choice (intention): Première Tech ST2S	0.082	-0.014	0.011	5770	0.015	-0.001	0.004	5149
Choice (intention): Première Tech STL	0.023	0.003	0.005	5770	0.026	-0.004	0.004	5149
Choice (intention): Première Tech TMD	0.001	-0.001*	0.001	5770	0.001	-0.000	0.001	5149
Choice (intention): Première Tech hôtellerie	0.002	0.001	0.001	5770	0.006	-0.004*	0.002	5149
Choice (intention): Première Tech STAV	0.001	0.001	0.001	5770	0.000	0.001	0.001	5149
Preferred fields of study								
Field (intention): biology	0.146	-0.011	0.010	5750	0.140	0.019*	0.010	5094
Field (intention): STEM	0.197	-0.007	0.012	5750	0.515	-0.009	0.017	5094
Field (intention): Medical, dental	0.321	-0.029*	0.015	5750	0.152	-0.002	0.012	5094
Field (intention): Health and social work	0.193	-0.025**	0.012	5750	0.049	-0.003	0.007	5094
Field (intention): Economics, Business, Management	0.415	0.014	0.013	5750	0.312	0.002	0.015	5094
Field (intention): Humanities	0.230	-0.004	0.014	5750	0.082	0.014*	0.008	5094
Field (intention): Sport	0.080	-0.001	0.007	5750	0.251	-0.017	0.013	5094
Field (intention): Arts	0.170	-0.006	0.015	5750	0.071	0.004	0.009	5094
Field (intention): Other	0.072	0.012*	0.007	5750	0.080	-0.001	0.008	5094
Field (intention): STEM only	0.042	0.001	0.007	4840	0.313	-0.015	0.017	3596
Number of fields*	1.945	-0.059*	0.030	5408	1.772	0.004	0.030	4792

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Table 3.11 – continued from previous page

Panel: Year 10	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Factors for choice								
Interest for major	8.118	0.008	0.063	5722	7.944	0.053	0.076	5084
Ability to specialize	5.410	-0.135	0.092	5705	5.550	0.005	0.089	5060
Having access to various jobs	7.603	-0.004	0.065	5722	7.606	-0.008	0.076	5093
Other majors are difficult	4.930	-0.198*	0.103	5719	4.394	-0.056	0.096	5083
Brings opportunity for stable job	6.963	0.078	0.096	5735	6.985	0.023	0.080	5098
Wages concerns	7.563	-0.031	0.075	5727	7.773	0.003	0.068	5091
Feeling comfortable	8.874	-0.065	0.047	5742	8.552	0.031	0.053	5100
Workload	6.109	-0.163*	0.087	5703	5.855	0.124	0.089	5059
Having female peers	2.269	0.128	0.094	5727	3.801	0.045	0.119	5075
Having male peers	2.233	0.080	0.095	5730	2.898	0.245**	0.103	5083

Note: This table presents the average treatment effect on the preferred fields of study. Items with a * correspond to oucomes that have been constructed from several variables of the questionnaire. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.12 – Effect of treatment on the preferred fields of study - Year 12

Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Major choices (intention)								
Considers science majors	0.649	0.016	0.019	2453	0.735	-0.013	0.021	2487
Number of Choices*	1.550	-0.032	0.030	2446	1.545	0.012	0.033	2485
Choice (intention): Other	0.127	-0.018	0.014	2463	0.126	0.005	0.014	2502
Date Choice	1.754	-0.035	0.033	2422	1.783	-0.002	0.035	2456
Hasn't started thinking about choice	0.016	0.004	0.006	2422	0.028	-0.006	0.006	2456
Parents strongly support choice	0.243	0.004	0.019	2452	0.223	-0.017	0.016	2488
Hesitates about choice	0.456	-0.017	0.021	2454	0.401	-0.012	0.020	2497
Major choices for year 12 (intention)								
Choice (intention): University	0.620	0.026	0.022	2438	0.484	0.014	0.025	2450
Choice (intention): CPGE	0.318	0.007	0.023	2438	0.431	0.008	0.022	2450
Choice (intention): BTS	0.095	-0.008	0.015	2438	0.095	-0.011	0.012	2450
Choice (intention): IUT	0.168	-0.024	0.017	2438	0.264	-0.021	0.020	2450
Choice (intention): specialized school	0.221	-0.027	0.019	2438	0.149	0.008	0.018	2450
Preferred fields of study								
Field (intention): biology	0.319	-0.010	0.023	2449	0.181	-0.001	0.021	2478
Field (intention): STEM	0.284	0.000	0.022	2449	0.585	-0.002	0.026	2478
Field (intention): Medical, dental	0.439	0.000	0.024	2449	0.200	0.005	0.020	2478
Field (intention): Health and social work	0.187	-0.014	0.014	2449	0.052	0.014	0.010	2478
Field (intention): Economics, Business, Management	0.248	-0.005	0.019	2449	0.208	0.017	0.018	2478
Field (intention): Humanities	0.155	-0.005	0.016	2449	0.089	-0.012	0.013	2478
Field (intention): Sport	0.072	-0.004	0.011	2449	0.158	0.011	0.016	2478
Field (intention): Arts	0.104	-0.009	0.014	2449	0.071	-0.014	0.011	2478
Field (intention): Other	0.078	0.012	0.011	2449	0.097	0.004	0.013	2478
Field (intention): STEM only	0.122	0.002	0.018	1991	0.446	-0.019	0.030	1835
Number of fields*	1.885	-0.027	0.043	2453	1.645	0.016	0.042	2487
Factors for choice								
Interest for major	9.005	0.061	0.067	2445	8.786	0.045	0.079	2485
Ability to specialize	5.223	-0.112	0.135	2445	5.411	-0.118	0.152	2479
Having access to various jobs	7.521	-0.020	0.102	2447	7.266	0.146	0.110	2480
Other majors are difficult	3.815	-0.152	0.126	2445	3.527	0.024	0.134	2484
Brings opportunity for stable job	7.545	0.191	0.124	2446	7.356	-0.038	0.116	2489
Wages concerns	7.626	0.265**	0.123	2450	7.831	0.100	0.101	2489

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Table 3.12 – continued from previous page

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Feeling comfortable	9.043	-0.007	0.061	2452	8.773	-0.101	0.066	2485
Workload	5.682	0.109	0.117	2446	5.776	-0.145	0.106	2474
Having female peers	1.805	0.238*	0.135	2440	3.808	0.316*	0.170	2483
Having male peers	1.837	0.182	0.137	2444	2.697	0.344**	0.140	2481

Note: This table presents the average treatment effect on the preferred fields of study. Items with a * correspond to oucomes that have been constructed from several variables of the questionnaire. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.13 – Factor analysis on the control group

	Lack of self-confidence	Distaste for science	Essentialist stereotypes	Stereotypes with respect to jobs in science - social -	Stereotypes with respect to jobs in science - economic -	Under-representation of women in science	Other	Uniqueness
Likes science	0.2828	**0.7354**	0.0545	0.0571	0.0444	-0.0040	0.0408	0.3693
Some jobs in science are interesting	0.1013	**0.7332**	0.0445	0.0826	-0.0246	-0.0138	-0.0241	0.442
Would consider jobs in science	0.2684	**0.7896**	0.0057	0.0737	-0.0247	0.0092	0.0045	0.2984
Better wages in science	-0.0207	0.1133	-0.1234	-0.1569	**-0.4826**	-0.0169	-0.0217	0.7132
Studies in science are long	0.0498	0.0609	0.0958	0.2466	**0.4695**	-0.0193	-0.0049	0.703
Jobs in science are dreary	-0.1082	-0.3556	-0.1051	-0.3787	-0.0754	0.0214	0.0051	0.7012
Hard to maintain work-life balance	0.1034	0.1528	0.1084	**0.5421**	0.1616	0.0320	0.0215	0.6327
Jobs in science are solitary	0.0879	0.2123	0.1509	**0.5441**	0.0989	0.0550	0.0115	0.6154
More men in science-related jobs	0.0689	0.0093	-0.2737	-0.0721	-0.0201	**-0.4042**	0.0196	0.7508
Men are more gifted in math	-0.0146	0.0502	**0.5774**	0.1172	0.0802	-0.0090	-0.0019	0.6437
Brains of M/W are different	-0.0003	0.0436	0.3421	0.0833	-0.0033	-0.0956	0.0339	0.8638
Women like science less than men	-0.0585	0.1109	**0.5619**	0.1187	0.0732	0.1064	0.0015	0.6377
Progress for women working in science is slow	0.0312	-0.0227	-0.0173	0.0718	-0.0206	**0.4117**	0.0170	0.8228
Lost in front of a math problem	**0.7161**	0.2374	0.0153	0.0884	0.0424	-0.0215	0.2182	0.3729
Worried when thinking about math	**0.6511**	0.1262	-0.0051	0.1063	0.0519	0.0118	0.2447	0.4862
Level in maths compared to girls	**0.8103**	0.1801	-0.0684	0.0197	0.0004	-0.0443	-0.1019	0.2936
Level in maths compared to boys	**0.7992**	0.1611	0.0286	-0.0158	-0.0200	0.0449	-0.1142	0.3187

Note: This table presents the results of the factor analysis (principal component) derived on the control group on questions related to stereotypes, where factors having an eigenvalue greater than 1 were retained. All variables were recoded to range from the lowest level of stereotypical views to the highest level. Factor weights are given with an orthogonal varimax rotation.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.14 – Persistence of the effect on stereotypes - Year 10

Panel: Year 10	Duration between treatment and post-treatment survey lower than					
	1-2 months		3-4 months		5-6 months	
	T-C	N	T-C	N	T-C	N
Lack of self-confidence						
Girls	0.045	1504	0.023	2720	-0.090	648
Boys	0.016	1370	0.023	2503	0.059	542
Distaste for science						
Girls	-0.138*	1504	0.031	2720	-0.041	648
Boys	-0.072	1370	0.012	2503	0.006	542
Stereotypes wrt preferences						
Girls	0.012	1504	0.057*	2720	0.159**	648
Boys	0.041	1370	0.083**	2503	-0.011	542
Stereotypes wrt jobs in science - social						
Girls	-0.188***	1504	-0.099***	2720	-0.029	648
Boys	-0.070	1370	-0.077***	2503	-0.050	542
Stereotypes wrt jobs in science - economic						
Girls	-0.066	1504	-0.092***	2720	-0.068	648
Boys	-0.038	1370	-0.044**	2503	-0.056	542
Underrepresentation of women						
Girls	0.250***	1504	0.220***	2720	0.286***	648
Boys	0.351***	1370	0.267***	2503	0.141***	542

Note: This table presents the average treatment effect on the persistence of stereotypes. Each row corresponds to a different subsamble based on the duration between treatment and survey, as reported in the post-treatment survey. Column (T-C) contains the coefficient of a treatment class dummy. Column (N) reports the number of observations. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.15 – Persistence of the effect on stereotypes - Year 12

Panel: Year 12	Duration between treatment and post-treatment survey lower than					
	1-2 months		3-4 months		5-6 months	
	T-C	N	T-C	N	T-C	N
Lack of self-confidence						
Girls	-0.001	696	-0.017	1237	-0.167	275
Boys	-0.087	682	-0.052	1309	0.051	277
Distaste for science						
Girls	0.003	696	-0.068	1237	-0.105	275
Boys	-0.039	682	-0.048	1309	0.096	277
Stereotypes wrt preferences						
Girls	0.123*	696	0.026	1237	-0.005	275
Boys	0.033	682	0.066**	1309	0.094	277
Stereotypes wrt jobs in science - social						
Girls	-0.191***	696	-0.129***	1237	-0.372*	275
Boys	-0.067	682	-0.107**	1309	0.012	277
Stereotypes wrt jobs in science - economic						
Girls	0.071	696	-0.076*	1237	-0.090	275
Boys	0.074	682	-0.052	1309	-0.168*	277
Underrepresentation of women						
Girls	0.236***	696	0.183***	1237	0.138	275
Boys	0.212***	682	0.210***	1309	0.072	277

Note: This table presents the average treatment effect on the persistence of stereotypes. Each row corresponds to a different subsamble based on the duration between treatment and survey, as reported in the post-treatment survey. Column (T-C) contains the coefficient of a treatment class dummy. Column (N) reports the number of observations. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.16 – Effect of treatment on the choice of major field of study - Year 10

Panel: Year 10	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Science	0.345	0.003	0.016	6284	0.437	0.005	0.017	5597
Humanities	0.124	-0.001	0.011	6284	0.029	0.005	0.006	5597
Social sciences	0.269	0.006	0.016	6284	0.172	0.011	0.012	5597
Science or tech.	0.368	-0.000	0.016	6284	0.577	-0.006	0.018	5597

Note: This table presents the average treatment effect on choice of major field of study. Each row corresponds to a different model, based on information reported in the administrative data. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Administrative data.

Table 3.17 – Effect of treatment on the choice of major field of study - Year 12

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
CPGE Science	0.075	0.028**	0.014	2657	0.136	0.029**	0.014	2758
CPGE STEM	0.055	0.020*	0.011	2657	0.125	0.029**	0.013	2758
CPGE Biology	0.020	0.008	0.007	2657	0.010	0.001	0.005	2758
Voc. Science	0.005	0.002	0.004	2657	0.011	-0.004	0.004	2758

Note: This table presents the average treatment effect on choice of major field of study. Each row corresponds to a different model, based on information reported in the administrative data. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Administrative data.

Table 3.18 – Effect of treatment on college major choices

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Number of choices								
Total number of choices	13.832	-0.112	0.333	2639	15.008	0.164	0.396	2724
Nb. of choices: Science/tech.	6.835	0.326	0.312	2639	9.424	0.208	0.467	2724
Nb. of choices: Science	6.090	0.429	0.311	2639	8.195	0.216	0.441	2724
Nb. of choices: Technology	0.714	-0.092	0.071	2639	1.101	0.019	0.116	2724
Nb. of choices: Science in vocational training	0.032	-0.012	0.011	2639	0.129	-0.027	0.026	2724
Nb. of choices: Science CPGE	1.002	0.205	0.147	2639	2.241	0.265	0.234	2724
Nb. of choices: STEM CPGE	1.546	0.261	0.167	2639	2.483	0.278	0.234	2724
Nb. of choices: Biology CPGE	0.543	0.056	0.080	2639	0.241	0.013	0.057	2724
Nb. of choices: Science University	3.087	0.048	0.133	2639	3.184	0.009	0.120	2724
Nb. of choices: School of engineering	0.837	0.167	0.166	2639	2.241	-0.059	0.276	2724
Nb. of choices: Science two-year college	0.714	-0.091	0.071	2639	1.101	0.019	0.116	2724
Nb. of choices: Medical school	0.612	-0.061	0.049	2639	0.276	-0.006	0.033	2724
Nb. of choices: All but science CPGE	12.284	-0.375	0.330	2639	12.515	-0.107	0.368	2724
Nb. of choices: Hum./social sciences CPGE	0.718	-0.122	0.109	2639	0.542	-0.073	0.074	2724
Nb. of choices: Economics/Law/Business	2.484	-0.161	0.203	2639	1.550	0.135	0.175	2724
Nb. of choices: Humanities/social sciences	1.904	0.046	0.118	2639	2.029	0.084	0.174	2724
Nb. of choices: Other non science	2.436	-0.141	0.137	2639	1.715	-0.183	0.120	2724
Share of choices								
Share of choices: Science/tech.	0.518	0.011	0.019	2639	0.623	0.003	0.020	2724
Share of choices: Science	0.466	0.015	0.019	2639	0.531	0.010	0.020	2724
Share of choices: Technology	0.049	-0.003	0.005	2639	0.083	-0.004	0.009	2724
Share of choices: Science in vocational training	0.002	-0.001	0.001	2639	0.010	-0.003*	0.002	2724
Share of choices: Science CPGE	0.058	0.010	0.009	2639	0.127	0.014	0.013	2724
Share of choices: STEM CPGE	0.091	0.013	0.010	2639	0.142	0.014	0.012	2724
Share of choices: Biology CPGE	0.033	0.003	0.005	2639	0.015	-0.000	0.004	2724
Share of choices: Science University	0.280	0.001	0.014	2639	0.270	-0.004	0.012	2724
Share of choices: School of engineering	0.038	0.006	0.005	2639	0.095	0.001	0.009	2724
Share of choices: Medical school	0.056	-0.006	0.004	2639	0.023	-0.001	0.003	2724
Share of choices: Science two-year college	0.049	-0.003	0.005	2639	0.083	-0.004	0.009	2724
Share of choices: All but science CPGE	0.909	-0.014	0.010	2639	0.857	-0.014	0.012	2724
Share of choices: Hum./social sciences CPGE	0.038	-0.003	0.006	2639	0.030	-0.003	0.005	2724
Share of choices: Economics/Law/Business	0.130	-0.003	0.010	2639	0.081	0.010	0.010	2724
Share of choices: Humanities/social sciences	0.154	0.006	0.010	2639	0.152	0.003	0.013	2724
Share of choices: Other non science	0.193	-0.008	0.011	2639	0.129	-0.013	0.009	2724

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Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
First choice								
1st choice: Science/tech.	0.615	0.030	0.022	2639	0.675	0.018	0.022	2724
1st choice: Science	0.555	0.044*	0.024	2639	0.566	0.010	0.024	2724
1st choice: Technology	0.057	-0.013	0.010	2639	0.096	0.008	0.013	2724
1st choice: Science in vocational training	0.003	-0.000	0.002	2639	0.013	-0.000	0.004	2724
1st choice: Science CPGE	0.065	0.020	0.012	2639	0.159	0.017	0.017	2724
1st choice: STEM CPGE	0.094	0.032**	0.015	2639	0.177	0.015	0.017	2724
1st choice: Biology CPGE	0.029	0.012	0.008	2639	0.018	-0.002	0.006	2724
1st choice: Science University	0.113	0.005	0.013	2639	0.123	-0.017	0.013	2724
1st choice: School of engineering	0.072	0.001	0.010	2639	0.152	0.006	0.017	2724
1st choice: Science two-year college	0.057	-0.013	0.010	2639	0.096	0.008	0.013	2724
1st choice: Paramedical	0.001	-0.001	0.001	2639	0.000	0.000	0.000	2724
1st choice: Medical school	0.274	0.008	0.021	2639	0.112	0.008	0.017	2724
1st choice: All but science CPGE	0.905	-0.031**	0.015	2639	0.821	-0.014	0.017	2724
1st choice: Hum./social sciences CPGE	0.062	-0.008	0.010	2639	0.047	-0.002	0.007	2724
1st choice: Economics/Law/Business	0.089	-0.017	0.013	2639	0.048	0.003	0.008	2724
1st choice: Humanities/social sciences	0.074	0.016	0.011	2639	0.102	-0.004	0.014	2724
1st choice: Other non science	0.191	-0.011	0.017	2639	0.147	-0.018	0.015	2724
Average rank of choice								
Average rank of choice: Science/tech.	6.049	0.151	0.226	2639	7.521	0.193	0.268	2724
Average rank of choice: Science	6.085	0.105	0.222	2639	7.678	0.280	0.261	2724
Average rank of choice: Technology	1.656	0.168	0.171	2639	2.951	0.002	0.277	2724
Average rank of choice: Science in vocational training	0.160	-0.013	0.058	2639	0.665	-0.103	0.122	2724
Average rank of choice: Science CPGE	1.120	0.222	0.151	2639	2.310	0.121	0.223	2724
Average rank of choice: STEM CPGE	1.748	0.126	0.182	2639	2.473	0.212	0.223	2724
Average rank of choice: Biology CPGE	0.900	-0.072	0.139	2639	0.360	0.084	0.094	2724
Average rank of choice: Science University	7.156	0.186	0.284	2639	9.893	0.204	0.403	2724
Average rank of choice: School of engineering	1.056	0.236	0.143	2639	2.233	0.304	0.241	2724
Average rank of choice: Science two-year college	1.655	0.169	0.171	2639	2.951	0.002	0.277	2724
Average rank of choice: Medical school	1.899	-0.248	0.204	2639	1.201	0.145	0.191	2724
Average rank of choice: Hum./social sciences CPGE	0.958	-0.153	0.125	2639	0.813	-0.146	0.118	2724
Ratio average rank/total rank: Science/tech.	0.810	0.016	0.021	2639	0.926	0.017	0.017	2724
Average rank of choice: Economics/Law/Business	3.234	-0.080	0.250	2639	2.489	0.014	0.255	2724
Average rank of choice: Humanities/social sciences	5.545	0.054	0.322	2639	5.215	-0.007	0.344	2724
Average rank of choice: Other non science	5.296	-0.313	0.284	2639	4.140	-0.146	0.298	2724
Performance at national exam (BAC)								

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... table 3.18 (cont'd)

Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Rank - math	49.175	0.835	1.280	2611	50.523	1.789	1.422	2673
Rank - physics-chemistry	48.376	-0.419	1.476	2605	51.497	1.426	1.499	2670
Rank - biology-geoscience	53.429	-1.938	1.456	2567	48.415	-0.126	1.422	2467
Rank - total	53.254	-0.759	1.404	2616	47.756	1.169	1.375	2683

Note: This table presents the average treatment effect on college major choices reported on the APB platform at the end of high school. Each row corresponds to a different model, based on responses reported in the APB data. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: APB data.

TABLE 3.19 – EFFECT OF TREATMENT ON ADMISSION OUTCOMES

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Admission outcomes								
Admitted to: Science/tech.	0.557	0.016	0.023	2750	0.595	0.007	0.022	2828
Admitted to: Science	0.517	0.020	0.024	2750	0.520	0.001	0.021	2828
Admitted to: Technology	0.038	-0.002	0.007	2750	0.074	0.006	0.012	2828
Admitted to: Science in vocational training	0.001	-0.002	0.001	2750	0.001	-0.000	0.001	2828
Admitted to: Science CPGE	0.057	0.023**	0.011	2750	0.131	0.031**	0.014	2828
Admitted to: STEM CPGE	0.077	0.032**	0.014	2750	0.142	0.033**	0.015	2828
Admitted to: Biology CPGE	0.020	0.009	0.007	2750	0.010	0.001	0.005	2828
Admitted to: Science University	0.126	-0.006	0.013	2750	0.154	-0.024	0.015	2828
Admitted to: School of engineering	0.046	0.001	0.008	2750	0.114	-0.014	0.014	2828
Admitted to: Science two-year college	0.038	-0.002	0.007	2750	0.074	0.006	0.012	2828
Admitted to: Paramedical	0.000	0.001	0.001	2750	0.000	0.000	0.000	2828
Admitted to: Medical school	0.267	-0.007	0.021	2750	0.110	0.007	0.014	2828
Admitted to: All but science CPGE	0.738	-0.034	0.021	2750	0.651	-0.047***	0.017	2828
Admitted to: Hum./social sciences CPGE	0.040	-0.003	0.008	2750	0.027	-0.000	0.007	2828
Admitted to: Economics/Law/Business	0.072	-0.011	0.011	2750	0.050	-0.005	0.008	2828
Admitted to: Humanities/social sciences	0.051	0.008	0.009	2750	0.063	-0.011	0.012	2828
Admitted to: Other non science	0.116	-0.004	0.015	2750	0.069	-0.006	0.009	2828
Admitted to first choice								
Admitted to first choice: Science/tech.	0.380	0.021	0.021	2750	0.301	0.014	0.020	2828
Admitted to first choice: Science	0.361	0.022	0.020	2750	0.271	0.006	0.021	2828
Admitted to first choice: Technology	0.017	0.001	0.005	2750	0.030	0.006	0.006	2828
Admitted to first choice: Science in vocational training	0.001	-0.002	0.001	2750	0.000	0.001	0.001	2828
Admitted to first choice: Science CPGE	0.017	0.021***	0.007	2750	0.035	0.019**	0.009	2828
Admitted to first choice: STEM CPGE	0.019	0.028***	0.008	2750	0.040	0.018*	0.009	2828
Admitted to first choice: Biology CPGE	0.002	0.006**	0.003	2750	0.004	-0.001	0.003	2828
Admitted to first choice: Science University	0.063	0.003	0.010	2750	0.064	-0.000	0.010	2828
Admitted to first choice: School of engineering	0.032	-0.005	0.007	2750	0.066	-0.014	0.012	2828
Admitted to first choice: Science two-year college	0.017	0.001	0.005	2750	0.030	0.006	0.006	2828
Admitted to first choice: Paramedical	0.000	0.000	0.000	2750	0.000	0.000	0.000	2828
Admitted to first choice: Medical school	0.246	-0.003	0.019	2750	0.100	0.003	0.014	2828
Admitted to first choice: All but science CPGE	0.493	-0.012	0.021	2750	0.359	-0.013	0.018	2828
Admitted to first choice: Hum./social sciences CPGE	0.014	0.001	0.004	2750	0.006	0.001	0.003	2828
Admitted to first choice: Economics/Law/Business	0.040	-0.005	0.008	2750	0.025	-0.002	0.006	2828
Admitted to first choice: Humanities/social sciences	0.028	0.005	0.007	2750	0.039	-0.006	0.009	2828

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... table 3.19 (cont'd)

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Admitted to first choice: Other non science	0.054	-0.001	0.010	2750	0.033	-0.003	0.006	2828

Note: This table presents the average treatment effect on admission outcomes. Each row corresponds to a different model, based on responses reported in the APB data. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: APB data.

Table 3.20 – Effect of treatment on the choice of major field of study - Environment -

Panel: Year 10	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Science								
Spillover below threshold 0.5	0.341	0.013	0.019	5039	0.447	0.001	0.018	4481
Spillover above the 0.5 threshold	0.472	-0.041	0.032	696	0.480	-0.011	0.043	617
School with other interventions	0.368	-0.017	0.027	2500	0.456	0.005	0.025	2435
School with few other interventions	0.349	0.022	0.023	3235	0.447	-0.003	0.024	2663
No organizational problem	0.358	0.010	0.020	4775	0.442	0.015	0.020	4216
Discipline problem lead to stop visit	0.359	0.007	0.017	5247	0.454	0.003	0.017	4613
Lack of self-confidence								
Spillover below threshold 0.5	0.182	0.019	0.029	4381	-0.249	0.025	0.029	3903
Spillover above the 0.5 threshold	0.135	-0.035	0.091	524	-0.243	-0.026	0.062	526
School with other interventions	0.196	-0.039	0.040	2110	-0.291	0.027	0.040	2117
School with few other interventions	0.162	0.051	0.038	2795	-0.208	0.010	0.039	2312
No organizational problem	0.167	0.015	0.033	4077	-0.247	0.000	0.033	3675
Discipline problem lead to stop visit	0.177	0.006	0.028	4494	-0.246	0.007	0.029	4013
Distaste for science								
Spillover below threshold 0.5	0.281	-0.051	0.038	4381	0.086	-0.028	0.035	3903
Spillover above the 0.5 threshold	0.004	0.091	0.120	524	-0.094	0.099	0.072	526
School with other interventions	0.202	-0.004	0.056	2110	0.032	-0.017	0.048	2117
School with few other interventions	0.286	-0.055	0.050	2795	0.095	-0.011	0.044	2312
No organizational problem	0.252	-0.050	0.043	4077	0.077	-0.038	0.037	3675
Discipline problem lead to stop visit	0.245	-0.039	0.039	4494	0.052	-0.008	0.033	4013
Stereotypes wrt preferences								
Spillover below threshold 0.5	-0.060	0.059**	0.028	4381	0.127	0.062**	0.026	3903
Spillover above the 0.5 threshold	-0.125	0.009	0.065	524	0.159	0.002	0.078	526
School with other interventions	-0.073	0.075*	0.039	2110	0.143	0.052	0.036	2117
School with few other interventions	-0.062	0.036	0.036	2795	0.119	0.058*	0.035	2312
No organizational problem	-0.068	0.057*	0.030	4077	0.141	0.043*	0.025	3675
Discipline problem lead to stop visit	-0.064	0.050*	0.027	4494	0.140	0.032	0.027	4013
Stereotypes wrt jobs in science - social								
Spillover below threshold 0.5	0.053	-0.115***	0.025	4381	0.058	-0.075***	0.025	3903
Spillover above the 0.5 threshold	0.035	-0.153**	0.066	524	0.070	-0.092	0.069	526
School with other interventions	0.056	-0.131***	0.036	2110	0.039	-0.078**	0.033	2117
School with few other interventions	0.048	-0.109***	0.032	2795	0.078	-0.078**	0.033	2312
No organizational problem	0.037	-0.116***	0.025	4077	0.043	-0.077***	0.023	3675
Discipline problem lead to stop visit	0.045	-0.107***	0.025	4494	0.060	-0.085***	0.023	4013

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Table 3.20 – continued from previous page

Panel: Year 10	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Stereotypes wrt jobs in science - economic								
Spillover below threshold 0.5	0.088	-0.087***	0.023	4381	0.076	-0.043**	0.019	3903
Spillover above the 0.5 threshold	0.014	0.007	0.051	524	0.115	-0.071	0.065	526
School with other interventions	0.051	-0.034	0.029	2110	0.070	-0.036	0.031	2117
School with few other interventions	0.101	-0.109***	0.030	2795	0.091	-0.055**	0.022	2312
No organizational problem	0.080	-0.085***	0.023	4077	0.071	-0.047**	0.020	3675
Discipline problem lead to stop visit	0.068	-0.073***	0.023	4494	0.085	-0.055***	0.019	4013
Underrepresentation of women								
Spillover below threshold 0.5	0.010	0.247***	0.021	4381	-0.104	0.294***	0.024	3903
Spillover above the 0.5 threshold	0.150	0.106*	0.060	524	-0.004	0.225***	0.068	526
School with other interventions	0.029	0.258***	0.028	2110	-0.105	0.311***	0.034	2117
School with few other interventions	0.022	0.213***	0.029	2795	-0.078	0.262***	0.030	2312
No organizational problem	0.021	0.248***	0.023	4077	-0.088	0.286***	0.026	3675
Discipline problem lead to stop visit	0.032	0.222***	0.020	4494	-0.085	0.282***	0.024	4013

Note: This table presents the average treatment effect on choice of major field of study by level of spillover as measure by the questionnaire on the control group. Each row corresponds to a different subsample based on the intensity of spillover, or potential organizational problems. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level. The level of spillover is computed from the share of students per pair in the control class who were told about an intervention happening in the high school by students from the school or by teachers. The threshold is 50%, which corresponds to the median. We account for the presence of other interventions happening the same year by restricting our sample to high schools where more or less than 15% (the median) of the students have been potentially exposed to another visit. Finally, we look at the impact of potential organizational problems.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.21 – Effect of treatment on the choice of major field of study - Environment -

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
CPGE Science								
Spillover below threshold 0.5	0.071	0.005	0.021	1361	0.151	0.005	0.019	1440
Spillover above the 0.5 threshold	0.089	0.055***	0.020	1102	0.134	0.057**	0.025	1062
School with other interventions	0.087	0.033*	0.017	1125	0.141	0.041*	0.022	1250
School with few other interventions	0.073	0.022	0.023	1338	0.147	0.014	0.019	1252
No organizational problem	0.084	0.026	0.016	2077	0.140	0.023	0.016	2129
Discipline problem lead to stop visit	0.080	0.024	0.016	2295	0.145	0.026*	0.015	2353
Lack of self-confidence								
Spillover below threshold 0.5	0.218	0.002	0.050	1275	-0.175	-0.016	0.052	1314

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Table 3.21 – continued from previous page

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Spillover above the 0.5 threshold	0.243	-0.075	0.068	963	-0.119	-0.101*	0.055	980
School with other interventions	0.216	0.009	0.060	1019	-0.165	-0.067	0.050	1133
School with few other interventions	0.238	-0.073	0.056	1219	-0.139	-0.036	0.058	1161
No organizational problem	0.215	-0.041	0.046	1881	-0.167	-0.021	0.040	1958
Discipline problem lead to stop visit	0.234	-0.042	0.043	2086	-0.164	-0.037	0.039	2163
Distaste for science								
Spillover below threshold 0.5	-0.292	-0.016	0.046	1275	-0.290	-0.035	0.043	1314
Spillover above the 0.5 threshold	-0.410	-0.049	0.065	963	-0.341	0.006	0.057	980
School with other interventions	-0.393	-0.079	0.057	1019	-0.345	0.043	0.051	1133
School with few other interventions	-0.304	0.013	0.050	1219	-0.280	-0.086**	0.042	1161
No organizational problem	-0.345	-0.038	0.043	1881	-0.292	-0.051	0.034	1958
Discipline problem lead to stop visit	-0.339	-0.016	0.039	2086	-0.314	-0.029	0.033	2163
Stereotypes wrt preferences								
Spillover below threshold 0.5	-0.211	0.116***	0.041	1275	0.076	0.081	0.055	1314
Spillover above the 0.5 threshold	-0.135	-0.011	0.036	963	0.090	0.053	0.062	980
School with other interventions	-0.196	0.067	0.048	1019	0.109	0.045	0.065	1133
School with few other interventions	-0.164	0.066*	0.037	1219	0.057	0.083*	0.049	1161
No organizational problem	-0.165	0.068**	0.031	1881	0.083	0.062	0.042	1958
Discipline problem lead to stop visit	-0.175	0.078**	0.031	2086	0.089	0.069*	0.041	2163
Stereotypes wrt jobs in science - social								
Spillover below threshold 0.5	-0.068	-0.156***	0.036	1275	-0.092	-0.082*	0.046	1314
Spillover above the 0.5 threshold	-0.141	-0.148***	0.046	963	-0.158	-0.060	0.048	980
School with other interventions	-0.114	-0.193***	0.043	1019	-0.151	-0.070	0.049	1133
School with few other interventions	-0.088	-0.123***	0.036	1219	-0.091	-0.075	0.045	1161
No organizational problem	-0.110	-0.148***	0.030	1881	-0.127	-0.064*	0.036	1958
Discipline problem lead to stop visit	-0.100	-0.158***	0.028	2086	-0.118	-0.082**	0.034	2163
Stereotypes wrt jobs in science - economic								
Spillover below threshold 0.5	-0.172	0.006	0.035	1275	-0.115	-0.011	0.035	1314
Spillover above the 0.5 threshold	-0.202	-0.058	0.048	963	-0.164	-0.046	0.042	980
School with other interventions	-0.190	-0.030	0.039	1019	-0.155	-0.049	0.043	1133
School with few other interventions	-0.181	-0.009	0.042	1219	-0.118	-0.003	0.034	1161
No organizational problem	-0.197	-0.019	0.033	1881	-0.135	-0.041	0.029	1958
Discipline problem lead to stop visit	-0.192	-0.008	0.030	2086	-0.135	-0.028	0.028	2163
Underrepresentation of women								
Spillover below threshold 0.5	0.069	0.186***	0.041	1275	0.021	0.199***	0.033	1314
Spillover above the 0.5 threshold	0.113	0.172***	0.047	963	0.034	0.188***	0.039	980
School with other interventions	0.126	0.167***	0.054	1019	0.068	0.162***	0.034	1133

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Table 3.21 – continued from previous page

Panel: Year 12	Girls				Boys			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
School with few other interventions	0.058	0.207***	0.041	1219	-0.011	0.227***	0.036	1161
No organizational problem	0.107	0.167***	0.032	1881	0.018	0.191***	0.027	1958
Discipline problem lead to stop visit	0.085	0.194***	0.035	2086	0.026	0.193***	0.026	2163

Note: This table presents the average treatment effect on choice of major field of study by level of spillover as measure by the questionnaire on the control group. Each row corresponds to a different subsample based on the intensity of spillover, or potential organizational problems. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level. The level of spillover is computed from the share of students per pair in the control class who were told about an intervention happening in the high school by students from the school or by teachers. The threshold is 50%, which corresponds to the median. We account for the presence of other interventions happening the same year by restricting our sample to high schools where more or less than 15% (the median) of the students have been potentially exposed to another visit. Finally, we look at the impact of potential organizational problems.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.22 – Descriptive statistics - Other interventions in the high school

	Other interventions in high school few	Other interventions in high school some	Difference T-C	P-value
Girl	0.534	0.498	-0.036	0.000
Non-French	0.051	0.058	0.007	0.060
Receives a scholarship	0.115	0.116	0.001	0.772
High SES (A)	0.459	0.475	0.016	0.040
Rather high SES (B)	0.258	0.220	-0.038	0.000
Rather low SES (C)	0.424	0.388	-0.035	0.000
Low SES (D)	0.332	0.330	-0.002	0.774
At least one parent unemployed	0.034	0.037	0.003	0.376

Note: This table presents high school characteristics according to the level of observed spillover. The level of spillover is computed from the share of students per pair in the control class who were told about an intervention happening in the high school by students from the school or by teachers. The threshold is 50%, which corresponds to the median. We account for the presence of other interventions happening the same year by restricting our sample to high schools where more or less than 15% (the median) of the students have been potentially exposed to another visit.
Source: Authors' own data.

Table 3.23 – Descriptive statistics - Exposure of control students

	Share of control students mention intervention $\geq$ median	Share of control students mention intervention $<$ median	Difference T-C	P-value
Girl	0.514	0.518	0.003	0.730
Non-French	0.046	0.057	0.010	0.013
Receives a scholarship	0.107	0.118	0.011	0.065
High SES (A)	0.544	0.444	-0.099	0.000
Rather high SES (B)	0.233	0.242	0.010	0.221
Rather low SES (C)	0.350	0.423	0.073	0.000
Low SES (D)	0.297	0.341	0.045	0.000
At least one parent unemployed	0.035	0.035	0.000	0.991

Note: This table presents high school characteristics according to the level of observed spillover. The level of spillover is computed from the share of students per pair in the control class who were told about an intervention happening in the high school by students from the school or by teachers. The threshold is 50%, which corresponds to the median. We account for the presence of other interventions happening the same year by restricting our sample to high schools where more or less than 15% (the median) of the students have been potentially exposed to another visit.
Source: Authors' own data.

Table 3.24 – Comparison treatment 1 and treatment 2 on choices - Year 10

Panel: Year 10	Regular slides				New slides			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Science								
Boys	0.46	0.066	0.040	677	0.45	0.025	0.044	606
Girls	0.37	0.002	0.033	760	0.33	0.093**	0.036	844
Humanities								
Boys	0.03	-0.012	0.017	677	0.03	0.019	0.015	606
Girls	0.13	-0.017	0.024	760	0.10	0.046	0.036	844
Social sciences								
Boys	0.16	-0.011	0.023	677	0.18	0.017	0.039	606
Girls	0.27	-0.021	0.048	760	0.24	0.015	0.027	844
Science or tech.								
Boys	0.58	0.047	0.030	677	0.55	0.041	0.048	606
Girls	0.40	0.004	0.038	760	0.34	0.096**	0.035	844

Note: This table presents the comparison between the effect of treatment 1 (regular slides) and treatment 2 (new slides with information on wages and employment prospect) on choices.
Estimates are obtained from a linear regression with high school fixed effect. Standard errors are clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.25 – Comparison treatment 1 and treatment 2 on choices - Year 12

Panel: Year 12	Regular slides				New slides			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
CPGE Science								
Boys	0.17	0.009	0.047	421	0.14	0.032	0.056	279
Girls	0.10	-0.010	0.035	378	0.05	-0.012	0.034	329
CPGE STEM								
Boys	0.17	0.004	0.044	421	0.12	0.039	0.048	279
Girls	0.09	-0.018	0.035	378	0.02	-0.019	0.013	329

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Table 3.25 – continued from previous page

Panel: Year 12	Regular slides				New slides			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
CPGE Biology								
Boys	0.00	0.005	0.012	421	0.02	-0.007	0.013	279
Girls	0.01	0.008	0.011	378	0.03	0.007	0.030	329
Voc. Science								
Boys	0.00	-0.000	0.007	421	0.03	-0.031**	0.014	279
Girls	0.01	0.006	0.010	378	0.01	-0.009	0.009	329

Note: This table presents the comparison between the effect of treatment 1 (regular slides) and treatment 2 (new slides with information on wages and employment prospect) on choi > ces.
Estimates are obtained from a linear regression with high school fixed effect. Standard errors are clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.26 – Net effect of treatment 2

	Science track			CPGE science		
	All	Girls	Boys	All	Girls	Boys
Treatment	0.032	0.008	0.063	0.004	0.003	0.011
	(0.032)	(0.030)	(0.039)	(0.036)	(0.034)	(0.046)
Treatment*(new slides)	0.028	0.077*	-0.036	0.002	-0.023	0.016
	(0.045)	(0.044)	(0.058)	(0.047)	(0.046)	(0.064)
Constant	0.396***	0.348***	0.455***	0.117***	0.077***	0.157***
	(0.012)	(0.012)	(0.015)	(0.013)	(0.012)	(0.017)
Observations	2887	1604	1283	1407	707	700
Adjusted R^2	0.002	0.003	0.001	-0.001	-0.002	-0.002

Note: This table presents the net effect of treatment 2 (new slides with information on wages and employment prospect) on the probability to be observed in science track one year after for students in year 10 for the first three columns, and on the probability of being observed in a science selective program (CPGE) for year 12-students for the last three columns. The coefficient of interest is Treatment*(new slides) that provides the net contribution of the new set of slides provided to ambassadors, with extensive information on wages and employment prospect. Estimates are obtained from a linear regression with high school fixed effect. Standard errors are clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.27 – Comparison treatment 1 and treatment 2 on stereotypes - Year 10

Panel: Year 10	Regular slides				New slides			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Lack of self-confidence								
Boys	-0.22	-0.007	0.052	573	-0.22	-0.032	0.091	514
Girls	0.16	0.045	0.064	659	0.15	0.111*	0.053	729
Distaste for science								
Boys	-0.04	0.019	0.072	573	0.05	-0.084	0.092	514
Girls	0.20	-0.039	0.099	659	0.27	-0.055	0.076	729
Stereotypes wrt preferences								
Boys	0.08	0.088	0.092	573	0.10	0.057	0.083	514
Girls	-0.11	0.065	0.049	659	-0.08	0.027	0.050	729
Stereotypes wrt jobs in science - social								
Boys	0.07	-0.083	0.072	573	0.04	-0.073	0.061	514
Girls	0.06	-0.143*	0.074	659	0.08	-0.181***	0.046	729
Stereotypes wrt jobs in science - economic								
Boys	0.12	-0.106*	0.051	573	0.09	-0.029	0.045	514
Girls	0.10	-0.098	0.058	659	0.08	-0.172***	0.051	729
Underrepresentation of women								
Boys	-0.05	0.178**	0.069	573	-0.11	0.317***	0.070	514
Girls	0.05	0.160**	0.066	659	0.03	0.236***	0.037	729

Note: This table presents the comparison between the effect of treatment 1 (regular slides) and treatment 2 (new slides with information on wages and employment prospect) on stereotypes. The dependent variables are obtained from a factor analysis on the control group.
Estimates are obtained from a linear regression with high school fixed effect. Standard errors are clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.28 – Ambassadors fixed effects on admission outcomes

	Boys					Girls				
	Mean	s.d	Min	Max	Obs.	Mean	s.d	Min	Max	Obs.
Sample: Year 10										
All	0.000	0.138	-0.319	0.414	52	-0.001	0.152	-0.282	0.444	54
Professionals	0.017	0.138	-0.225	0.414	31	0.000	0.159	-0.280	0.444	33
Researchers	-0.025	0.138	-0.319	0.237	21	-0.002	0.144	-0.282	0.351	21
P-value difference	0.282					0.968				
Non STEM	-0.017	0.135	-0.319	0.275	39	-0.014	0.140	-0.282	0.444	41
STEM	0.052	0.141	-0.122	0.414	13	0.042	0.186	-0.249	0.428	13
P-value difference	0.122					0.254				
University	-0.008	0.145	-0.227	0.414	29	0.016	0.142	-0.249	0.428	29
CPGE	0.027	0.120	-0.319	0.263	20	-0.014	0.160	-0.282	0.444	21
P-value difference	0.368					0.488				
Sample: Year 12										
All	0.017	0.109	-0.155	0.274	52	0.013	0.081	-0.085	0.210	53
Professionals	0.028	0.113	-0.155	0.274	31	0.026	0.083	-0.085	0.210	33
Researchers	0.002	0.103	-0.155	0.266	21	-0.009	0.075	-0.085	0.201	20
P-value difference	0.398					0.132				
Non STEM	0.015	0.103	-0.155	0.274	40	0.007	0.078	-0.085	0.210	41
STEM	0.024	0.131	-0.155	0.266	12	0.030	0.092	-0.085	0.201	12
P-value difference	0.807					0.397				
University	0.033	0.118	-0.155	0.274	29	0.011	0.077	-0.085	0.201	28
CPGE	0.010	0.096	-0.155	0.220	20	0.006	0.081	-0.085	0.128	21
P-value difference	0.477					0.825				

Note: This table presents descriptive statistics of ambassadors' fixed effects on, respectively, the probability of being observed in science track the year after the intervention for the sample of year 10-students, and on the probability of being observed in selective science program (CPGE science) the year after the intervention for year 12-students. Ambassadors' fixed effects are obtained from a linear probability model where treatment has been interacted with each ambassador's individual dummy variable, and that includes high school fixed effects. The line (P-value difference) indicates the P-value of the T-test (difference in mean) for each group.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.29 – Effect of treatment on the share of female and male students per class choosing science

	C	T-C	s.e	Change in %	Obs.
Sample: Year 10					
Share of women per class					
Admitted to: science track	0.474	-0.015	0.018	-3.2%	11847
Share of men per class					
Admitted to: science track	0.526	0.015	0.018	2.9%	11847
Sample: Year 12					
Share of women per class					
Admitted to: Science CPGE	0.038	0.015**	0.006	38.0%	5631
Admitted to: Science University	0.063	-0.005	0.007	-8.0%	5631
Admitted to: School of engineering	0.023	0.000	0.004	0.7%	5631
Admitted to: Science two-year college	0.019	-0.002	0.004	-10.1%	5631
Admitted to: Medical school	0.133	-0.003	0.012	-2.3%	5631
Admitted to: All but science CPGE	0.369	-0.023	0.018	-6.3%	5631
Share of men per class					
Admitted to: Science CPGE	0.071	0.020**	0.008	28.6%	5631
Admitted to: Science University	0.077	-0.011	0.007	-14.7%	5631
Admitted to: School of engineering	0.057	-0.005	0.008	-9.1%	5631
Admitted to: Science two-year college	0.037	0.003	0.006	9.4%	5631
Admitted to: Medical school	0.055	0.004	0.007	6.7%	5631
Admitted to: All but science CPGE	0.326	-0.019	0.013	-5.8%	5631

Note: This table presents the average treatment effect on the share of female students per class choosing science track and science CPGE. Each row corresponds to a different model, based on information reported in the administrative data. Column (C) shows the average share of female students going to science per class in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level. Colum (Change in %) indicates the magnitude of the effect in percentage of the control group mean.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Administrative and APB data.

Appendix

Table 3.30 – Attendance rate by grade and gender

Attendance rate	Girls			Boys		
	Control	Treated	Difference	Control	Treated	Difference
Year 10	0.953	0.959	0.005	0.951	0.959	0.009**
Year 12	0.996	0.996	-0.000	0.999	0.995	-0.000

Attendance rate	Control	Treated	Difference
All	0.966	0.970	0.005*

Note: This table reports attendance rate on the day the survey was administered to students from the treated and control groups.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.31 – Response rate by question

Questions	Non response rate - Control	Non response rate - Treated	Difference T-C	Non response rate - Total
Mother works in science	0.006	0.006	-0.000	0.006
Father works in science	0.010	0.011	0.001	0.010
Older brothers	0.071	0.070	-0.001	0.071
Older sisters	0.082	0.076	-0.006	0.079
Sex	0.007	0.008	0.001	0.007
Plays video games at least 1*week	0.011	0.011	-0.000	0.011
Plays sports at least 1*week	0.014	0.015	0.001	0.014
Plays board games at least 1*week	0.012	0.013	0.001	0.012
Competitive sports at least 1*week	0.009	0.012	0.003*	0.011
Watches science TV programs at least 1*week	0.009	0.009	-0.001	0.009
Reads comics at least 1*week	0.007	0.010	0.002	0.008
Uses Facebook at least 1*week	0.000	0.000	0.000	0.000
Hangs out with friends at least 1*week	0.010	0.011	0.001	0.011
Spends time with family at least 1*week	0.007	0.012	0.005***	0.009
Likes biology-geoscience	0.010	0.010	-0.000	0.010
Likes English	0.006	0.005	-0.001	0.005
Likes math	0.006	0.006	-0.001	0.006
Likes physics-chemistry	0.006	0.007	0.002	0.006

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Table 3.31 – continued from previous page

Questions	Non response rate - Control	Non response rate - Treated	Difference T-C	Non response rate - Total
Likes sport	0.006	0.006	-0.000	0.006
Likes history-geography	0.005	0.005	0.000	0.005
Likes French	0.006	0.008	0.002	0.007
Likes philosophie	0.003	0.006	0.003	0.004
Level in biology-geoscience: Good	0.012	0.011	-0.001	0.012
Level in English: Good	0.007	0.008	0.001	0.008
Level in math: Good	0.010	0.009	-0.000	0.009
Level in physics-chemistry: Good	0.009	0.009	0.000	0.009
Level in sport: Good	0.009	0.011	0.003	0.010
Level in history-geography: Good	0.007	0.008	0.001	0.007
Level in French: Good	0.009	0.011	0.001	0.010
Level in philosophie: Good	0.005	0.008	0.002	0.007
Level in maths compared to girls: Better	0.013	0.018	0.005**	0.015
Level in maths compared to boys: Better	0.023	0.032	0.009*	0.028
Level in French compared to girls: Better	0.013	0.018	0.005*	0.016
Level in French compared to boys: Better	0.027	0.033	0.006*	0.030
Level in biology-geoscience compared to girls: Better	0.029	0.023	-0.006	0.026
Level in biology-geoscience compared to boys: Better	0.036	0.038	0.002	0.037
Lost in front of a math problem: Agree	0.007	0.008	0.001	0.007
Worried when thinking about math: Agree	0.004	0.006	0.002*	0.005
You can succeed if try hard enough: Agree	0.006	0.008	0.002	0.007
Considers science majors	0.030	0.032	0.002	0.031
Number of Choices*	0.029	0.033	0.003	0.031
Choice (intention): Other	0.315	0.309	-0.006	0.312
Date Choice	0.023	0.026	0.002	0.025
Hasn't started thinking about choice	0.023	0.026	0.002	0.025
Parents strongly support choice	0.006	0.009	0.003	0.008
Hesitates about choice	0.004	0.005	0.001	0.004
Choice (intention): Première S	0.012	0.015	0.003	0.014
Choice (intention): Première L	0.012	0.015	0.003	0.014
Choice (intention): Première ES	0.012	0.015	0.003	0.014
Choice (intention): Première Tech	0.012	0.015	0.003	0.014
Choice (intention): Première Pro	0.012	0.015	0.003	0.014
Choice (intention): Première Tech STI2D	0.003	0.002	-0.002	0.002
Choice (intention): Première Tech ST2A	0.003	0.002	-0.002	0.002
Choice (intention): Première Tech STMG	0.003	0.002	-0.002	0.002
Choice (intention): Première Tech ST2S	0.003	0.002	-0.002	0.002
Choice (intention): Première Tech STL	0.003	0.002	-0.002	0.002
Choice (intention): Première Tech TMD	0.003	0.002	-0.002	0.002

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Table 3.31 – continued from previous page

Questions	Non response rate - Control	Non response rate - Treated	Difference T-C	Non response rate - Total
Choice (intention): Première Tech hôtellerie	0.003	0.002	-0.002	0.002
Choice (intention): Première Tech STAV	0.003	0.002	-0.002	0.002
Choice (intention): University	0.017	0.014	-0.004	0.016
Choice (intention): CPGE	0.017	0.014	-0.004	0.016
Choice (intention): BTS	0.017	0.014	-0.004	0.016
Choice (intention): IUT	0.017	0.014	-0.004	0.016
Choice (intention): specialized school	0.017	0.014	-0.004	0.016
Field (intention): biology	0.008	0.010	0.002	0.009
Field (intention): STEM	0.008	0.010	0.002	0.009
Field (intention): Medical, dental	0.008	0.010	0.002	0.009
Field (intention): Health and social work	0.008	0.010	0.002	0.009
Field (intention): Economics, Business, Management	0.008	0.010	0.002	0.009
Field (intention): Humanities	0.008	0.010	0.002	0.009
Field (intention): Sport	0.008	0.010	0.002	0.009
Field (intention): Arts	0.008	0.010	0.002	0.009
Field (intention): Other	0.008	0.010	0.002	0.009
Field (intention): STEM only	0.008	0.010	0.002	0.009
Number of fields*	0.048	0.049	0.001	0.048
Could like being a pharmacist	0.014	0.014	-0.000	0.014
Could like being a computer scientist	0.013	0.013	-0.000	0.013
Could like being a engineer	0.012	0.011	-0.001	0.012
Could like being a lawyer	0.015	0.013	-0.002	0.014
Could like being a doctor	0.012	0.012	-0.000	0.012
Could like being a therapist	0.014	0.013	-0.000	0.013
Could like being a renewable energy technician	0.016	0.014	-0.001	0.015
Could like being a chemist	0.015	0.013	-0.002	0.014
Could like being a researcher in biology	0.013	0.013	-0.001	0.013
Could like being an industrial designer	0.020	0.017	-0.003	0.018
Could like being in a job in STEM*	0.005	0.005	-0.001	0.005
Could like being in a job in non-STEM science*	0.006	0.006	-0.000	0.006
Could like being a in a non scientific job*	0.008	0.008	-0.000	0.008
Interest for major	0.009	0.012	0.003*	0.011
Ability to specialize	0.013	0.014	0.001	0.014
Having access to various jobs	0.010	0.011	0.002	0.011
Other majors are difficult	0.010	0.012	0.002	0.011
Brings opportunity for stable job	0.008	0.010	0.003	0.009
Wages concerns	0.008	0.011	0.003**	0.010
Feeling comfortable	0.007	0.010	0.003*	0.008
Workload	0.013	0.015	0.002	0.014

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Table 3.31 – continued from previous page

Questions	Non response rate - Control	Non response rate - Treated	Difference T-C	Non response rate - Total
Having female peers	0.010	0.013	0.004**	0.012
Having male peers	0.009	0.013	0.004**	0.011
Likes science: Agree	0.007	0.010	0.002	0.009
Some jobs in science are interesting: Agree	0.011	0.012	0.001	0.011
Would consider jobs in science: Agree	0.018	0.024	0.006**	0.021
Better wages in science: Agree	0.017	0.025	0.008***	0.021
Studies in science are long: Agree	0.010	0.014	0.004**	0.012
Jobs in science are dreary: Agree	0.014	0.018	0.004*	0.016
Hard to maintain work-life balance: Agree	0.011	0.015	0.004*	0.013
Jobs in science are solitary: Agree	0.011	0.017	0.006**	0.014
More men in science-related jobs: True	0.009	0.013	0.005*	0.011
Men are more gifted in math: True	0.010	0.017	0.007***	0.013
Brains of M/W are different: True	0.013	0.020	0.007***	0.016
Women like science less than men: True	0.010	0.017	0.007**	0.014
Women are discriminated in science: True	0.017	0.020	0.003	0.018
Men scientists - *interesting*	0.023	0.030	0.006	0.027
Men scientists - *elegant*	0.065	0.068	0.003	0.066
Men scientists - *respected*	0.032	0.042	0.010*	0.037
Men scientists - *exemplary*	0.037	0.041	0.004	0.039
Men scientists - *creative*	0.034	0.044	0.010**	0.039
Men scientists - *social*	0.040	0.044	0.004	0.042
Men scientists - *extravert*	0.068	0.067	-0.001	0.068
Women scientists - *interesting*	0.025	0.027	0.002	0.026
Women scientists - *elegant*	0.057	0.077	0.020***	0.067
Women scientists - *respected*	0.033	0.042	0.009*	0.038
Women scientists - *exemplary*	0.041	0.050	0.009*	0.046
Women scientists - *creative*	0.040	0.045	0.005	0.043
Women scientists - *social*	0.043	0.051	0.008	0.048
Women scientists - *extravert*	0.068	0.076	0.008	0.072

Note: This table reports response rate on survey's questions for students of the treated and control groups.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.32 – Reported versus actual level of ability - math - Year 10

Panel: Year 10	**Over- or underestimation all**		**Over- or underestimation wrt opposite gender**		**Over- or underestimation wrt same gender**	
	W/o inter.	With inter.	W/o inter.	With inter.	W/o inter.	With inter.
Mean Boys	2.042	2.089	3.113	3.114	3.254	3.254
Mean Girls	1.739	1.699	2.862	2.862	2.861	2.860
Diff. W-M	-0.303***	-0.390***	-0.251***	-0.252***	-0.393***	-0.394***
Rank	0.027***	0.026***	0.018***	0.018***	0.019***	0.019***
(Rank)*Girl		0.002*		0.000		0.001

Note: This table presents descriptive statistics on the prevalence of overestimation/underestimation of students' own ability. Even columns present estimations of model 3.1, and uneven columns of model 3.2. The coefficient (Mean Boys) corresponds to the constant of the regression The coefficient (Mean Girls) corresponds to sum of the constant of models and the girl dummy from 3.1 and 3.2. The coefficient (Diff. W-M) corresponds to the coefficient of the girl dummy. In column (1) and (2), the variable of interest is the answer to the question 'On average my level in math is...' (all sex specification). The variable *Rank* is student's actual percentile rank in math at DNB national exam in the experimental sample. In column (3) and (4), the variable of interest is the answer to the question 'On average my level in math is... compare to the average of *boys*' for female respondents and 'to the average of *girls*' for male respondents (opposite sex specification). The variable *Rank* is student's relative distance to the median rank of the subsample of opposite gender. In column (5) and (6), the variable of interest is the answer to the question 'On average my level in math is... compare to the average of *boys*' for male respondents and 'to the average of *girls*' for female respondents (same sex specification). The variable *Rank* is student's relative distance to the median rank of the subsample of same gender. Estimates are obtained from a linear regression with high school fixed effect. Standard errors are clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.33 – Reported versus actual level of ability - math - Year 12

Panel: Year 12	**Over- or underestimation all**		**Over- or underestimation wrt opposite gender**		**Over- or underestimation wrt same gender**	
	W/o inter.	With inter.	W/o inter.	With inter.	W/o inter.	With inter.
Mean Boys	2.088	2.042	3.115	3.111	3.159	3.158
Mean Girls	1.795	1.836	2.769	2.768	2.854	2.854
Diff. W-M	-0.293***	-0.207*	-0.346***	-0.343***	-0.305***	-0.304***
Rank	0.019***	0.020***	0.014***	0.015***	0.015***	0.016***
(Rank)*Girl		-0.001		-0.002		-0.001

Note: This table presents descriptive statistics on the prevalence of overestimation/underestimation of students' own ability. Even columns present estimations of model 3.1, and uneven columns of model 3.2. The coefficient (Mean Boys) corresponds to the constant of the regression The coefficient (Mean Girls) corresponds to sum of the constant of models and the girl dummy from 3.1 and 3.2. The coefficient (Diff. W-M) corresponds to the coefficient of the girl dummy. In column (1) and (2), the variable of interest is the answer to the question 'On average my level in math is...' (all sex specification). The variable *Rank* is student's actual percentile rank in math at DNB national exam in the experimental sample. In column (3) and (4), the variable of interest is the answer to the question 'On average my level in math is... compare to the average of *boys*' for female respondents and 'to the average of *girls*' for male respondents (opposite sex specification). The variable *Rank* is student's relative distance to the median rank of the subsample of opposite gender. In column (5) and (6), the variable of interest is the answer to the question 'On average my level in math is... compare to the average of *boys*' for male respondents and 'to the average of *girls*' for female respondents (same sex specification). The variable *Rank* is student's relative distance to the median rank of the subsample of same gender. Estimates are obtained from a linear regression with high school fixed effect. Standard errors are clustered at the high school level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' own data.

Table 3.34 – Effect of treatment on tastes and self-confidence - Year 10

Panel: Year 10	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Taste for each field of study								
Likes biology-geoscience	0.598	-0.017	0.019	5742	0.678	-0.023	0.018	5123
Likes English	0.738	-0.018	0.017	5754	0.703	-0.004	0.014	5125
Likes math	0.560	0.013	0.018	5751	0.714	-0.025	0.017	5123
Likes physics-chemistry	0.517	-0.010	0.021	5741	0.693	-0.019	0.019	5128
Likes sport	0.686	-0.009	0.015	5744	0.881	-0.009	0.009	5128
Likes history-geography	0.648	0.013	0.020	5745	0.700	0.011	0.016	5131
Taste for each field of study - year 10 specific								
Likes French	0.594	0.006	0.017	5741	0.418	0.008	0.018	5127
Self-assessment of performance								
Level in biology-geoscience: Good	0.409	-0.006	0.020	5727	0.474	0.014	0.021	5123
Level in English: Good	0.547	0.012	0.020	5727	0.493	0.028	0.017	5119
Level in math: Good	0.369	0.003	0.017	5719	0.483	0.003	0.017	5108
Level in physics-chemistry: Good	0.321	-0.000	0.017	5712	0.462	0.009	0.020	5115
Level in sport: Good	0.554	-0.005	0.014	5707	0.803	-0.007	0.012	5119
Level in history-geography: Good	0.425	0.006	0.018	5733	0.433	0.025	0.018	5117
Self-assessment of performance - year 10 specific								
Level in French: Good	0.431	0.008	0.018	5716	0.283	0.009	0.016	5120
Relative performance with respect to each gender								
Level in maths compared to girls: Better	0.285	-0.010	0.012	5670	0.420	0.010	0.016	5077
Level in maths compared to boys: Better	0.271	0.006	0.016	5558	0.402	0.007	0.012	5055
Relative performance with respect to each gender - year 10 specific								
Level in French compared to girls: Better	0.253	-0.022	0.010	5685	0.185	0.005	0.013	5085
Level in French compared to boys: Better	0.469	-0.021	0.019	5557	0.306	0.005	0.014	5060
Self-confidence in science								
Lost in front of a math problem: Agree	0.542	0.013	0.017	5735	0.329	0.002	0.014	5127
Worried when thinking about math: Agree	0.611	-0.027	0.016	5752	0.409	-0.018	0.015	5141
You can succeed if try hard enough: Agree	0.845	0.020	0.010	5735	0.887	-0.004	0.010	5120

Note: This table presents the average treatment effect on tastes and self-confidence. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.35 – Effect of treatment on tastes and self-confidence - Year 12

Panel: Year 12	**Girls**				**Boys**			
	C	T-C	s.e	Obs.	C	T-C	s.e	Obs.
Taste for each field of study								
Likes biology-geoscience	0.844	-0.016	0.015	2439	0.723	-0.020	0.031	2449
Likes English	0.729	0.019	0.020	2450	0.724	-0.008	0.020	2494
Likes math	0.712	0.038	0.024	2449	0.784	0.020	0.020	2494
Likes physics-chemistry	0.658	-0.011	0.025	2449	0.734	-0.009	0.019	2490
Likes sport	0.740	-0.008	0.019	2452	0.871	0.021	0.015	2488
Likes history-geography	0.632	-0.005	0.023	2453	0.621	0.033	0.026	2495
Taste for each field of study - year 12 specific								
Likes philosophy	0.501	-0.053	0.028	2450	0.455	0.001	0.028	2493
Self-assessment of performance								
Level in biology-geoscience: Good	0.573	-0.010	0.023	2435	0.506	0.004	0.028	2437
Level in English: Good	0.563	0.031	0.020	2452	0.566	-0.026	0.022	2490
Level in math: Good	0.315	0.021	0.024	2443	0.452	0.010	0.024	2490
Level in physics-chemistry: Good	0.299	0.001	0.024	2447	0.422	-0.017	0.025	2488
Level in sport: Good	0.641	-0.028	0.020	2437	0.793	0.006	0.016	2486
Level in history-geography: Good	0.446	-0.007	0.024	2446	0.414	-0.002	0.023	2495
Self-assessment of performance - year 12 specific								
Level in philosophy: Good	0.258	-0.001	0.023	2449	0.218	0.007	0.020	2483
Relative performance with respect to each gender								
Level in maths compared to girls: Better	0.268	0.011	0.019	2444	0.394	0.012	0.022	2473
Level in maths compared to boys: Better	0.257	-0.001	0.023	2375	0.371	0.009	0.017	2477
Relative performance with respect to each gender - year 12 specific								
Level in biology-geoscience compared to girls: Better	0.293	0.005	0.018	2427	0.300	0.013	0.021	2409
Level in biology-geoscience compared to boys: Better	0.434	0.006	0.027	2366	0.384	-0.013	0.020	2414
Self-confidence in science								
Lost in front of a math problem: Agree	0.482	-0.029	0.027	2452	0.322	-0.027	0.021	2481
Worried when thinking about math: Agree	0.557	-0.034	0.024	2451	0.375	-0.041	0.021	2491
You can succeed if try hard enough: Agree	0.940	-0.003	0.010	2450	0.952	0.005	0.009	2493

Note: This table presents the average treatment effect on tastes and self-confidence. Each row corresponds to a different model, based on responses reported in the post-treatment survey. Column (C) shows the average response of students in the control group. Column (T-C) contains the coefficient of a treatment class dummy. We use a linear probability model with high school fixed effects. Column (s.e) shows corresponding standard errors clustered at the high school level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.36 – Descriptive statistics from the control group

	Mean	S.D	Min	Max	N
Student's characteristics					
Mother works in science					
Year 10					
All	0.143	0.350	0	1	5304
Girls	0.149	0.357	0	1	2837
Boys	0.135	0.341	0	1	2467
Difference girls-boys	0.010				
Year 12					
All	0.187	0.390	0	1	2451
Girls	0.196	0.397	0	1	1237
Boys	0.177	0.382	0	1	1214
Difference girls-boys	0.022*				
Father works in science					
Year 10					
All	0.184	0.387	0	1	5284
Girls	0.176	0.381	0	1	2825
Boys	0.193	0.395	0	1	2459
Difference girls-boys	-0.021*				
Year 12					
All	0.277	0.448	0	1	2444
Girls	0.275	0.446	0	1	1231
Boys	0.279	0.449	0	1	1213
Difference girls-boys	0.008				
Older brothers					
Year 10					
All	0.409	0.492	0	1	4893
Girls	0.414	0.493	0	1	2623
Boys	0.404	0.491	0	1	2270
Difference girls-boys	0.016				
Year 12					
All	0.369	0.483	0	1	2353
Girls	0.379	0.485	0	1	1193
Boys	0.359	0.480	0	1	1160
Difference girls-boys	0.030				
Older sisters					
Year 10					
All	0.389	0.488	0	1	4842

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Girls	0.401	0.490	0	1	2607
Boys	0.375	0.484	0	1	2235
Difference girls-boys	0.033**				
Year 12					
All	0.321	0.467	0	1	2321
Girls	0.333	0.472	0	1	1185
Boys	0.308	0.462	0	1	1136
Difference girls-boys	0.017				
Extracurricular activities					
Plays video games at least once a week					
Year 10					
All	0.583	0.493	0	1	5268
Girls	0.342	0.474	0	1	2819
Boys	0.860	0.347	0	1	2449
Difference girls-boys	-0.516***				
Year 12					
All	0.498	0.500	0	1	2450
Girls	0.249	0.432	0	1	1234
Boys	0.751	0.433	0	1	1216
Difference girls-boys	-0.483***				
Plays sports at least once a week					
Year 10					
All	0.723	0.448	0	1	5250
Girls	0.650	0.477	0	1	2811
Boys	0.807	0.395	0	1	2439
Difference girls-boys	-0.165***				
Year 12					
All	0.644	0.479	0	1	2441
Girls	0.593	0.492	0	1	1230
Boys	0.697	0.460	0	1	1211
Difference girls-boys	-0.108***				
Plays board games at least once a week					
Year 10					
All	0.707	0.455	0	1	5266
Girls	0.687	0.464	0	1	2813
Boys	0.729	0.444	0	1	2453
Difference girls-boys	-0.048***				
Year 12					
All	0.740	0.439	0	1	2444
Girls	0.736	0.441	0	1	1233

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	0.744	0.437	0	1	1211
Difference girls-boys	-0.007				
Competitive sports at least once a week					
Year 10					
All	0.377	0.485	0	1	5279
Girls	0.246	0.431	0	1	2817
Boys	0.526	0.499	0	1	2462
Difference girls-boys	-0.281***				
Year 12					
All	0.318	0.466	0	1	2453
Girls	0.209	0.407	0	1	1234
Boys	0.429	0.495	0	1	1219
Difference girls-boys	-0.216***				
Watches scientific TV programs at least once a week					
Year 10					
All	0.633	0.482	0	1	5276
Girls	0.625	0.484	0	1	2821
Boys	0.642	0.480	0	1	2455
Difference girls-boys	-0.014				
Year 12					
All	0.687	0.464	0	1	2452
Girls	0.700	0.459	0	1	1235
Boys	0.675	0.469	0	1	1217
Difference girls-boys	0.032				
Reads comics at least once a week					
Year 10					
All	0.505	0.500	0	1	5294
Girls	0.442	0.497	0	1	2828
Boys	0.577	0.494	0	1	2466
Difference girls-boys	-0.140***				
Year 12					
All	0.486	0.500	0	1	2452
Girls	0.438	0.496	0	1	1234
Boys	0.534	0.499	0	1	1218
Difference girls-boys	-0.095***				
Uses Facebook at least once a week					
Year 10					
All	0.573	0.495	0	1	5338
Girls	0.596	0.491	0	1	2853

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	0.546	0.498	0	1	2485
Difference girls-boys	0.052***				
Year 12					
All	0.646	0.478	0	1	2464
Girls	0.640	0.480	0	1	1240
Boys	0.652	0.477	0	1	1224
Difference girls-boys	-0.008				
Hangs out with friends at least once a week					
Year 10					
All	0.278	0.448	0	1	5283
Girls	0.271	0.444	0	1	2824
Boys	0.287	0.453	0	1	2459
Difference girls-boys	-0.009				
Year 12					
All	0.186	0.389	0	1	2441
Girls	0.162	0.368	0	1	1231
Boys	0.210	0.407	0	1	1210
Difference girls-boys	-0.037**				
Spends time with family at least once a week					
Year 10					
All	0.413	0.492	0	1	5296
Girls	0.422	0.494	0	1	2830
Boys	0.403	0.491	0	1	2466
Difference girls-boys	0.025*				
Year 12					
All	0.386	0.487	0	1	2453
Girls	0.404	0.491	0	1	1234
Boys	0.368	0.482	0	1	1219
Difference girls-boys	0.042**				
Taste for each field of study					
Likes biology-geoscience					
Year 10					
All	0.635	0.481	0	1	5300
Girls	0.598	0.490	0	1	2828
Boys	0.678	0.467	0	1	2472
Difference girls-boys	-0.081***				
Year 12					
All	0.784	0.411	0	1	2424
Girls	0.844	0.363	0	1	1234
Boys	0.723	0.448	0	1	1190

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	0.103***				
Likes English					
Year 10					
All	0.722	0.448	0	1	5304
Girls	0.738	0.440	0	1	2835
Boys	0.703	0.457	0	1	2469
Difference girls-boys	0.027				
Year 12					
All	0.726	0.446	0	1	2453
Girls	0.729	0.445	0	1	1232
Boys	0.724	0.447	0	1	1221
Difference girls-boys	0.009				
Likes math					
Year 10					
All	0.632	0.482	0	1	5300
Girls	0.560	0.497	0	1	2832
Boys	0.714	0.452	0	1	2468
Difference girls-boys	-0.147***				
Year 12					
All	0.748	0.434	0	1	2454
Girls	0.712	0.453	0	1	1234
Boys	0.784	0.411	0	1	1220
Difference girls-boys	-0.059***				
Likes physics-chemistry					
Year 10					
All	0.599	0.490	0	1	5304
Girls	0.517	0.500	0	1	2830
Boys	0.693	0.461	0	1	2474
Difference girls-boys	-0.172***				
Year 12					
All	0.696	0.460	0	1	2454
Girls	0.658	0.475	0	1	1236
Boys	0.734	0.442	0	1	1218
Difference girls-boys	-0.078***				
Likes sport					
Year 10					
All	0.777	0.417	0	1	5300
Girls	0.686	0.464	0	1	2831
Boys	0.881	0.324	0	1	2469

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	-0.195***				
Year 12					
All	0.805	0.396	0	1	2454
Girls	0.740	0.439	0	1	1237
Boys	0.871	0.335	0	1	1217
Difference girls-boys	-0.136***				
Likes history-geography					
Year 10					
All	0.672	0.469	0	1	5304
Girls	0.648	0.478	0	1	2832
Boys	0.700	0.458	0	1	2472
Difference girls-boys	-0.069***				
Year 12					
All	0.627	0.484	0	1	2457
Girls	0.632	0.482	0	1	1238
Boys	0.621	0.485	0	1	1219
Difference girls-boys	0.009				
Percentile rank at DNB					
Average rank DNB - total					
Year 10					
All	44.267	28.414	0	100	5766
Girls	48.078	28.863	0	100	3079
Boys	39.899	27.247	0	100	2687
Difference girls-boys	6.530***				
Year 12					
All	63.359	24.410	0	100	2518
Girls	68.172	23.435	3	100	1254
Boys	58.585	24.430	0	100	1264
Difference girls-boys	8.760***				
Average rank DNB in French - blind score					
Year 10					
All	46.150	28.396	0	100	5754
Girls	50.861	28.489	0	100	3072
Boys	40.753	27.312	0	100	2682
Difference girls-boys	8.453***				
Year 12					
All	59.160	27.413	0	100	2515
Girls	64.188	26.502	0	100	1252
Boys	54.176	27.401	0	100	1263
Difference girls-boys	9.979***				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Average rank DNB in math - blind score					
Year 10					
All	45.494	28.457	0	100	5756
Girls	44.903	28.402	0	100	3075
Boys	46.172	28.509	0	100	2681
Difference girls-boys	-2.413***				
Year 12					
All	62.208	25.084	0	100	2515
Girls	61.629	25.530	0	100	1252
Boys	62.782	24.630	1	100	1263
Difference girls-boys	-1.317				
Average rank DNB in French - non blind score					
Year 10					
All	45.922	28.541	0	100	5764
Girls	51.913	28.136	0	100	3077
Boys	39.060	27.441	0	100	2687
Difference girls-boys	11.669***				
Year 12					
All	59.445	27.232	0	100	2518
Girls	66.224	25.623	1	100	1254
Boys	52.719	27.123	0	100	1264
Difference girls-boys	13.052***				
Average rank DNB in math - non blind score					
Year 10					
All	43.515	28.195	0	100	5764
Girls	44.192	28.411	0	100	3077
Boys	42.740	27.931	0	100	2687
Difference girls-boys	0.775				
Year 12					
All	65.349	23.561	0	100	2518
Girls	68.183	22.784	1	100	1254
Boys	62.536	23.988	0	100	1264
Difference girls-boys	5.814***				
Self-assessment of performance					
Level in biology-geoscience: Good					
Year 10					
All	0.439	0.496	0	1	5295
Girls	0.409	0.492	0	1	2831
Boys	0.474	0.499	0	1	2464

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	-0.062***				
Year 12					
All	0.540	0.498	0	1	2411
Girls	0.573	0.495	0	1	1230
Boys	0.506	0.500	0	1	1181
Difference girls-boys	0.063***				
Level in English: Good					
Year 10					
All	0.522	0.500	0	1	5292
Girls	0.547	0.498	0	1	2829
Boys	0.493	0.500	0	1	2463
Difference girls-boys	0.053***				
Year 12					
All	0.564	0.496	0	1	2454
Girls	0.563	0.496	0	1	1235
Boys	0.566	0.496	0	1	1219
Difference girls-boys	-0.001				
Level in math: Good					
Year 10					
All	0.422	0.494	0	1	5277
Girls	0.369	0.483	0	1	2819
Boys	0.483	0.500	0	1	2458
Difference girls-boys	-0.107***				
Year 12					
All	0.383	0.486	0	1	2450
Girls	0.315	0.465	0	1	1233
Boys	0.452	0.498	0	1	1217
Difference girls-boys	-0.134***				
Level in physics-chemistry: Good					
Year 10					
All	0.387	0.487	0	1	5281
Girls	0.321	0.467	0	1	2817
Boys	0.462	0.499	0	1	2464
Difference girls-boys	-0.145***				
Year 12					
All	0.361	0.480	0	1	2449
Girls	0.299	0.458	0	1	1230
Boys	0.422	0.494	0	1	1219
Difference girls-boys	-0.125***				
Level in sport: Good					

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Year 10					
All	0.670	0.470	0	1	5280
Girls	0.554	0.497	0	1	2813
Boys	0.803	0.398	0	1	2467
Difference girls-boys	-0.256***				
Year 12					
All	0.717	0.451	0	1	2453
Girls	0.641	0.480	0	1	1233
Boys	0.793	0.405	0	1	1220
Difference girls-boys	-0.156***				
Level in history-geography: Good					
Year 10					
All	0.428	0.495	0	1	5292
Girls	0.425	0.494	0	1	2831
Boys	0.433	0.496	0	1	2461
Difference girls-boys	-0.009				
Year 12					
All	0.430	0.495	0	1	2454
Girls	0.446	0.497	0	1	1232
Boys	0.414	0.493	0	1	1222
Difference girls-boys	0.034*				
Relative performance with respect to each gender					
Level in maths compared to girls: Better					
Year 10					
All	0.348	0.476	0	1	5258
Girls	0.285	0.452	0	1	2813
Boys	0.420	0.494	0	1	2445
Difference girls-boys	-0.123***				
Year 12					
All	0.330	0.470	0	1	2446
Girls	0.268	0.443	0	1	1234
Boys	0.394	0.489	0	1	1212
Difference girls-boys	-0.116***				
Level in maths compared to boys: Better					
Year 10					
All	0.332	0.471	0	1	5200
Girls	0.271	0.444	0	1	2764
Boys	0.402	0.490	0	1	2436
Difference girls-boys	-0.138***				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Year 12					
All	0.314	0.464	0	1	2420
Girls	0.257	0.437	0	1	1208
Boys	0.371	0.483	0	1	1212
Difference girls-boys	-0.126***				
Self-confidence in science					
Lost in front of a math problem: Agree					
Year 10					
All	0.443	0.497	0	1	5300
Girls	0.542	0.498	0	1	2826
Boys	0.329	0.470	0	1	2474
Difference girls-boys	0.210***				
Year 12					
All	0.403	0.491	0	1	2449
Girls	0.482	0.500	0	1	1236
Boys	0.322	0.467	0	1	1213
Difference girls-boys	0.157***				
Worried when thinking about math: Agree					
Year 10					
All	0.517	0.500	0	1	5317
Girls	0.611	0.488	0	1	2839
Boys	0.409	0.492	0	1	2478
Difference girls-boys	0.194***				
Year 12					
All	0.467	0.499	0	1	2457
Girls	0.557	0.497	0	1	1236
Boys	0.375	0.484	0	1	1221
Difference girls-boys	0.186***				
You can succeed if try hard enough: Agree					
Year 10					
All	0.864	0.342	0	1	5300
Girls	0.845	0.362	0	1	2830
Boys	0.887	0.317	0	1	2470
Difference girls-boys	-0.042***				
Year 12					
All	0.946	0.226	0	1	2455
Girls	0.940	0.238	0	1	1234
Boys	0.952	0.215	0	1	1221
Difference girls-boys	-0.008				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Major choices (intention)					
Considers science majors					
Year 10					
All	0.548	0.498	0	1	5113
Girls	0.468	0.499	0	1	2738
Boys	0.640	0.480	0	1	2375
Difference girls-boys	-0.158***				
Year 12					
All	0.692	0.462	0	1	2454
Girls	0.649	0.477	0	1	1238
Boys	0.735	0.441	0	1	1216
Difference girls-boys	-0.087***				
Number of Choices*					
Year 10					
All	1.196	0.434	1	5	5119
Girls	1.198	0.437	1	3	2742
Boys	1.194	0.431	1	5	2377
Difference girls-boys	0.005				
Year 12					
All	1.547	0.713	1	5	2454
Girls	1.550	0.702	1	5	1235
Boys	1.545	0.725	1	5	1219
Difference girls-boys	0.026				
Choice (intention): Other					
Year 10					
All	0.010	0.097	0	1	5338
Girls	0.005	0.067	0	1	2853
Boys	0.015	0.123	0	1	2485
Difference girls-boys	-0.012***				
Year 12					
All	0.126	0.332	0	1	2464
Girls	0.127	0.333	0	1	1240
Boys	0.126	0.332	0	1	1224
Difference girls-boys	0.000				
Date Choice					
Year 10					
All	1.721	0.866	1	4	5193
Girls	1.732	0.856	1	4	2780
Boys	1.708	0.878	1	4	2413
Difference girls-boys	0.043				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Year 12					
All	1.768	0.852	1	4	2427
Girls	1.754	0.831	1	4	1224
Boys	1.783	0.873	1	4	1203
Difference girls-boys	-0.028				
Hasn't started thinking about choice					
Year 10					
All	0.026	0.158	0	1	5193
Girls	0.019	0.138	0	1	2780
Boys	0.033	0.178	0	1	2413
Difference girls-boys	-0.013***				
Year 12					
All	0.022	0.148	0	1	2427
Girls	0.016	0.127	0	1	1224
Boys	0.028	0.166	0	1	1203
Difference girls-boys	-0.015**				
Parents strongly support choice					
Year 10					
All	0.208	0.406	0	1	5296
Girls	0.197	0.398	0	1	2827
Boys	0.220	0.414	0	1	2469
Difference girls-boys	-0.013				
Year 12					
All	0.233	0.423	0	1	2457
Girls	0.243	0.429	0	1	1237
Boys	0.223	0.416	0	1	1220
Difference girls-boys	0.014				
Hesitates about choice					
Year 10					
All	0.409	0.492	0	1	5315
Girls	0.423	0.494	0	1	2843
Boys	0.392	0.488	0	1	2472
Difference girls-boys	0.037**				
Year 12					
All	0.429	0.495	0	1	2459
Girls	0.456	0.498	0	1	1236
Boys	0.401	0.490	0	1	1223
Difference girls-boys	0.040**				
Preferred fields of study					

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Field (intention): biology					
Year 10					
All	0.143	0.350	0	1	5295
Girls	0.146	0.353	0	1	2835
Boys	0.140	0.347	0	1	2460
Difference girls-boys	0.014				
Year 12					
All	0.250	0.433	0	1	2448
Girls	0.319	0.466	0	1	1235
Boys	0.181	0.385	0	1	1213
Difference girls-boys	0.116***				
Field (intention): STEM					
Year 10					
All	0.345	0.475	0	1	5295
Girls	0.197	0.398	0	1	2835
Boys	0.515	0.500	0	1	2460
Difference girls-boys	-0.310***				
Year 12					
All	0.433	0.496	0	1	2448
Girls	0.284	0.451	0	1	1235
Boys	0.585	0.493	0	1	1213
Difference girls-boys	-0.294***				
Field (intention): Medical, dental					
Year 10					
All	0.242	0.429	0	1	5295
Girls	0.321	0.467	0	1	2835
Boys	0.152	0.359	0	1	2460
Difference girls-boys	0.174***				
Year 12					
All	0.320	0.467	0	1	2448
Girls	0.439	0.496	0	1	1235
Boys	0.200	0.400	0	1	1213
Difference girls-boys	0.221***				
Field (intention): Health and social work					
Year 10					
All	0.126	0.332	0	1	5295
Girls	0.193	0.395	0	1	2835
Boys	0.049	0.216	0	1	2460
Difference girls-boys	0.151***				
Year 12					

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
All	0.120	0.325	0	1	2448
Girls	0.187	0.390	0	1	1235
Boys	0.052	0.222	0	1	1213
Difference girls-boys	0.133***				
Field (intention): Economics, Business, Management					
Year 10					
All	0.367	0.482	0	1	5295
Girls	0.415	0.493	0	1	2835
Boys	0.312	0.463	0	1	2460
Difference girls-boys	0.094***				
Year 12					
All	0.228	0.420	0	1	2448
Girls	0.248	0.432	0	1	1235
Boys	0.208	0.406	0	1	1213
Difference girls-boys	0.048**				
Field (intention): Humanities					
Year 10					
All	0.161	0.368	0	1	5295
Girls	0.230	0.421	0	1	2835
Boys	0.082	0.274	0	1	2460
Difference girls-boys	0.141***				
Year 12					
All	0.123	0.328	0	1	2448
Girls	0.155	0.362	0	1	1235
Boys	0.089	0.285	0	1	1213
Difference girls-boys	0.065***				
Field (intention): Sport					
Year 10					
All	0.160	0.366	0	1	5295
Girls	0.080	0.272	0	1	2835
Boys	0.251	0.434	0	1	2460
Difference girls-boys	-0.170***				
Year 12					
All	0.115	0.319	0	1	2448
Girls	0.072	0.259	0	1	1235
Boys	0.158	0.365	0	1	1213
Difference girls-boys	-0.093***				
Field (intention): Arts					
Year 10					
All	0.124	0.329	0	1	5295

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Girls	0.170	0.375	0	1	2835
Boys	0.071	0.257	0	1	2460
Difference girls-boys	0.084***				
Year 12					
All	0.087	0.283	0	1	2448
Girls	0.104	0.305	0	1	1235
Boys	0.071	0.257	0	1	1213
Difference girls-boys	0.027**				
Field (intention): Other					
Year 10					
All	0.076	0.264	0	1	5295
Girls	0.072	0.258	0	1	2835
Boys	0.080	0.271	0	1	2460
Difference girls-boys	-0.010				
Year 12					
All	0.087	0.283	0	1	2448
Girls	0.078	0.268	0	1	1235
Boys	0.097	0.296	0	1	1213
Difference girls-boys	-0.011				
Field (intention): STEM only					
Year 10					
All	0.157	0.364	0	1	4116
Girls	0.042	0.202	0	1	2377
Boys	0.313	0.464	0	1	1739
Difference girls-boys	-0.258***				
Year 12					
All	0.276	0.447	0	1	1917
Girls	0.122	0.328	0	1	1007
Boys	0.446	0.497	0	1	910
Difference girls-boys	-0.312***				
Number of fields*					
Year 10					
All	1.865	0.960	1	8	4977
Girls	1.945	0.974	1	8	2670
Boys	1.772	0.936	1	8	2307
Difference girls-boys	0.171***				
Year 12					
All	1.766	0.931	1	8	2454
Girls	1.885	0.960	1	5	1238
Boys	1.645	0.884	1	8	1216

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	0.206***				
Would consider this job on a 1-to-10 scale					
Could like being a pharmacist					
Year 10					
All	0.206	0.404	0	1	5250
Girls	0.251	0.434	0	1	2813
Boys	0.153	0.360	0	1	2437
Difference girls-boys	0.103***				
Year 12					
All	0.288	0.453	0	1	2441
Girls	0.376	0.485	0	1	1231
Boys	0.199	0.400	0	1	1210
Difference girls-boys	0.160***				
Could like being a computer scientist					
Year 10					
All	0.321	0.467	0	1	5253
Girls	0.135	0.341	0	1	2813
Boys	0.536	0.499	0	1	2440
Difference girls-boys	-0.400***				
Year 12					
All	0.337	0.473	0	1	2445
Girls	0.175	0.380	0	1	1228
Boys	0.500	0.500	0	1	1217
Difference girls-boys	-0.313***				
Could like being a engineer					
Year 10					
All	0.458	0.498	0	1	5267
Girls	0.276	0.447	0	1	2813
Boys	0.667	0.472	0	1	2454
Difference girls-boys	-0.384***				
Year 12					
All	0.594	0.491	0	1	2443
Girls	0.468	0.499	0	1	1228
Boys	0.721	0.449	0	1	1215
Difference girls-boys	-0.252***				
Could like being a lawyer					
Year 10					
All	0.401	0.490	0	1	5251
Girls	0.487	0.500	0	1	2820

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	0.302	0.459	0	1	2431
Difference girls-boys	0.178***				
Year 12					
All	0.329	0.470	0	1	2437
Girls	0.384	0.487	0	1	1226
Boys	0.273	0.446	0	1	1211
Difference girls-boys	0.114***				
Could like being a doctor					
Year 10					
All	0.403	0.491	0	1	5263
Girls	0.453	0.498	0	1	2826
Boys	0.346	0.476	0	1	2437
Difference girls-boys	0.113***				
Year 12					
All	0.483	0.500	0	1	2447
Girls	0.587	0.493	0	1	1236
Boys	0.377	0.485	0	1	1211
Difference girls-boys	0.190***				
Could like being a therapist					
Year 10					
All	0.421	0.494	0	1	5258
Girls	0.539	0.499	0	1	2821
Boys	0.283	0.451	0	1	2437
Difference girls-boys	0.252***				
Year 12					
All	0.407	0.491	0	1	2439
Girls	0.489	0.500	0	1	1228
Boys	0.324	0.468	0	1	1211
Difference girls-boys	0.163***				
Could like being a renewable energy technician					
Year 10					
All	0.184	0.388	0	1	5237
Girls	0.083	0.276	0	1	2810
Boys	0.302	0.459	0	1	2427
Difference girls-boys	-0.213***				
Year 12					
All	0.268	0.443	0	1	2443
Girls	0.183	0.387	0	1	1229
Boys	0.354	0.478	0	1	1214
Difference girls-boys	-0.162***				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Could like being a chemist					
Year 10					
All	0.308	0.462	0	1	5242
Girls	0.256	0.437	0	1	2815
Boys	0.367	0.482	0	1	2427
Difference girls-boys	-0.108***				
Year 12					
All	0.364	0.481	0	1	2443
Girls	0.381	0.486	0	1	1229
Boys	0.348	0.476	0	1	1214
Difference girls-boys	0.038*				
Could like being a researcher in biology					
Year 10					
All	0.318	0.466	0	1	5254
Girls	0.314	0.464	0	1	2818
Boys	0.323	0.468	0	1	2436
Difference girls-boys	-0.006				
Year 12					
All	0.444	0.497	0	1	2444
Girls	0.507	0.500	0	1	1231
Boys	0.379	0.485	0	1	1213
Difference girls-boys	0.110***				
Could like being an industrial designer					
Year 10					
All	0.309	0.462	0	1	5215
Girls	0.290	0.454	0	1	2793
Boys	0.332	0.471	0	1	2422
Difference girls-boys	-0.054***				
Year 12					
All	0.308	0.462	0	1	2432
Girls	0.271	0.445	0	1	1223
Boys	0.346	0.476	0	1	1209
Difference girls-boys	-0.068***				
Could like being in a job in STEM*					
Year 10					
All	0.641	0.480	0	1	5338
Girls	0.496	0.500	0	1	2853
Boys	0.808	0.394	0	1	2485
Difference girls-boys	-0.316***				
Year 12					

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
All	0.741	0.438	0	1	2464
Girls	0.635	0.481	0	1	1240
Boys	0.849	0.358	0	1	1224
Difference girls-boys	-0.212***				
Could like being in a job in non-STEM science*					
Year 10					
All	0.614	0.487	0	1	5338
Girls	0.629	0.483	0	1	2853
Boys	0.596	0.491	0	1	2485
Difference girls-boys	0.035**				
Year 12					
All	0.727	0.445	0	1	2464
Girls	0.817	0.387	0	1	1240
Boys	0.636	0.481	0	1	1224
Difference girls-boys	0.171***				
Could like being a in a non scientific job*					
Year 10					
All	0.570	0.495	0	1	5338
Girls	0.693	0.461	0	1	2853
Boys	0.429	0.495	0	1	2485
Difference girls-boys	0.256***				
Year 12					
All	0.528	0.499	0	1	2464
Girls	0.615	0.487	0	1	1240
Boys	0.440	0.497	0	1	1224
Difference girls-boys	0.175***				
Factors for choice					
Interest for major					
Year 10					
All	8.037	2.173	0	10	5274
Girls	8.118	2.189	0	10	2822
Boys	7.944	2.151	0	10	2452
Difference girls-boys	0.125*				
Year 12					
All	8.896	1.637	0	10	2455
Girls	9.005	1.564	0	10	1235
Boys	8.786	1.700	0	10	1220
Difference girls-boys	0.210***				
Ability to specialize					

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Year 10					
All	5.475	2.858	0	10	5250
Girls	5.410	2.866	0	10	2810
Boys	5.550	2.849	0	10	2440
Difference girls-boys	-0.073				
Year 12					
All	5.316	2.900	0	10	2448
Girls	5.223	2.848	0	10	1230
Boys	5.411	2.950	0	10	1218
Difference girls-boys	-0.178				
Having access to various jobs					
Year 10					
All	7.605	2.369	0	10	5277
Girls	7.603	2.359	0	10	2818
Boys	7.606	2.381	0	10	2459
Difference girls-boys	0.018				
Year 12					
All	7.395	2.360	0	10	2449
Girls	7.521	2.252	0	10	1233
Boys	7.266	2.458	0	10	1216
Difference girls-boys	0.220**				
Other majors are difficult					
Year 10					
All	4.681	3.346	0	10	5272
Girls	4.930	3.347	0	10	2823
Boys	4.394	3.322	0	10	2449
Difference girls-boys	0.565***				
Year 12					
All	3.672	3.048	0	10	2449
Girls	3.815	3.072	0	10	1231
Boys	3.527	3.018	0	10	1218
Difference girls-boys	0.330**				
Brings opportunity for stable job					
Year 10					
All	6.973	2.658	0	10	5290
Girls	6.963	2.698	0	10	2833
Boys	6.985	2.611	0	10	2457
Difference girls-boys	0.039				
Year 12					
All	7.451	2.469	0	10	2453
Girls	7.545	2.426	0	10	1233

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	7.356	2.508	0	10	1220
Difference girls-boys	0.183				
Wages concerns					
Year 10					
All	7.661	2.360	0	10	5287
Girls	7.563	2.402	0	10	2823
Boys	7.773	2.306	0	10	2464
Difference girls-boys	-0.144**				
Year 12					
All	7.728	2.353	0	10	2453
Girls	7.626	2.385	0	10	1234
Boys	7.831	2.317	0	10	1219
Difference girls-boys	-0.205*				
Feeling comfortable					
Year 10					
All	8.724	1.691	0	10	5294
Girls	8.874	1.566	0	10	2831
Boys	8.552	1.808	0	10	2463
Difference girls-boys	0.329***				
Year 12					
All	8.909	1.510	0	10	2454
Girls	9.043	1.426	0	10	1236
Boys	8.773	1.580	0	10	1218
Difference girls-boys	0.239***				
Workload					
Year 10					
All	5.990	2.722	0	10	5257
Girls	6.109	2.709	0	10	2809
Boys	5.855	2.731	0	10	2448
Difference girls-boys	0.311***				
Year 12					
All	5.729	2.801	0	10	2441
Girls	5.682	2.809	0	10	1229
Boys	5.776	2.793	0	10	1212
Difference girls-boys	-0.097				
Having female peers					
Year 10					
All	2.982	3.431	0	10	5283
Girls	2.269	3.065	0	10	2824

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	3.801	3.641	0	10	2459
Difference girls-boys	-1.468***				
Year 12					
All	2.802	3.404	0	10	2444
Girls	1.805	2.746	0	10	1228
Boys	3.808	3.697	0	10	1216
Difference girls-boys	-2.011***				
Having male peers					
Year 10					
All	2.542	3.069	0	10	5284
Girls	2.233	2.998	0	10	2826
Boys	2.898	3.111	0	10	2458
Difference girls-boys	-0.632***				
Year 12					
All	2.263	2.954	0	10	2449
Girls	1.837	2.743	0	10	1234
Boys	2.697	3.095	0	10	1215
Difference girls-boys	-0.874***				
Opinions on science					
Likes science: Agree					
Year 10					
All	0.726	0.446	0	1	5298
Girls	0.665	0.472	0	1	2826
Boys	0.796	0.403	0	1	2472
Difference girls-boys	-0.128***				
Year 12					
All	0.922	0.269	0	1	2447
Girls	0.915	0.280	0	1	1230
Boys	0.929	0.258	0	1	1217
Difference girls-boys	-0.014				
Some jobs in science are interesting: Agree					
Year 10					
All	0.853	0.354	0	1	5270
Girls	0.848	0.359	0	1	2817
Boys	0.858	0.349	0	1	2453
Difference girls-boys	-0.009				
Year 12					
All	0.950	0.218	0	1	2450
Girls	0.960	0.195	0	1	1234
Boys	0.939	0.239	0	1	1216

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	0.020**				
Would consider jobs in science: Agree					
Year 10					
All	0.527	0.499	0	1	5225
Girls	0.468	0.499	0	1	2789
Boys	0.594	0.491	0	1	2436
Difference girls-boys	-0.113***				
Year 12					
All	0.739	0.439	0	1	2440
Girls	0.716	0.451	0	1	1231
Boys	0.763	0.426	0	1	1209
Difference girls-boys	-0.044**				
Better wages in science: Agree					
Year 10					
All	0.645	0.479	0	1	5236
Girls	0.631	0.483	0	1	2797
Boys	0.660	0.474	0	1	2439
Difference girls-boys	-0.015				
Year 12					
All	0.548	0.498	0	1	2435
Girls	0.527	0.499	0	1	1227
Boys	0.570	0.495	0	1	1208
Difference girls-boys	-0.044**				
Studies in science are long: Agree					
Year 10					
All	0.843	0.364	0	1	5278
Girls	0.838	0.368	0	1	2828
Boys	0.849	0.358	0	1	2450
Difference girls-boys	-0.009				
Year 12					
All	0.692	0.462	0	1	2445
Girls	0.664	0.473	0	1	1231
Boys	0.722	0.448	0	1	1214
Difference girls-boys	-0.059***				
Jobs in science are dreary: Agree					
Year 10					
All	0.294	0.455	0	1	5247
Girls	0.281	0.450	0	1	2800
Boys	0.308	0.462	0	1	2447

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	-0.022				
Year 12					
All	0.202	0.402	0	1	2445
Girls	0.172	0.378	0	1	1235
Boys	0.232	0.422	0	1	1210
Difference girls-boys	-0.065***				
Hard to maintain work-life balance: Agree					
Year 10					
All	0.284	0.451	0	1	5267
Girls	0.293	0.455	0	1	2822
Boys	0.274	0.446	0	1	2445
Difference girls-boys	0.027*				
Year 12					
All	0.195	0.396	0	1	2449
Girls	0.225	0.418	0	1	1233
Boys	0.165	0.372	0	1	1216
Difference girls-boys	0.047***				
Jobs in science are solitary: Agree					
Year 10					
All	0.312	0.463	0	1	5271
Girls	0.323	0.468	0	1	2819
Boys	0.300	0.458	0	1	2452
Difference girls-boys	0.028**				
Year 12					
All	0.219	0.414	0	1	2444
Girls	0.234	0.424	0	1	1229
Boys	0.204	0.403	0	1	1215
Difference girls-boys	0.024				
Opinions on women/men in science					
More men in science-related jobs: True					
Year 10					
All	0.628	0.484	0	1	5284
Girls	0.631	0.483	0	1	2827
Boys	0.624	0.484	0	1	2457
Difference girls-boys	0.009				
Year 12					
All	0.720	0.449	0	1	2451
Girls	0.719	0.450	0	1	1238
Boys	0.721	0.449	0	1	1213
Difference girls-boys	0.013				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Men are more gifted in math: True					
Year 10					
All	0.234	0.424	0	1	5277
Girls	0.183	0.387	0	1	2832
Boys	0.294	0.456	0	1	2445
Difference girls-boys	-0.104***				
Year 12					
All	0.217	0.412	0	1	2450
Girls	0.162	0.369	0	1	1235
Boys	0.272	0.445	0	1	1215
Difference girls-boys	-0.109***				
Brains of M/W are different: True					
Year 10					
All	0.204	0.403	0	1	5257
Girls	0.206	0.404	0	1	2816
Boys	0.202	0.402	0	1	2441
Difference girls-boys	0.007				
Year 12					
All	0.167	0.373	0	1	2447
Girls	0.150	0.357	0	1	1232
Boys	0.184	0.387	0	1	1215
Difference girls-boys	-0.037**				
Women like science less than men: True					
Year 10					
All	0.171	0.376	0	1	5274
Girls	0.154	0.361	0	1	2824
Boys	0.191	0.393	0	1	2450
Difference girls-boys	-0.033***				
Year 12					
All	0.111	0.314	0	1	2448
Girls	0.074	0.261	0	1	1234
Boys	0.149	0.356	0	1	1214
Difference girls-boys	-0.070***				
Progress for women working in science is slow: True					
Year 10					
All	0.568	0.495	0	1	5231
Girls	0.606	0.489	0	1	2799
Boys	0.524	0.500	0	1	2432
Difference girls-boys	0.082***				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Year 12					
All	0.609	0.488	0	1	2440
Girls	0.623	0.485	0	1	1230
Boys	0.596	0.491	0	1	1210
Difference girls-boys	0.038				
Quality attributed to a male scientist					
Men scientists - *interesting*					
Year 10					
All	0.787	0.410	0	1	2609
Girls	0.765	0.424	0	1	1389
Boys	0.811	0.392	0	1	1220
Difference girls-boys	-0.046***				
Year 12					
All	0.874	0.332	0	1	1226
Girls	0.883	0.322	0	1	613
Boys	0.865	0.342	0	1	613
Difference girls-boys	0.014				
Men scientists - *elegant*					
Year 10					
All	0.581	0.494	0	1	2491
Girls	0.582	0.493	0	1	1327
Boys	0.580	0.494	0	1	1164
Difference girls-boys	0.005				
Year 12					
All	0.559	0.497	0	1	1180
Girls	0.546	0.498	0	1	592
Boys	0.573	0.495	0	1	588
Difference girls-boys	-0.017				
Men scientists - *respected*					
Year 10					
All	0.901	0.298	0	1	2582
Girls	0.905	0.293	0	1	1370
Boys	0.897	0.304	0	1	1212
Difference girls-boys	0.009				
Year 12					
All	0.935	0.246	0	1	1218
Girls	0.951	0.217	0	1	608
Boys	0.920	0.272	0	1	610

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	0.034**				
Men scientists - *exemplary*					
Year 10					
All	0.680	0.467	0	1	2572
Girls	0.663	0.473	0	1	1371
Boys	0.699	0.459	0	1	1201
Difference girls-boys	-0.028				
Year 12					
All	0.709	0.454	0	1	1211
Girls	0.696	0.460	0	1	606
Boys	0.722	0.448	0	1	605
Difference girls-boys	-0.043				
Men scientists - *creative*					
Year 10					
All	0.632	0.482	0	1	2684
Girls	0.585	0.493	0	1	1433
Boys	0.685	0.465	0	1	1251
Difference girls-boys	-0.108***				
Year 12					
All	0.710	0.454	0	1	1243
Girls	0.666	0.472	0	1	623
Boys	0.755	0.431	0	1	620
Difference girls-boys	-0.087***				
Men scientists - *social*					
Year 10					
All	0.479	0.500	0	1	2684
Girls	0.442	0.497	0	1	1433
Boys	0.521	0.500	0	1	1251
Difference girls-boys	-0.073***				
Year 12					
All	0.467	0.499	0	1	1243
Girls	0.413	0.493	0	1	623
Boys	0.523	0.500	0	1	620
Difference girls-boys	-0.108***				
Men scientists - *extravert*					
Year 10					
All	0.438	0.496	0	1	2684

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Girls	0.394	0.489	0	1	1433
Boys	0.488	0.500	0	1	1251
Difference girls-boys	-0.091***				
Year 12					
All	0.379	0.485	0	1	1243
Girls	0.327	0.470	0	1	623
Boys	0.431	0.496	0	1	620
Difference girls-boys	-0.112***				
Quality attributed to a female scientist					
Women scientists - ***interesting***					
Year 10					
All	0.887	0.317	0	1	2578
Girls	0.908	0.289	0	1	1389
Boys	0.862	0.345	0	1	1189
Difference girls-boys	0.049***				
Year 12					
All	0.932	0.251	0	1	1199
Girls	0.967	0.178	0	1	610
Boys	0.896	0.305	0	1	589
Difference girls-boys	0.068***				
Women scientists - ***elegant***					
Year 10					
All	0.686	0.464	0	1	2487
Girls	0.692	0.462	0	1	1333
Boys	0.680	0.467	0	1	1154
Difference girls-boys	0.021				
Year 12					
All	0.697	0.460	0	1	1169
Girls	0.737	0.441	0	1	593
Boys	0.656	0.475	0	1	576
Difference girls-boys	0.096***				
Women scientists - ***respected***					
Year 10					
All	0.845	0.362	0	1	2558
Girls	0.868	0.339	0	1	1375
Boys	0.819	0.385	0	1	1183
Difference girls-boys	0.054***				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Year 12					
All	0.838	0.369	0	1	1190
Girls	0.865	0.342	0	1	608
Boys	0.809	0.393	0	1	582
Difference girls-boys	0.052*				
Women scientists - *exemplary*					
Year 10					
All	0.751	0.432	0	1	2530
Girls	0.781	0.414	0	1	1357
Boys	0.717	0.451	0	1	1173
Difference girls-boys	0.067***				
Year 12					
All	0.793	0.406	0	1	1186
Girls	0.844	0.363	0	1	603
Boys	0.739	0.439	0	1	583
Difference girls-boys	0.104***				
Women scientists - *creative*					
Year 10					
All	0.727	0.446	0	1	2654
Girls	0.689	0.463	0	1	1420
Boys	0.770	0.421	0	1	1234
Difference girls-boys	-0.073***				
Year 12					
All	0.788	0.409	0	1	1221
Girls	0.812	0.391	0	1	617
Boys	0.763	0.425	0	1	604
Difference girls-boys	0.060**				
Women scientists - *social*					
Year 10					
All	0.616	0.487	0	1	2654
Girls	0.608	0.488	0	1	1420
Boys	0.624	0.485	0	1	1234
Difference girls-boys	-0.008				
Year 12					
All	0.622	0.485	0	1	1221
Girls	0.634	0.482	0	1	617
Boys	0.609	0.488	0	1	604
Difference girls-boys	0.039				

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Women scientists - *extravert*					
Year 10					
All	0.429	0.495	0	1	2654
Girls	0.442	0.497	0	1	1420
Boys	0.414	0.493	0	1	1234
Difference girls-boys	0.038*				
Year 12					
All	0.374	0.484	0	1	1221
Girls	0.404	0.491	0	1	617
Boys	0.344	0.476	0	1	604
Difference girls-boys	0.056*				
Year 10-specific questions					
Choice (intention): Première S					
All	0.503	0.500	0	1	5273
Girls	0.452	0.498	0	1	2826
Boys	0.562	0.496	0	1	2447
Difference girls-boys	-0.110***				
Choice (intention): Première L					
All	0.115	0.319	0	1	5273
Girls	0.170	0.376	0	1	2826
Boys	0.051	0.221	0	1	2447
Difference girls-boys	0.112***				
Choice (intention): Première ES					
All	0.335	0.472	0	1	5273
Girls	0.369	0.483	0	1	2826
Boys	0.296	0.457	0	1	2447
Difference girls-boys	0.069***				
Choice (intention): Première Tech					
All	0.170	0.376	0	1	5273
Girls	0.147	0.354	0	1	2826
Boys	0.197	0.398	0	1	2447
Difference girls-boys	-0.038***				
Choice (intention): Première Pro					
All	0.016	0.125	0	1	5273
Girls	0.011	0.103	0	1	2826
Boys	0.022	0.147	0	1	2447

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	-0.013***				
Choice (intention): Première Tech STI2D					
All	0.085	0.279	0	1	5321
Girls	0.013	0.113	0	1	2842
Boys	0.167	0.373	0	1	2479
Difference girls-boys	-0.136***				
Choice (intention): Première Tech ST2A					
All	0.019	0.136	0	1	5321
Girls	0.026	0.158	0	1	2842
Boys	0.011	0.104	0	1	2479
Difference girls-boys	0.007**				
Choice (intention): Première Tech STMG					
All	0.109	0.311	0	1	5321
Girls	0.109	0.312	0	1	2842
Boys	0.109	0.311	0	1	2479
Difference girls-boys	0.004				
Choice (intention): Première Tech ST2S					
All	0.051	0.219	0	1	5321
Girls	0.082	0.274	0	1	2842
Boys	0.015	0.120	0	1	2479
Difference girls-boys	0.068***				
Choice (intention): Première Tech STL					
All	0.024	0.154	0	1	5321
Girls	0.023	0.151	0	1	2842
Boys	0.026	0.159	0	1	2479
Difference girls-boys	0.001				
Choice (intention): Première Tech TMD					
All	0.001	0.031	0	1	5321
Girls	0.001	0.032	0	1	2842
Boys	0.001	0.028	0	1	2479
Difference girls-boys	0.000				
Choice (intention): Première Tech hôtellerie					
All	0.004	0.066	0	1	5321
Girls	0.002	0.050	0	1	2842
Boys	0.006	0.080	0	1	2479

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Difference girls-boys	-0.004**				
Choice (intention): Première Tech STAV					
All	0.001	0.024	0	1	5321
Girls	0.001	0.032	0	1	2842
Boys	0.000	0.000	0	0	2479
Difference girls-boys	0.001*				
Likes French					
All	0.512	0.500	0	1	5305
Girls	0.594	0.491	0	1	2833
Boys	0.418	0.493	0	1	2472
Difference girls-boys	0.173***				
Level in French: Good					
All	0.362	0.481	0	1	5289
Girls	0.431	0.495	0	1	2823
Boys	0.283	0.450	0	1	2466
Difference girls-boys	0.152***				
Level in French compared to girls: Better					
All	0.221	0.415	0	1	5267
Girls	0.253	0.435	0	1	2817
Boys	0.185	0.389	0	1	2450
Difference girls-boys	0.079***				
Level in French compared to boys: Better					
All	0.393	0.488	0	1	5199
Girls	0.469	0.499	0	1	2763
Boys	0.306	0.461	0	1	2436
Difference girls-boys	0.162***				
Year 12-specific questions					
Choice (intention): University					
All	0.553	0.497	0	1	2421
Girls	0.620	0.486	0	1	1226
Boys	0.484	0.500	0	1	1195
Difference girls-boys	0.127***				
Choice (intention): CPGE					
All	0.374	0.484	0	1	2421
Girls	0.318	0.466	0	1	1226

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	0.431	0.495	0	1	1195
Difference girls-boys	-0.107***				
Choice (intention): BTS					
All	0.095	0.293	0	1	2421
Girls	0.095	0.293	0	1	1226
Boys	0.095	0.293	0	1	1195
Difference girls-boys	0.008				
Choice (intention): IUT					
All	0.216	0.411	0	1	2421
Girls	0.168	0.374	0	1	1226
Boys	0.264	0.441	0	1	1195
Difference girls-boys	-0.084***				
Choice (intention): specialized school					
All	0.185	0.389	0	1	2421
Girls	0.221	0.415	0	1	1226
Boys	0.149	0.356	0	1	1195
Difference girls-boys	0.079***				
Likes philosophy					
All	0.478	0.500	0	1	2456
Girls	0.501	0.500	0	1	1236
Boys	0.455	0.498	0	1	1220
Difference girls-boys	0.036				
Level in philosophy: Good					
All	0.238	0.426	0	1	2451
Girls	0.258	0.438	0	1	1236
Boys	0.218	0.413	0	1	1215
Difference girls-boys	0.026				
Level in biology-geoscience compared to girls: Better					
All	0.296	0.457	0	1	2393
Girls	0.293	0.455	0	1	1226
Boys	0.300	0.458	0	1	1167
Difference girls-boys	-0.009				
Level in biology-geoscience compared to boys: Better					
All	0.409	0.492	0	1	2372
Girls	0.434	0.496	0	1	1204

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Table 3.36 – continued from previous page

	Mean	S.D	Min	Max	N
Boys	0.384	0.486	0	1	1168
Difference girls-boys	0.045**				

Note: This table presents baseline statistics from the control group on several characteristics and variables of interest. Sample means are reported for the whole control group, and by gender. The result of a T-test on the statistical difference of the sample means between both genders is indicated below.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' own data.

Table 3.37 – Feedback from ambassadors

	Mean	S.D	Min	Max	N
Teacher was present					
No	0.108	0.310	0	1	8132
Yes	0.892	0.310	0	1	8132
Teacher's gender					
A man	0.435	0.496	0	1	6952
A woman	0.565	0.496	0	1	6952
Other adult member present beside teacher					
No	0.656	0.475	0	1	8037
Yes	0.344	0.475	0	1	8037
Organizational problems					
No	0.858	0.349	0	1	8093
Yes	0.142	0.349	0	1	8093
Talk was stopped due to indiscipline problems					
No	0.926	0.262	0	1	8206
Yes	0.074	0.262	0	1	8206
The Powerpoint worked well					
No	0.040	0.196	0	1	8206
Yes	0.960	0.196	0	1	8206
Films worked well					
No	0.108	0.310	0	1	8206
Yes	0.892	0.310	0	1	8206
Teacher's subject					
Other	0.021	0.142	0	1	18914
French	0.620	0.485	0	1	18914
History-geography	0.029	0.169	0	1	18914
Do not know	0.042	0.201	0	1	18914
Languages	0.025	0.155	0	1	18914
Math	0.028	0.165	0	1	18914
Philosophy	0.118	0.322	0	1	18914
Physics	0.009	0.096	0	1	18914

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Table 3.37 – continued from previous page

	Mean	S.D	Min	Max	N
Engineering	0.071	0.256	0	1	18914
Biology/geoscience	0.002	0.041	0	1	18914
If teacher was present, was he/she interested?					
No	0.020	0.140	0	1	7328
Yes	0.694	0.461	0	1	7328
Rather no	0.049	0.216	0	1	7328
Rather yes	0.237	0.425	0	1	7328
Talk was well-designed					
Stronly agree	0.476	0.499	0	1	8206
Stronly disagree	0.003	0.055	0	1	8206
Rather disagree	0.043	0.204	0	1	8206
Agree	0.477	0.500	0	1	8206
Gender stereotypes were strong for some students					
Stronly agree	0.086	0.280	0	1	8164
Stronly disagree	0.103	0.304	0	1	8164
Rather disagree	0.503	0.500	0	1	8164
Agree	0.309	0.462	0	1	8164
Overall feedback					
Good	0.371	0.483	0	1	8206
Average	0.067	0.251	0	1	8206
Really bad	0.006	0.079	0	1	8206
Not really good	0.003	0.057	0	1	8206
Very good	0.552	0.497	0	1	8206
Students were interested					
Neutral	0.050	0.218	0	1	8206
Stronly agree	0.413	0.492	0	1	8206
Agree	0.457	0.498	0	1	8206
Strongly disagree	0.007	0.085	0	1	8206
Rather disagree	0.073	0.261	0	1	8206
Students engaged in the discussion					
Neutral	0.017	0.128	0	1	8206
Stronly agree	0.386	0.487	0	1	8206

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Table 3.37 – continued from previous page

	Mean	S.D	Min	Max	N
Agree	0.391	0.488	0	1	8206
Strongly disagree	0.029	0.167	0	1	8206
Rather disagree	0.177	0.382	0	1	8206
Students were inattentive					
Neutral	0.073	0.259	0	1	8129
Stronly agree	0.034	0.180	0	1	8129
Agree	0.134	0.341	0	1	8129
Strongly disagree	0.495	0.500	0	1	8129
Rather disagree	0.264	0.441	0	1	8129
Students were responsive to 'jobs in science pay'					
Students not responsive at all	0.011	0.104	0	1	8007
Students not really responsive	0.140	0.347	0	1	8007
Students rather responsive	0.342	0.474	0	1	8007
Students very responsive	0.367	0.482	0	1	8007
Does not apply	0.141	0.348	0	1	8007
Students were responsive to the short films					
Students not responsive at all	0.006	0.079	0	1	8206
Students not really responsive	0.067	0.249	0	1	8206
Students rather responsive	0.355	0.479	0	1	8206
Students very responsive	0.553	0.497	0	1	8206
Does not apply	0.018	0.134	0	1	8206
Students were responsive to 'jobs in science are fulfilling'					
Students not responsive at all	0.003	0.055	0	1	8206
Students not really responsive	0.101	0.301	0	1	8206
Students rather responsive	0.543	0.498	0	1	8206
Students very responsive	0.342	0.475	0	1	8206
Does not apply	0.011	0.105	0	1	8206
Students were responsive to 'science is everywhere'					
Students not really responsive	0.069	0.253	0	1	8206
Students rather responsive	0.518	0.500	0	1	8206
Students very responsive	0.413	0.492	0	1	8206

Source: Authors' own data.

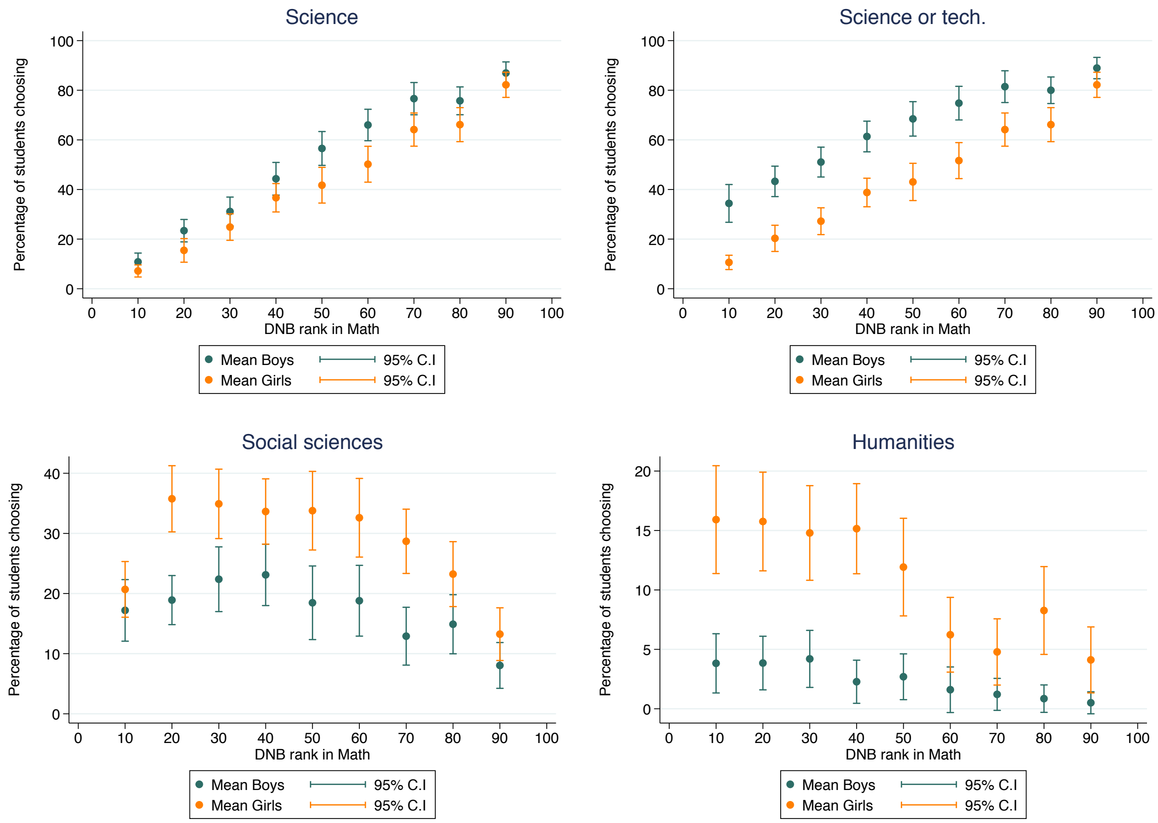


Figure 3.16 – Choice of field for year 10 by rank at DNB mathematics exam

The figure shows, for the students of the control group, the baseline probability of being observed in science track (*Première S*), science and technology track (*Première S* and *Première Technologique*), humanities track (*Première L*) and social sciences track (*Première ES*) the year after the intervention for the sample of year 10-students, according to the percentile rank in mathematics at DNB national exam. Coefficients and 95-percent confidence intervals are obtained from a univariate regression by gender. Standard errors are clustered at the high school level.

Source: Authors' own data.

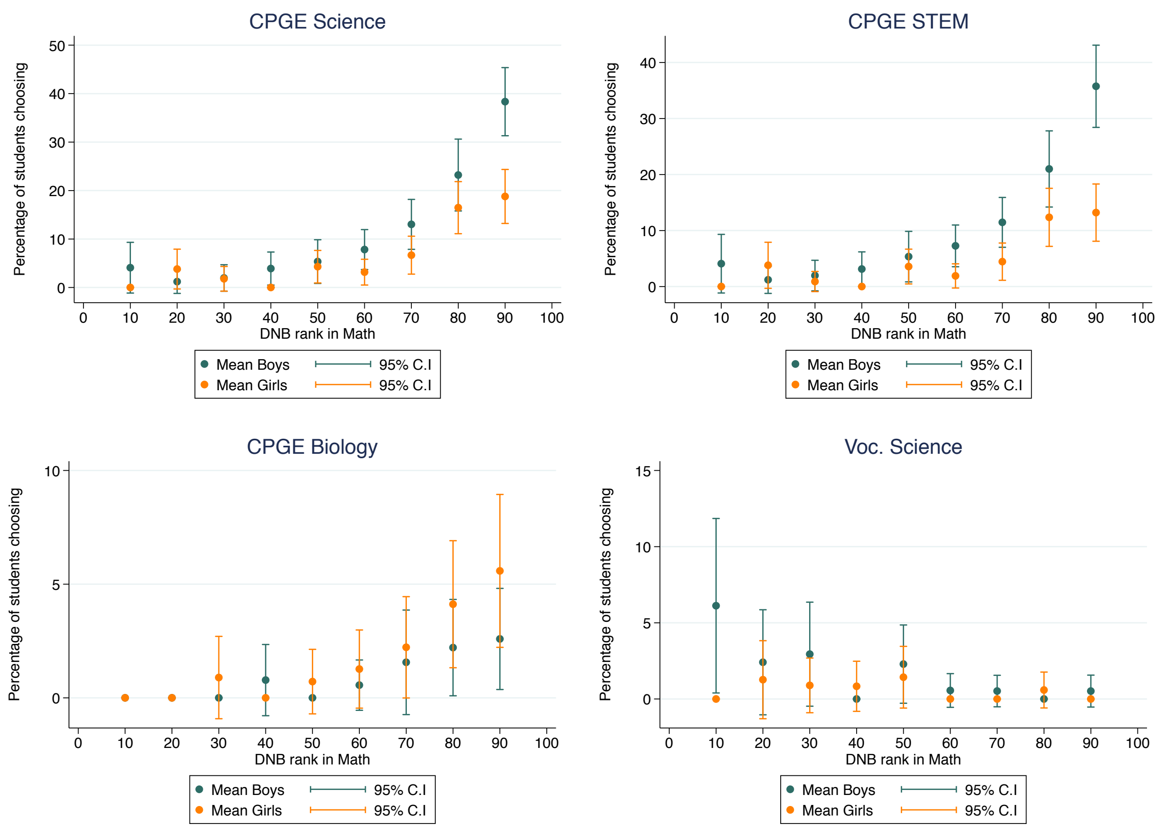


Figure 3.17 – Choice of CPGE program by rank at DNB mathematics exam

The figure shows, for the students of the control group, the baseline probability of being observed in elective science track (CPGE Science), elective science STEM track (CPGE *MPSI*,*PCSI* and *PTSI*), biology science track (CPGE *BCPST*) and vocational education sciences track (*BTS scientifiques*) the year after the intervention (and high school graduation) for the sample of year 12-students, according to the percentile rank in mathematics at DNB national exam. Coefficients and 95-percent confidence intervals are obtained from a univariate regression by gender. Standard errors are clustered at the high school level.

Source: Authors' own data.

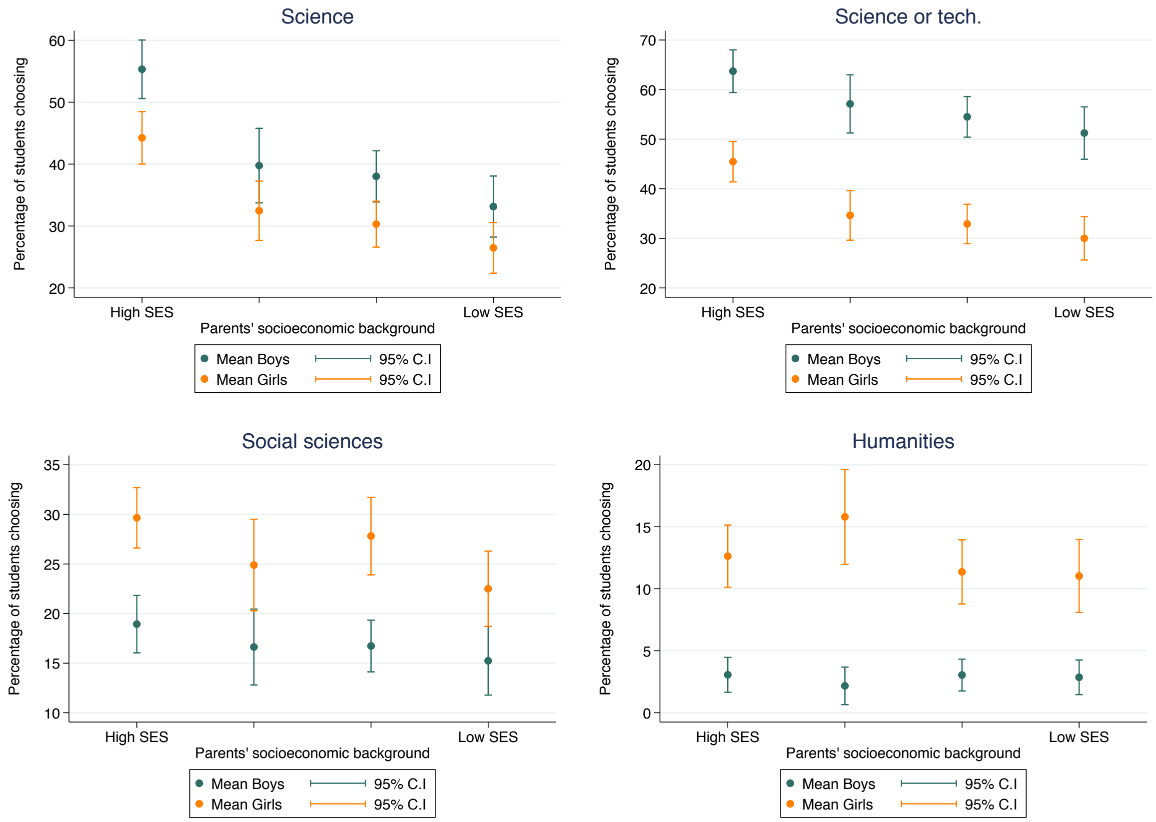


Figure 3.18 – Choice of field for year 10 by socioeconomic background

The figure shows, for the students of the control group, the baseline probability of being observed in science track (*Première S*), science and technology track (*Première S* and *Première Technologique*), humanities track (*Première L*) and social sciences track (*Première ES*) the year after the intervention for the sample of year 10-students, according to students' socioeconomic status. Coefficients and 95-percent confidence intervals are obtained from a univariate regression by gender. Standard errors are clustered at the high school level.

Source: Authors' own data.

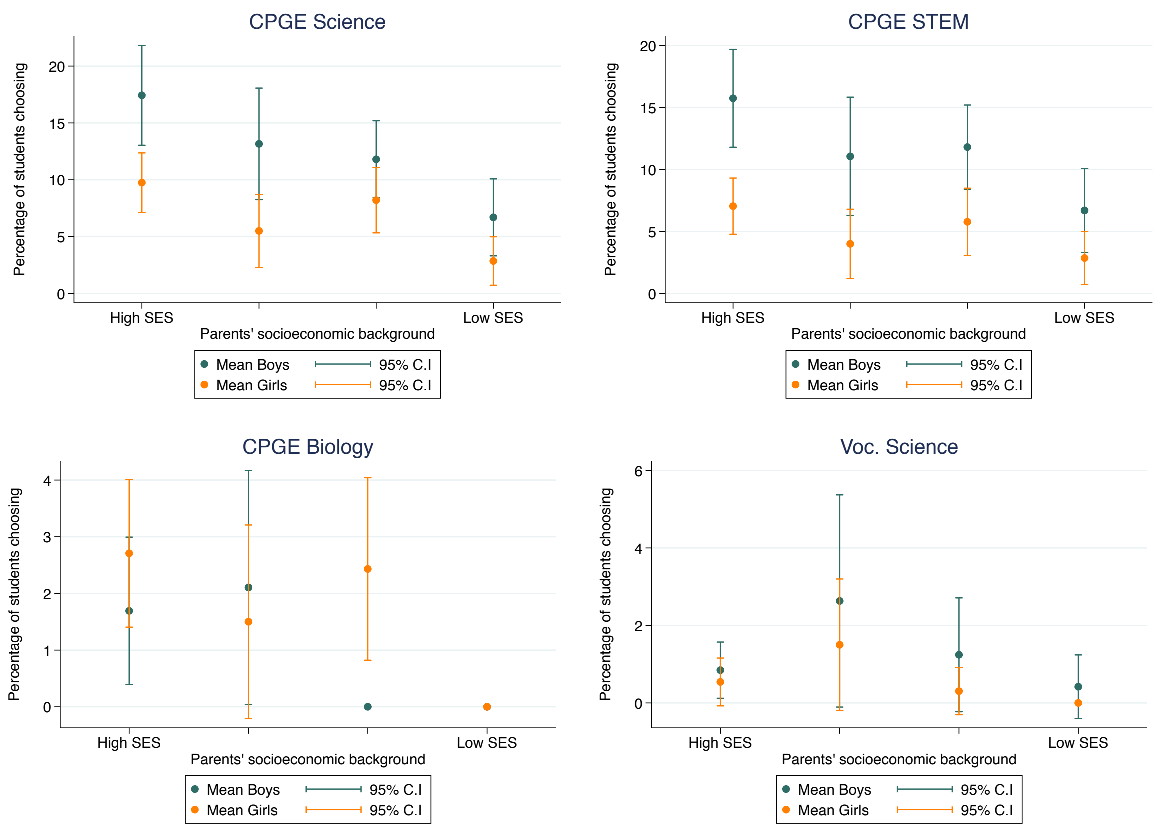


Figure 3.19 – Choice of CPGE program by socioeconomic background

The figure shows, for the students of the control group, the baseline probability of being observed in elective science track (CPGE Science), elective science STEM track (CPGE *MPSI*,*PCSI* and *PTSI*), biology science track (CPGE *BCPST*) and vocational education sciences track (*BTS scientifiques*) the year after the intervention (and high school graduation) for the sample of year 12-students, according to students' socioeconomic status. Coefficients and 95-percent confidence intervals are obtained from a univariate regression by gender. Standard errors are clustered at the high school level.

Source: Authors' own data.

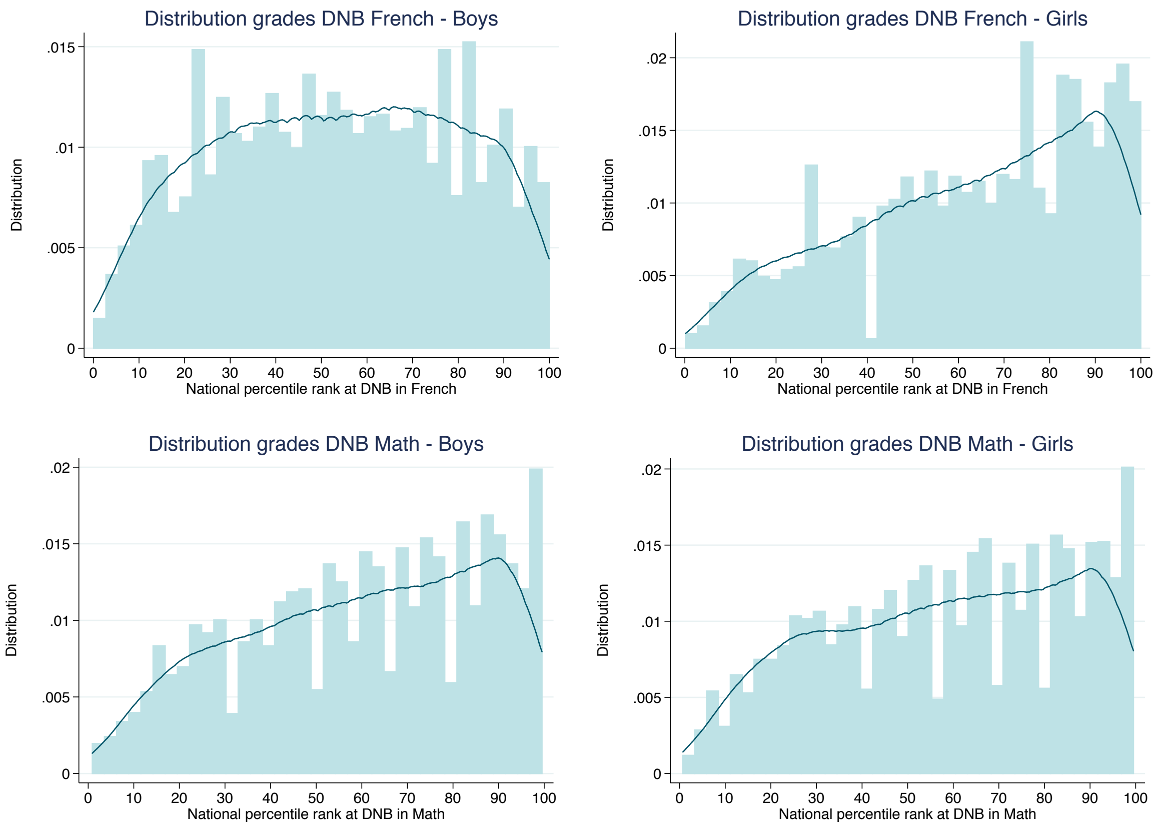


Figure 3.20 – Grades at DNB - Year 10

The figure reports the distribution of percentile ranks of year 10-students from the sample, in French and mathematics, separately by gender.

Source: Authors' own data.

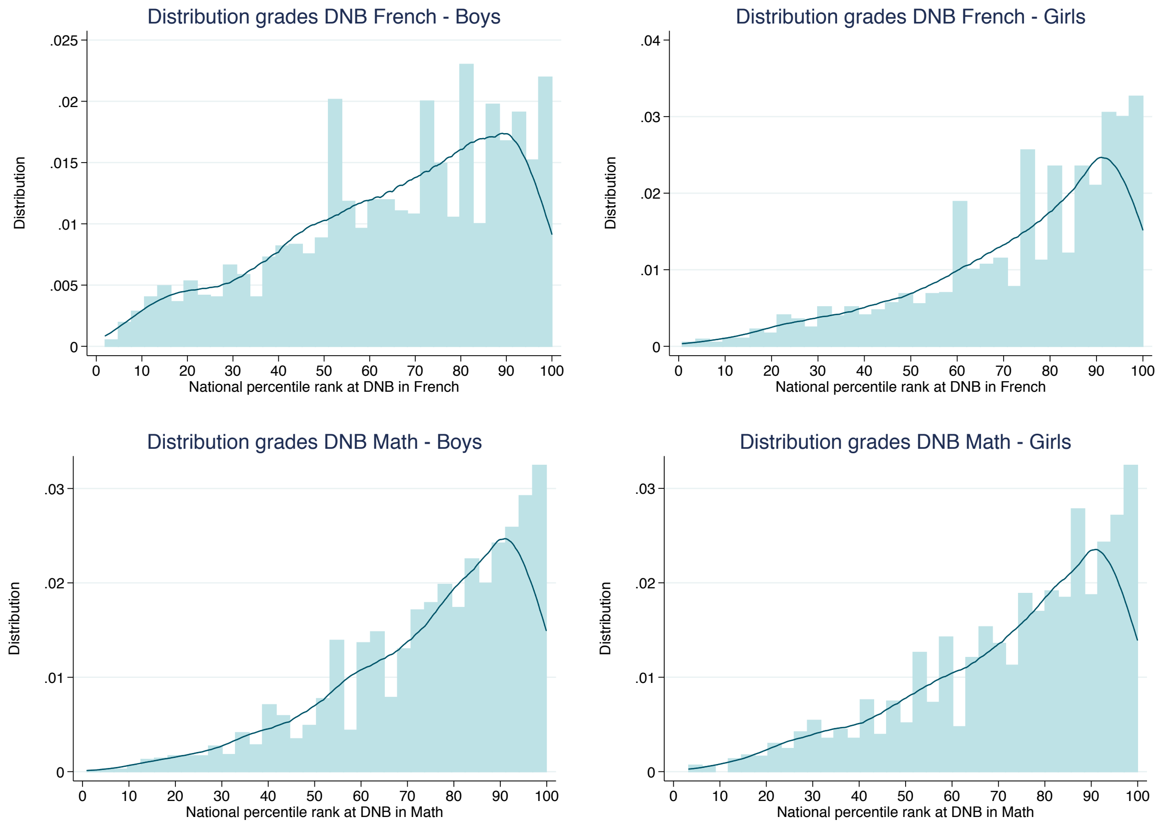


Figure 3.21 – Grades at DNB - Year 12

The figure reports the distribution of percentile ranks of year 12-students from the sample, in French and mathematics, separately by gender.

Source: Authors' own data.

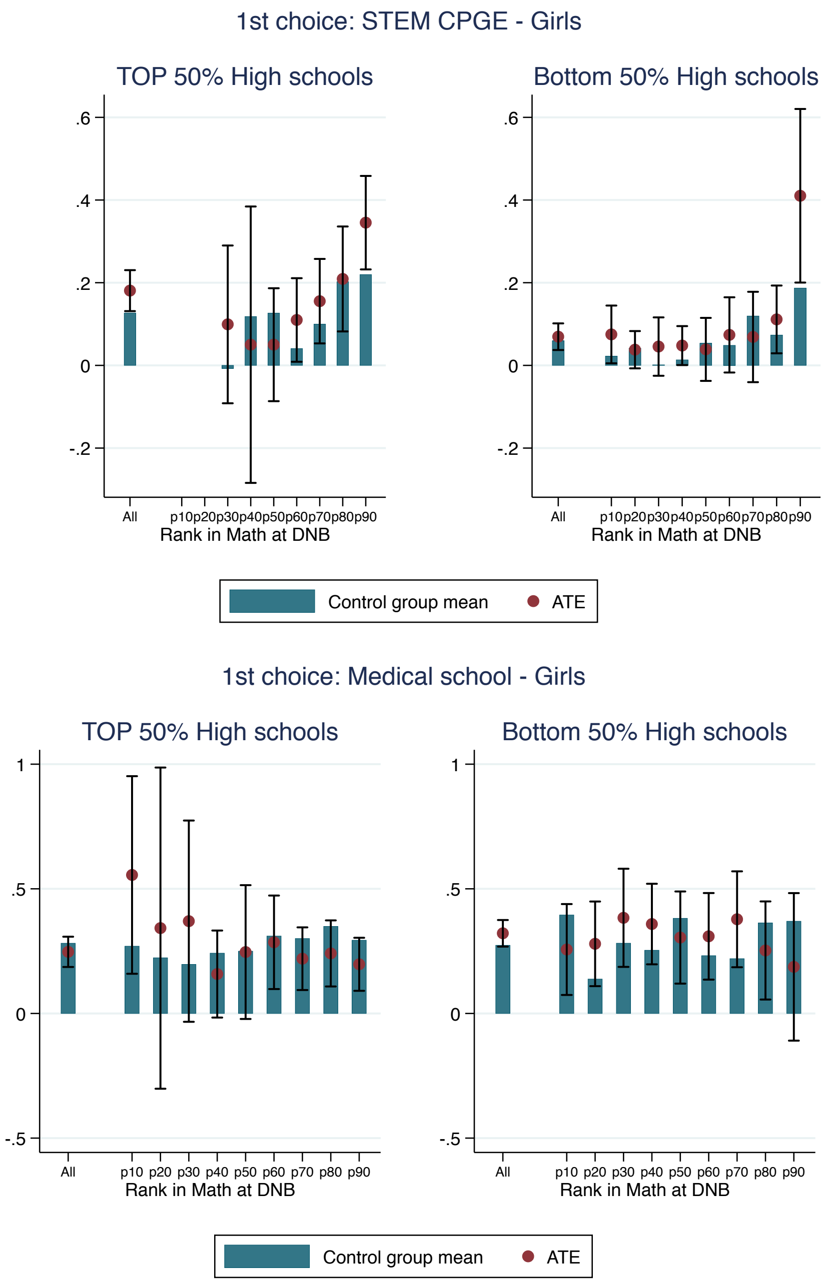


Figure 3.22 – Impact of treatment on first choice by school environment and ability - DNB

The figure reports, for female students, the treatment effect on the probability of choosing STEM selective program or medical studies as a first choice for post-secondary education. In the first and the third graph, the sample is restricted to year 12-students in high schools where the average rank in mathematics at DNB national exam is greater than the median, and in the second and fourth graph where the average in lower than the median. Results are presented for the whole group, and by percentile rank in mathematics at DNB final exam (blind scores). Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

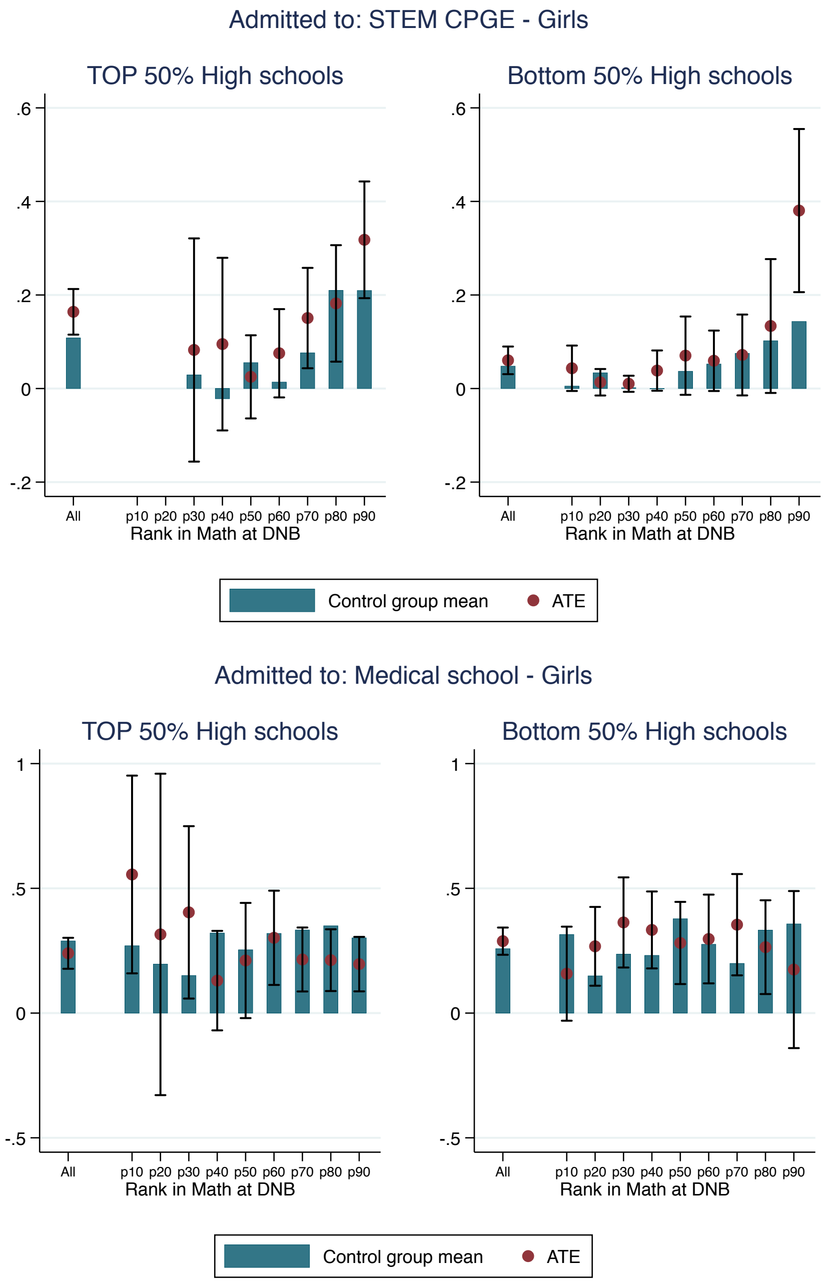


Figure 3.23 – Impact of treatment on admission by school environment and ability - DNB

The figure reports, for female students, the treatment effect on the probability of admission in selective science program, and on the probability of admission in medical studies, according to high schools' average level. In the first and the third graph, the sample is restricted to year 12-students in high schools where the average rank in mathematics at DNB national exam is greater than the median, and in the second and fourth graph where the average in lower than the median. Results are presented for the whole group, and by percentile rank in mathematics at DNB final exam (blind scores). Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regression with high school fixed effects, where standard errors are clustered at the high school level.

Source: APB data.

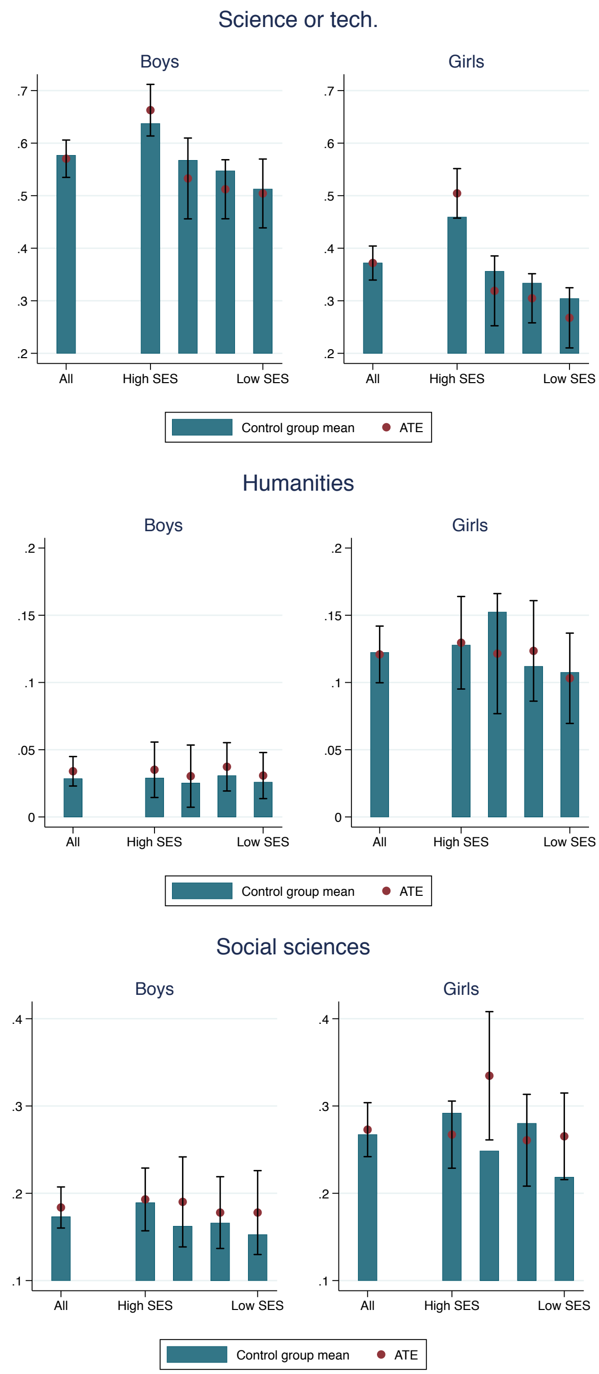


Figure 3.24 – Treatment effect by socioeconomic status - Year 10

The figure shows the treatment effect on the choice of field of study according to students' socioeconomic status. The variable of interest is the probability of being observed in science and technology track (*Première S* and *Première Technologique*), humanities track (*Première L*) and social sciences track (*Première ES*) the year after the intervention for the sample of year 10-students, according to students' socioeconomic status. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regressions with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

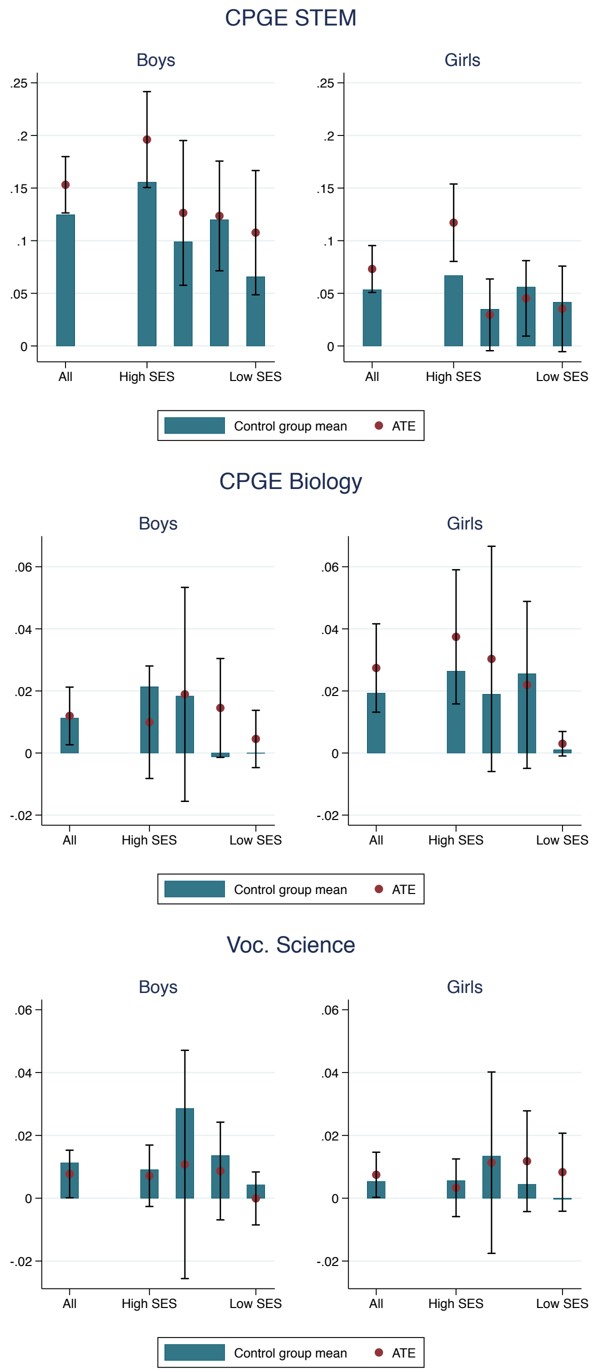


Figure 3.24 – Treatment effect by socioeconomic status - Year 12

The figure shows the treatment effect on the choice of field of study according to students' socioeconomic status. The variable of interest is the probability of being observed in elective science track (CPGE Science), elective science STEM track (CPGE *MPSI*, *PCSI* and *PTSI*), biology science track (CPGE *BCPST*) and vocational education sciences track (*BTS scientifiques*) the year after the intervention (and high school graduation) for the sample of year 12-students, according to students' socioeconomic status. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regressions with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

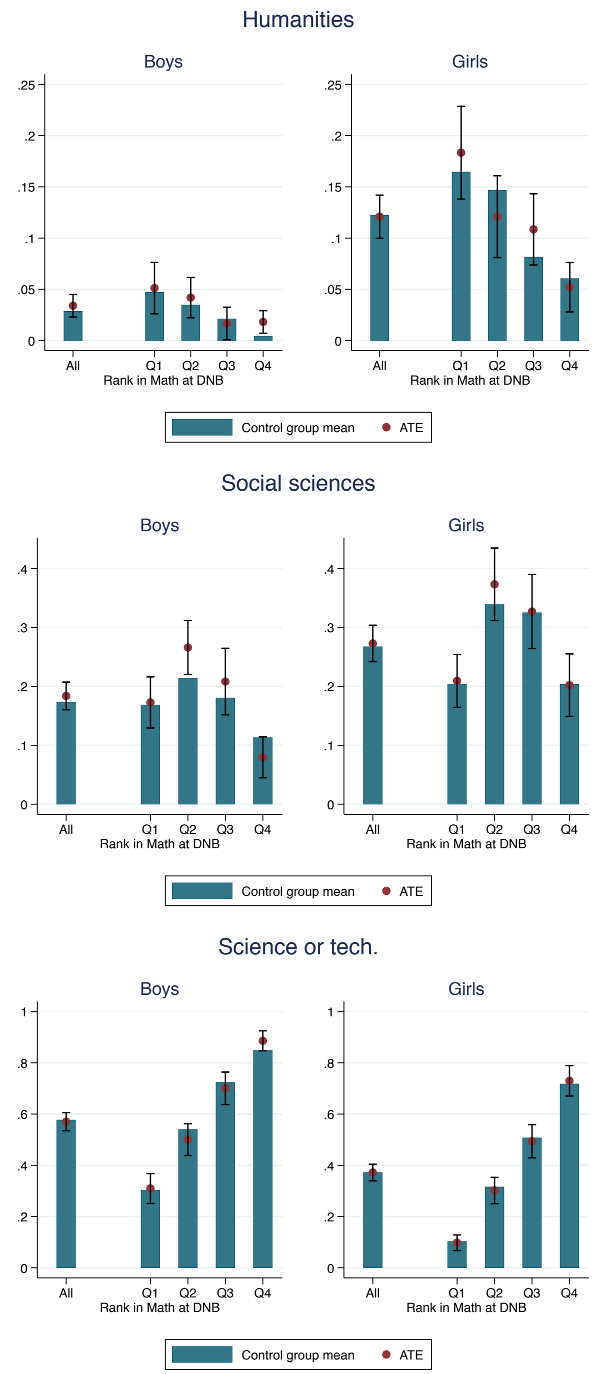


Figure 3.24 – Treatment effect by quartile of grade in mathematics at DNB - Year 10

The figure shows the treatment effect on the choice of field of study according to students' socioeconomic status. The variable of interest is the probability of being observed in science and technology track (*Première S* and *Première Technologique*), humanities track (*Première L*) and social sciences track (*Première ES*) the year after the intervention for the sample of year 10-students, according to students' quartile in mathematics at DNB national exam. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regressions with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.

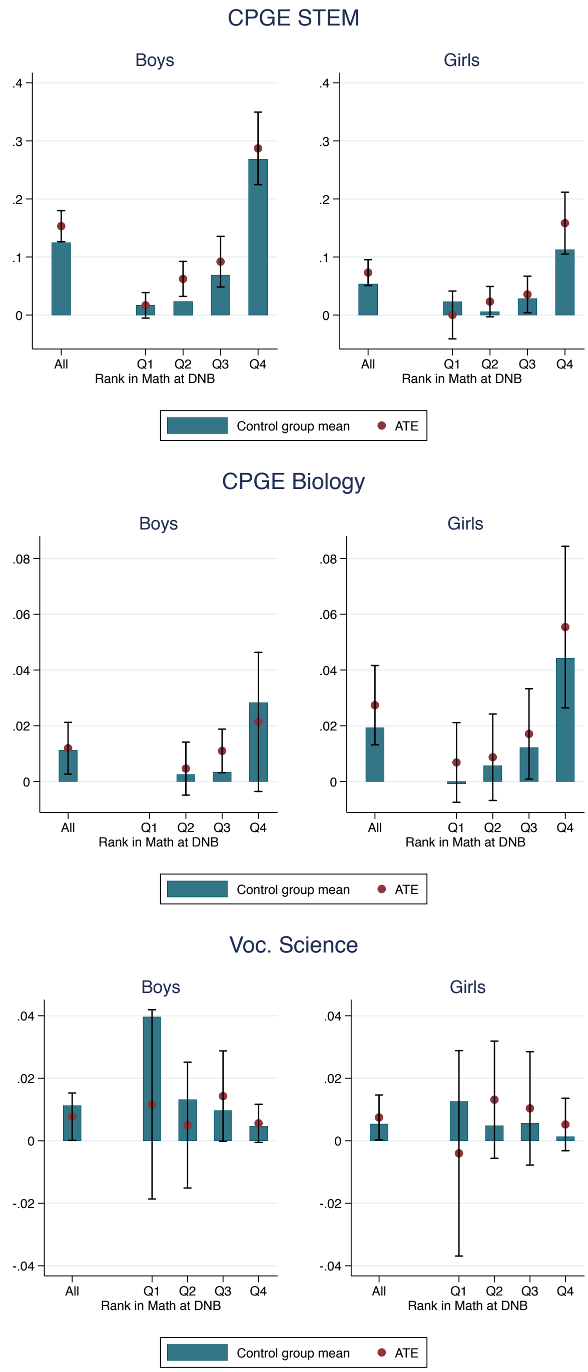
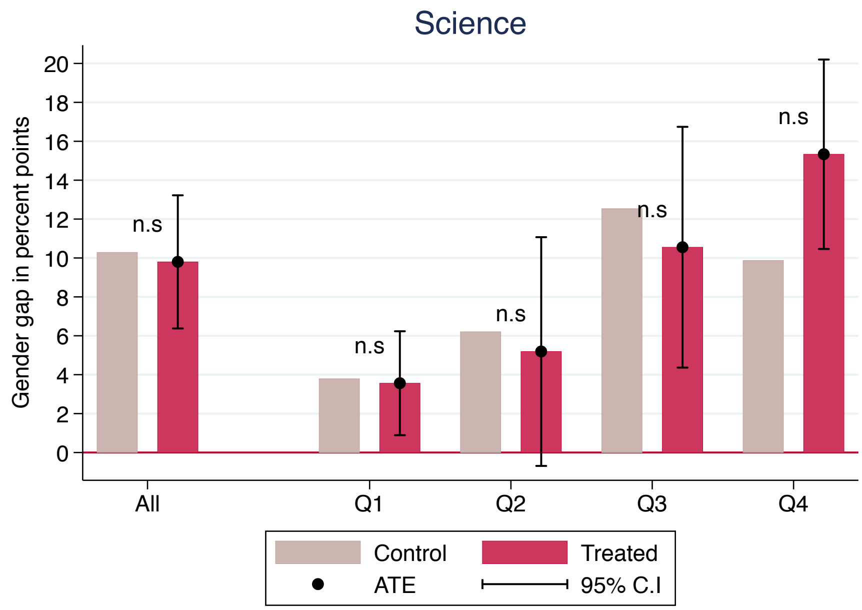


Figure 3.24 – Treatment effect by quartile of grade in mathematics at DNB - Year 12

The figure shows the treatment effect on the choice of field of study according to students' socioeconomic status. The variable of interest is the probability of being observed in elective science track (CPGE Science), elective science STEM track (CPGE *MPSI*, *PCSI* and *PTSI*), biology science track (CPGE *BCPST*) and vocational education sciences track (*BTS scientifiques*) the year after the intervention (and high school graduation) for the sample of year 12-students, according to students' quartile in mathematics at DNB national exam. Each bar represents the control group mean, and each dot the point estimate of the average treatment effect with 95-percent confidence intervals. Each estimate is obtained from a regressions with high school fixed effects, where standard errors are clustered at the high school level.

Source: Authors' own data.



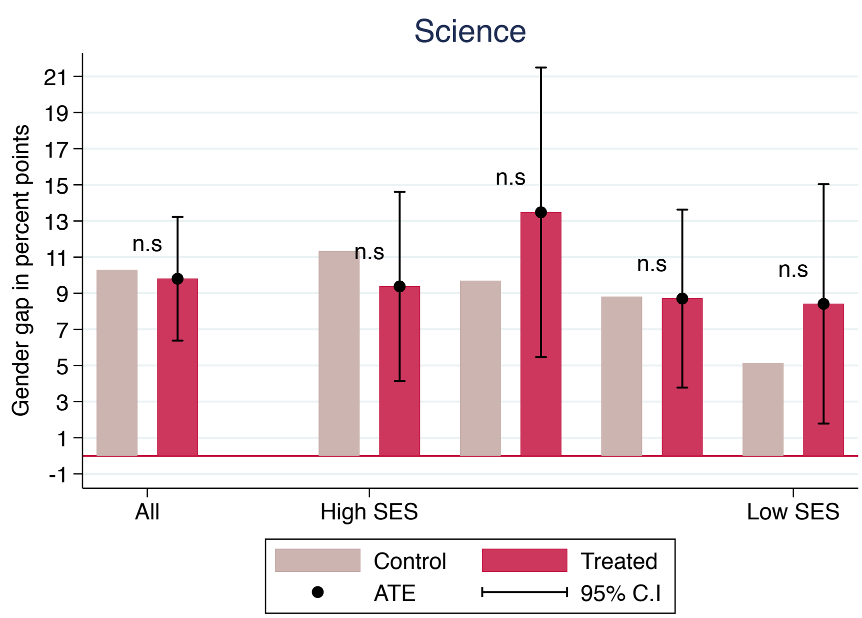
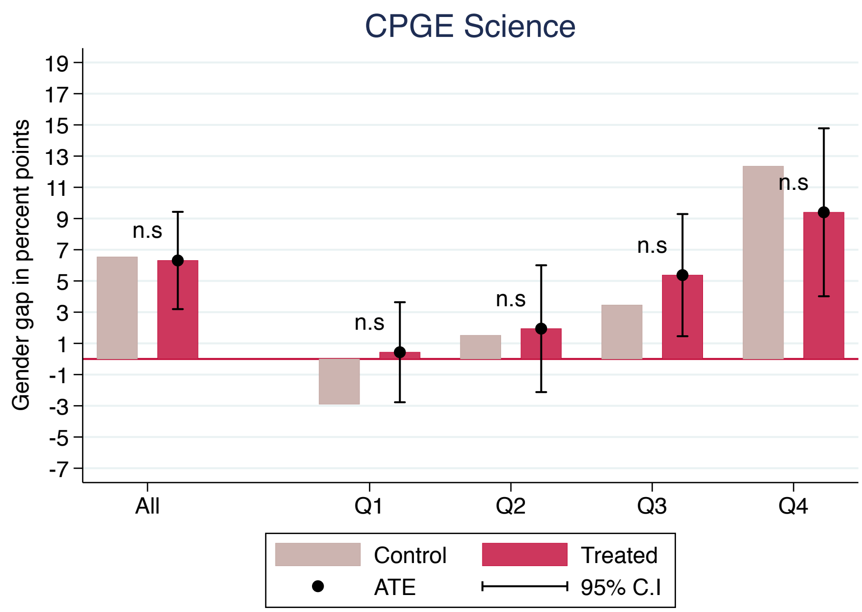


Figure 3.25 – Treatment effect on the gender gap in science track - Year 10

The figure shows the treatment effect on the gender gap in terms of choice of field of study, according to students' rank in mathematics at DNB national exam and students' socioeconomic status. The variable of interest is the probability of being observed in science track (*Première S*) for the sample of year 10-students. Each bar represents the average gender gap in the control group (light pink) and in the treated group mean (pink) respectively. Each dot corresponds to the point estimate of the average treatment effect with 95-percent confidence intervals. These estimates are obtained from regressions with high school fixed effects, where standard errors are clustered at the high school level. The label on top of each pair of bars indicates whether the change in terms of gender gap is significant or not.

Source: Authors' own data.



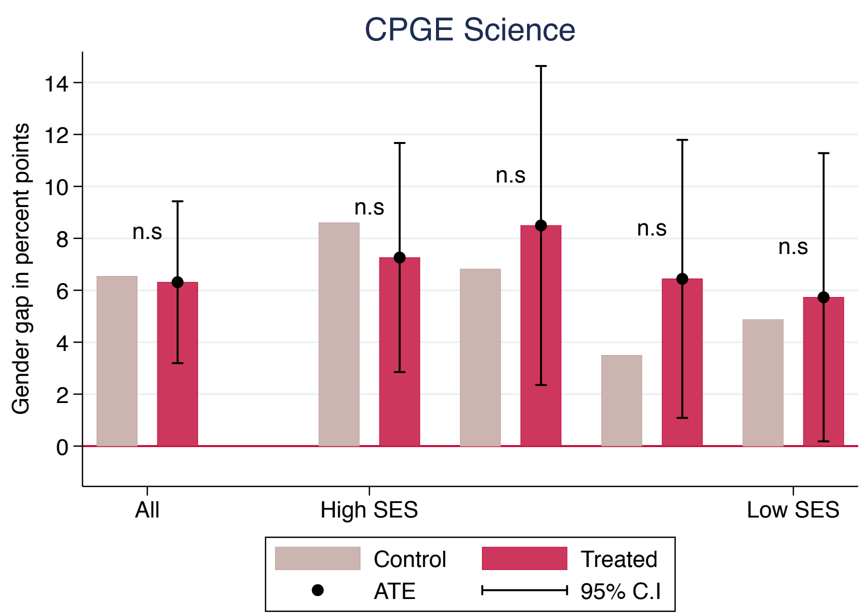


FIGURE 3.26 – TREATMENT EFFECT ON THE GENDER GAP IN CPGE SCIENCE - YEAR 12

The figure shows the treatment effect on the gender gap in terms of choice of field of study, according to students' rank in mathematics at DNB national exam and students' socioeconomic status. The variable of interest is the probability of being observed in elective science track (CPGE Science) the year after the intervention (and high school graduation) for the sample of year 12-students. Each bar represents the average gender gap in the control group (light pink) and in the treated group mean (pink) respectively. Each dot corresponds to the point estimate of the average treatment effect with 95-percent confidence intervals. These estimates are obtained from regressions with high school fixed effects, where standard errors are clustered at the high school level. The label on top of each pair of bars indicates whether the change in terms of gender gap is significant or not.

Source: Authors' own data.

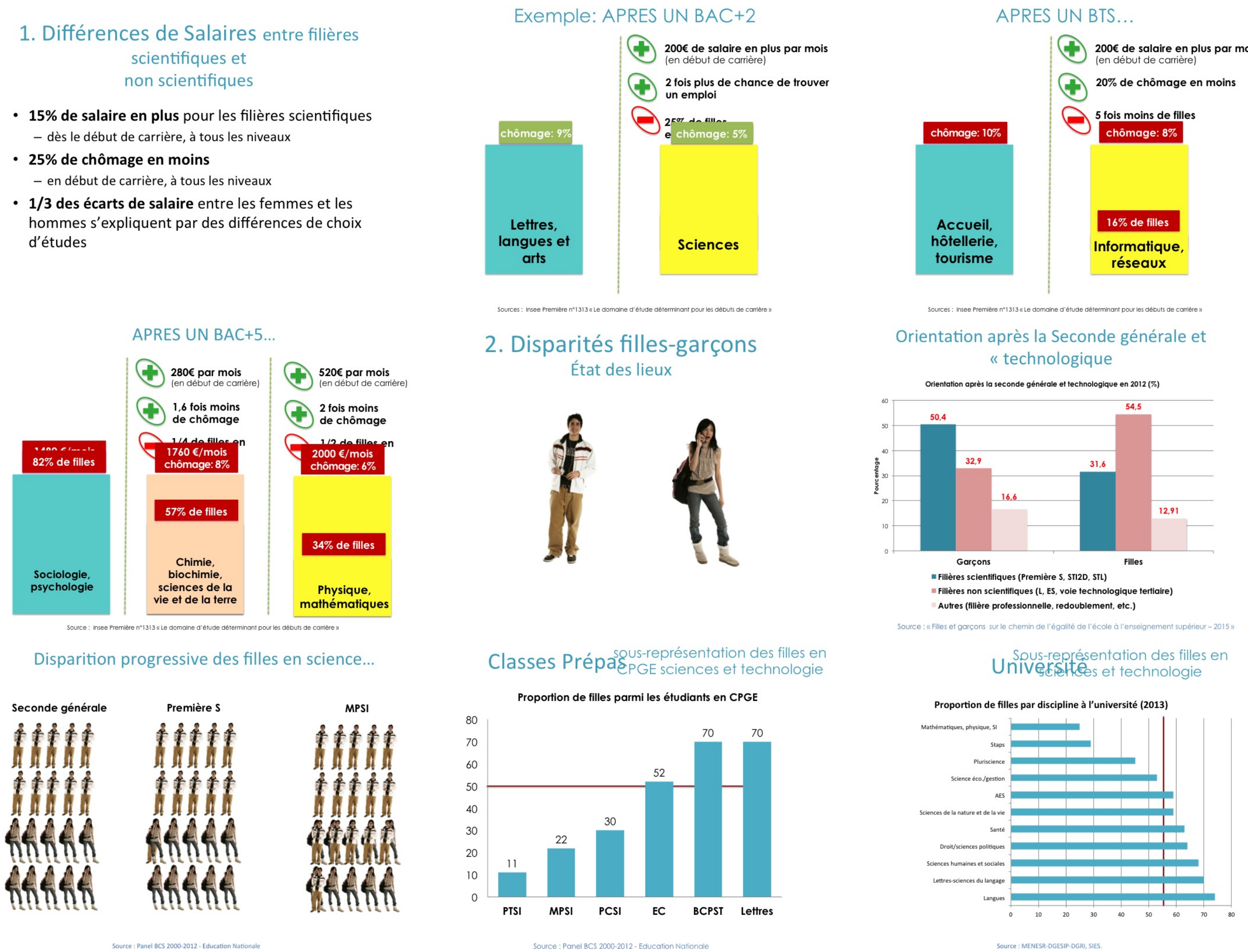


Figure 3.27 – Additional slides in treatment 2

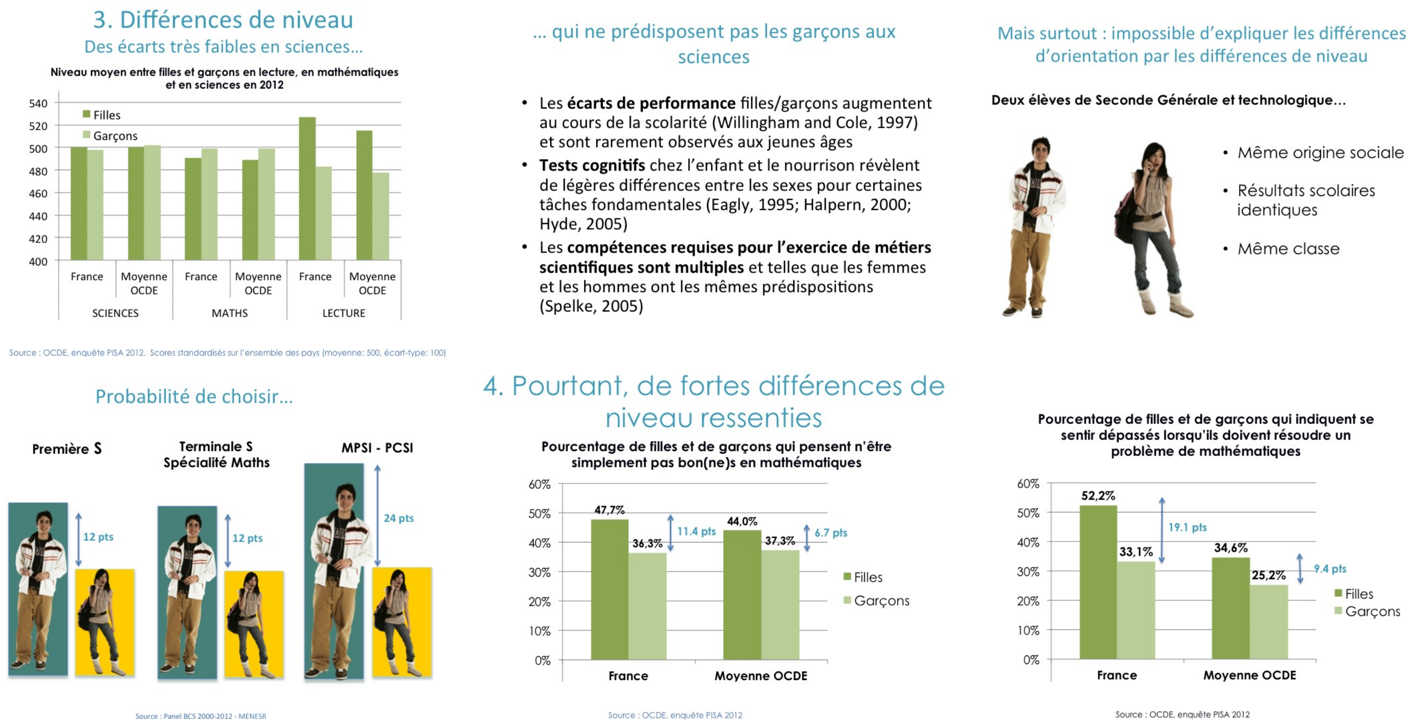


Figure 3.28 – Additional slides in treatment 2 - cont'd

This figure presents the content of the additional slides sent to ambassadors (treatment 2).

Questions pour les classes visitées

❶ Avez-vous reçu la visite en classe d'une scientifique du programme L'Oréal « Pour les Filles et la Science » ?

☐ OUI ☐ NON

❷ Avez-vous apprécié cette intervention ?

☐ OUI ☐ NON

❸ Diriez-vous que cette visite a changé…

Cette visite a-t-elle changé…	Tout à fait d'accord	Assez d'accord	Pas d'accord	Pas du tout d'accord	Je ne sais pas
Votre perception des métiers scientifiques ?	☐	☐	☐	☐	☐
Votre intérêt pour les métiers scientifiques ?	☐	☐	☐	☐	☐
Votre perception sur la place des femmes dans les métiers scientifiques ?	☐	☐	☐	☐	☐

❹ Diriez-vous que cette visite…

Cette visite…	Tout à fait d'accord	Assez d'accord	Pas d'accord	Pas du tout d'accord	Je ne sais pas
Vous a donné des idées nouvelles ?	☐	☐	☐	☐	☐
A influencé vos désirs et vos choix d'orientation ?	☐	☐	☐	☐	☐
A renforcé un choix que vous vouliez déjà faire ?	☐	☐	☐	☐	☐
A influencé vos souhaits sans pour autant vous faire changer de choix	☐	☐	☐	☐	☐
Vous a fait changer d'orientation ?	☐	☐	☐	☐	☐
Vous a donné envie de poursuivre des études scientifiques ?	☐	☐	☐	☐	☐

→ Le questionnaire est maintenant terminé. Merci de vérifier que vous avez répondu à TOUTES les questions qui vous concernent avant de rendre le questionnaire à votre professeur (dans l'enveloppe). Merci pour votre participation.

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Figure 3.29 – Questionnaire - Treated version

This figure presents the content of the last page of the questionnaire for the treated version for year 10-students.

Main conclusion

This dissertation presents three essays on gender norms and inequality. I present hereafter the main contributions, policy implications, and limitations of each chapter, as well as perspectives for future research.

Contributions, policy implications and limitations

In the first chapter of this dissertation, I use both theoretical and empirical analysis to study the impact of offspring's gender on their parental political beliefs toward gender issues. I present a simple model to examine the hypothesis that men's political attitudes toward abortion do respond to the presence of a daughter, but differently according to their general political beliefs. The model predicts that fathers with paternalistic preferences adopt more extreme political positions when they have a daughter than when they have a son. Using two original datasets, I present empirical evidence of a polarization effect of daughters on fathers' views on abortion. The magnitude of the effect corresponds to around 30% of the impact of right-wing political affiliation on abortion support.

This paper confirms that the socialization effect of daughters is particularly salient on reproductive rights, but also suggests that when individuals form opinions about a complex societal issue, they might do so in a way that preserves their cultural and political identity. As a consequence, these results advocate that future models of transmission of political preferences take into consideration the general political preferences of the parents.

This paper has several limitations. In the theoretical part, I first assume for simplicity that political preferences are heterogenous *ex ante*. Moreover, I do not put structure on the degree of paternalism, while these two dimensions could be correlated. A potential extension of the model would be to study the formation of paternalistic preferences in a dynamic setting. The idea would be that the parameter measuring the intensity of paternalism could be endogenous to parents' personal political types. Understanding the extent to which paternalistic preferences are endogenously shaped by personal ideology and by different cultural contexts could be a direction for future research. Moreover, altruism is not the only mechanism that could produce empirical predictions in this setting. Children could choose to engage in explicit actions to teach their parents about certain issues.

In the empirical part, the identification strategy relies on the hypothesis that conditional on the number of children, the number of female children is a random variable. Ideally, the use of panel data would allow me to clearly identify the change in political preferences after the birth of a daughter. To my knowledge, such data containing both a measure of abortion views and of the presence of daughters do not exist.

Parents' socialization is a complex phenomenon, and further investigation is needed to better understand how children can affect their parents' views on complex societal issues.

In chapter 2, we study women's employment decisions in a context where institutions limit their chances of having a regular working schedule. This setting allows us to bring several insights. First, we observe that the possibility to adopt a flexible working schedule greatly hinges on the interplay between the cost of flexibility associated to women's occupation and their bargaining power at work. Secondly, we bring evidence that mothers take advantage of a fall in the value of flexibility to regularize their working schedule, especially if they work in occupations where the regular presence at work is particularly rewarded, such as in managerial positions.

Two considerations are worth mentioning. First, so far we do not find evidence that the reform affects women's wages. On the one hand, this might depend on the fact that on average we do not observe any increase in total hours of work. On the other hand, any financial reward for a more regular presence at work might take some time to materialize. In the same way, it is possible that a more regular working schedule will eventually affect the career path of mothers, by allowing them to perform more tasks and occupations, and by expanding their chances of receiving on-the-job training and promotions. Clearly, we will keep on monitoring these potential long-term effects of the reform. Secondly, so far we are only considering how institutional constraints affect mothers' labor supply. However, the sudden availability of a larger pool of female employees willing to adopt a regular working schedule might also affect their co-workers and firms' decisions regarding the overall organization of the work environment. Upon the release of the appropriate data, it will certainly be important to study all these responses.

Our study suggests that adopting a flexible working schedule is simply not an option for many workers and this is true both for a low-skilled worker who cannot organize her work independently and for the top-manager who must show up at work to coordinate others' job. Technological advancements are already enhancing the ability of firms and workers to develop new forms of work, and even create forms of flexible work that are suitable to low-skilled workers. Yet, policy makers who want to promote flexible work arrangements as a way to achieve a better work-life balance, on the one hand, and help women breaking the glass ceiling, on the other, still have to take into account these specific job constraints.

In chapter 3, we report results of a large-scale randomized experiment showing that stereotypical views affect schooling decisions of female students, and can be mitigated through a light-touch in-class intervention of external female role models. Using random assignment of students in year 10 and year 12 - two decisive years in terms of tracking choices - to a one-hour intervention, we investigate the causal impact of role models on aspirations, attitudes, and educational investment. External female role models significantly reduce the prevalence of stereotypes associated to jobs in science, both for female and male students, as well as stereotypes related to innate gender differences in cognitive abilities. However, it simultaneously increases the salience of the under-representation of women, and therefore the belief that women have a less pronounced taste for science, or that they tend to progress slower than men in the same occupations. This suggests that students rationalize gender segregation among occupations as reflecting differences in tastes (potentially socially constructed) or discrimination. However, role models impact the projection of students in scientific jobs in the future. Using administrative data one year after treatment, we show that changes in stereotypes translate into different academic choices for year 12-students in the treated group. Treated female students enroll 30% more in selective science programs after high school graduation than control students. Importantly, high-achieving students are more likely to respond to the intervention in terms of college major choices. This suggests that this type of intervention is typically relevant for these students who are at the margin for deciding to enroll in science curriculum.

Interestingly, reducing the prevalence of stereotypes among male students does not affect their self-confidence and does not discourage them from applying to science majors. We provide suggestive evidence that the profile of ambassadors might affect the magnitude of the treatment effect, in particular ambassadors working in the private sector more than young researchers seem particularly efficient at affecting the choice of STEM for students in year 12. Moreover, providing information on the economic return to scientific studies might be more relevant to students in year 10 who have not yet selected themselves into science track. This result might contribute to improve interventions designed to provide information on returns to college education. Further research is needed to investigate whether varying the profile of ambassadors (gender, ethnicity) might target a larger share of students.

Our study has several limitations that are worth mentioning for future research. Upon the release of appropriate data, we would like to study the long-term impact of the interventions on students' performance at the end of high school, and on the performance of those students who decided to enroll in selective science programs (one and two year after). However, our data do not allow us to track students from the treated and control groups at university, and to observe their labor market outcomes. Secondly, we attempted to provide a variation of the treatment in terms of information provision on the economic returns of scientific majors. In our experimental design, this second treatment is measured in terms of intention-to-treat, as ambassadors could decide to use these slides or not. We provide only suggestive evidence that younger students are more receptive to this information. It would be interesting to further address variations of the key messages put forward for younger students, who are in general less responsive to the role model in terms of academic choice. Finally, our results suggest that both female and male students were affected by the intervention of female role models, but more specifically, high-achieving students. More research is needed to see which role model could be more relevant to address the need of lower achieving students, or if such an intervention is simply not an appropriate tool for this type of students.

Perspectives for future research

As a whole, this work does not pretend to give the full picture of the dynamics of gender inequality. These studies build upon the use of mostly French data. The experience brought by advanced economies is certainly not enough to bring a global perspective to the evolution of gender disparities. Secondly, our results suggest that women's experience at school and in the workplace vary greatly according to their socioeconomic status and level of education. [29] Therefore, our results call for further research on the specific needs and situations of women accounting for their socioeconomic status, and implicitly attest that gender is a category that should be mobilized in connection with other concept such as class (Collins, McLaughlin, Higginbotham, Henderson, Tickamyer, MacDonald, Gatta, Manuel, Jones-Deweever, Schram, et al. 2009). [30]

However this work opens several directions for further research. As alternative work arrangements become a growing feature of most advanced economies, it would be interesting to investigate how the labor market valuation of inflexible work attributes has changed over

29. This consideration brings back a widespread issue in social sciences in academia: how to speak for the well-being of poor women and their families from positions of relative power and privilege.

30. In the French context, there is a clear limitation to the mobilization of the concept of race, as this variable is never reported explicitly in public surveys.

time, in particular the relation between technological change and job attributes. On the other hand, because women who value flexibility may be penalized in the labor market, it becomes fundamental to gain more insight into the formation, evolution and implications of gender differences in preferences over work arrangements. In particular, we would like to study whether government policies, economic cycles, the influences of peers and social ties, or a greater availability of market substitutes for home work can shock these preferences.

Finally, to further understand how the dynamics of gender norms operate in different types of couples, one would want to investigate trends in assortative mating. Recent trends on the marriage market suggests that the marriage rate of high educated women is still increasing in the US. It would be interesting to look at whether these trends are also observed in European countries, if these women marry partners with similar job characteristics, and potentially how flexible working arrangements of the parents can impact children's wellbeing and academic performance.

Conclusion générale

Cette thèse propose trois essais sur les normes et les inégalités de genre. En conclusion, nous présentons un résumé des principales contributions de chacun des chapitres, ainsi que les limites et les perspectives de recherche.

Contributions, limites et implications en termes de politiques publiques

Le premier chapitre de cette thèse porte sur l'influence du genre des enfants sur les opinions de leurs pères en matière de droits des femmes. Nous proposons une analyse théorique et empirique dans lesquelles nous montrons que le fait d'avoir une fille plutôt qu'un garçon affecte l'opinion des hommes en matière de droit à l'avortement, mais que cet effet varie selon la nature de leurs convictions politiques. Nous développons un modèle théorique dans lequel les pères ayant des préférences paternalistes ont tendance à adopter des positions politiques plus extrêmes lorsqu'ils ont une fille plutôt qu'un garçon. Nos résultats, obtenus à partir de deux nouvelles sources de données, suggèrent que les filles *polarisent* les attitudes de leur père en matière de droit à l'avortement. La magnitude de l'effet de *polarisation* correspond ainsi à environ 30% de l'effet de l'affiliation politique à droite sur les attitudes vis-à-vis de l'avortement.

Ce chapitre confirme que le phénomène de socialisation par les filles est particulièrement marqué en matière de droits reproductifs, mais suggère également que lorsque les individus se forgent des opinions sur des enjeux sociétaux complexes, ils le font aussi probablement de manière à préserver leur identité culturelle et politique. En conséquence, ces résultats préconisent que les futurs modèles de transmission des préférences tiennent compte des préférences politiques générales des parents.

Cet article comporte plusieurs limites. Dans la partie théorique, nous faisons l'hypothèse simple que les préférences politiques sont hétérogènes *ex ante*. De plus, nous n'imposons pas de structure sur le paramètre d'intensité du paternalisme, alors que préférences politiques et paternalisme pourraient être corrélés. Une extension potentielle du modèle serait d'étudier la formation de préférences paternalistes dans un contexte dynamique. Le paramètre mesurant l'intensité du paternalisme pourrait être endogène aux opinions politiques des parents. Comprendre dans quelle mesure les préférences paternalistes sont influencées de manière endogène par l'idéologie personnelle et par différents contextes culturels peut constituer un axe de recherche pour des travaux futurs. Par ailleurs, l'altruisme n'est pas le seul mécanisme qui puisse produire des prédictions empiriques dans ce contexte. Les enfants pourraient en effet choisir de s'engager dans des actions explicites pour éduquer leurs propres parents.

Dans la partie empirique, la stratégie d'identification repose sur l'hypothèse selon laquelle, à taille de famille donnée, le nombre de filles est une variable aléatoire. Idéalement, l'utilisation de données de panel nous permettrait d'identifier clairement le changement de préférences politiques après la naissance d'une fille. À notre connaissance, ces données contenant à la fois une mesure des opinions vis-à-vis de l'avortement et de la présence de filles ne sont pas encore disponibles.

Cet article laisse donc penser que la socialisation des parents par leurs enfants est un phénomène complexe, et des recherches plus approfondies sont nécessaires pour mieux comprendre comment les enfants peuvent affecter les opinions de leurs parents sur des problèmes sociétaux complexes.

Dans le chapitre 2, nous proposons une analyse des décisions d'offre de travail des femmes dans un contexte où les institutions limitent leur possibilité d'accéder à un emploi du temps régulier. Nous utilisons la réforme dites des *rythmes scolaires* de 2013 comme expérience naturelle pour mettre en évidence le fait que les femmes accordent de la valeur à la flexibilité horaire du fait de l'emploi du temps de leurs enfants. Ce cadre nous permet de tirer plusieurs enseignements relatifs à la dynamique d'offre de travail des femmes. Tout d'abord, nous montrons que la possibilité d'adopter un emploi du temps flexible est corrélée au pouvoir de négociation au travail. Deuxièmement, nous mettons en évidence le fait que les mères profitent d'une baisse de la valeur associée à la flexibilité pour régulariser leur emploi du temps, surtout si elles travaillent dans des professions où la présence continue sur le lieu de travail est particulièrement valorisée, par exemple dans les postes d'encadrement.

Notre étude suggère que l'adoption d'un emploi du temps flexible n'est pas une option pour de nombreux travailleurs, en particulier pour les travailleurs peu qualifiés qui n'ont pas de pouvoir de négociation pour organiser leur travail de manière autonome, ainsi que pour les cadres qui doivent avoir une présence continue sur le lieu de travail. Les innovations technologiques ont dès à présent amélioré la capacité des entreprises et des travailleurs à développer de nouvelles formes de travail, y compris certaines plus adaptées aux travailleurs peu qualifiés. Les politiques publiques qui visent à promouvoir les nouvelles formes de travail flexibles dans le but de parvenir à un meilleur équilibre entre vie professionnelle et vie personnelle et d'aider les femmes à briser le plafond de verre devraient encore tenir compte des contraintes professionnelles spécifiques à chaque type d'emploi.

Deux aspects de cette étude méritent enfin d'être mentionnés. Tout d'abord, cette réforme ne semble pas affecter les salaires des femmes. Cela pourrait s'expliquer d'une part par le fait qu'en moyenne, nous n'observons pas d'augmentation du nombre d'heures totales travaillées. D'autre part, toute récompense financière pour une présence plus régulière au travail pourrait prendre du temps à se concrétiser. De la même manière, il est possible qu'un emploi du temps plus régulier affecte la carrière des mères, en leur permettant d'accéder à d'autres fonctions et en augmentant leurs chances de recevoir des formations et des promotions. Nous avons l'intention de continuer à étudier les effets potentiels de long terme de la réforme. Par ailleurs, nous avons limité jusqu'à présent notre étude à l'impact des contraintes institutionnelles sur l'offre de travail des mères. Cependant, si un grand nombre de femmes choisissent soudainement d'adopter un emploi du temps régulier, cela pourrait également affecter à la fois leurs collègues et l'organisation globale du temps de travail dans les entreprises. Il conviendra donc d'étudier cette possibilité une fois que les données nécessaires seront rendues disponibles.

Dans le chapitre 3, nous présentons les résultats d'une expérimentation avec assignation aléatoire, qui montre que l'intervention courte d'un modèle positif d'identification féminin (*role model*) à l'école peut influencer les attitudes des apprenants, et contribuer ensuite à modifier leurs choix d'orientation scolaire. A l'aide d'une assignation aléatoire des élèves de Seconde et de Terminale scientifique - deux années décisives en termes de choix d'orientation - à une intervention d'une heure, nous étudions l'impact causal des modèles positifs d'identification féminins sur les aspirations, les attitudes et les choix éducatifs. Ces modèles féminins extérieurs font baisser de manière significative la prévalence des visions stéréotypées associées aux métiers dans les sciences, tant chez les élèves filles que garçons. L'usage de données administratives exhaustives révèle que le traitement n'a pas d'effet significatif sur le choix d'orientation des élèves de seconde, mais nous montrons que la proportion de filles qui s'orientent et sont admises en classe préparatoire scientifique après le lycée augmente de 3 points de pourcentage dans le groupe traité par rapport au groupe de contrôle. Cet effet correspond à une augmentation de 30% par rapport à la moyenne du groupe de contrôle. Ces changements sont principalement attribuables aux élèves ayant les meilleurs résultats scolaires en mathématiques.

Notre étude comporte plusieurs limites qui méritent d'être d?examinées pour mieux tracer les perspectives de recherche. Tout d'abord, nous aimerions étudier l'impact à long terme des interventions sur la réussite des élèves à la fin du lycée et sur la performance des étudiants qui ont décidé de s'inscrire à des programmes scientifiques sélectifs (CGPE) une et deux années après. Cependant, nos données ne nous permettent pas de suivre les élèves des groupes traités et de contrôle après l'université et d'observer leurs situations sur le marché du travail.

Deuxièmement, nous avons tenté de mesurer l'effet d'une variation du traitement s'agissant de la qualité de l'information rendue disponible sur les bénéfices économiques associés aux études scientifiques. Nos résultats ne font que suggérer que ces messages peuvent être plus pertinents pour les élèves de Seconde. Il serait intéressant d'envisager des variations plus fines dans les messages clés mis en avant dans les interventions auprès des élèves les plus jeunes, étant donné que ce sont les élèves les moins sensibles à l'intervention des *role models* en termes de choix d'orientation. Enfin, nos résultats suggèrent que les filles et les garçons ont été touchés par l'intervention de modèles féminins, mais plus particulièrement les élèves ayant les meilleurs résultats scolaires en mathématiques. De plus amples recherches sont nécessaires pour voir quel modèle pourrait être plus pertinent pour répondre aux besoins des élèves ayant un niveau scolaire plus faible, ou si une telle intervention n'est tout simplement pas un outil approprié pour ce type d'élèves.

Perspectives de recherche

Dans l'ensemble, ce travail ne prétend évidemment pas donner une vision exhaustive de la dynamique des inégalités de genre. Chaque chapitre s'appuie sur l'utilisation de données principalement françaises et sur des domaines spécifiques. L'expérience des économies avancées n'est certainement pas suffisante pour apporter une perspective globale de l'évolution des disparités entre les sexes.

D'autre part, nos résultats suggèrent que l'expérience des femmes à l'école et sur le lieu de travail varie considérablement en fonction de leur statut socioéconomique et de leur niveau de diplôme [31]. Par conséquent, nos résultats invitent à approfondir les recherches sur les besoins spécifiques et les situations des femmes en tenant compte de leur statut socioéconomique et attestent implicitement que le genre est une catégorie qui devrait être mobilisée en lien avec d'autres concepts tel que la classe (Collins, McLaughlin, Higginbotham, Henderson, Tickamyer, MacDonald, Gatta, Manuel, Jones-Deweever, Schram, et al. 2009) [32].

Ce travail permet néanmoins de tracer plusieurs perspectives pour des recherches futures.

31. Cette considération soulève une question importante pour le milieu universitaire des sciences sociales : comment pouvoir parler, depuis une position de pouvoir et de privilège relatif, de l'amélioration de la situation des femmes pauvres et de leurs familles.

32. Dans le contexte français, il existe une limitation claire à la mobilisation du concept de race, car cette variable n'est jamais signalée explicitement dans les enquêtes publiques.

Alors que les arrangements de travail dits alternatifs sont de plus en plus répandus dans la plupart des économies avancées, il serait intéressant d'étudier comment a évolué au cours du temps la valeur accordée par le marché aux emplois caractérisés par une flexibilité horaire limitée, et étudier en particulier la relation entre changements technologiques et caractéristiques des emplois.

D'autre part, parce que les femmes qui valorisent la flexibilité peuvent être pénalisées sur le marché du travail, il devient fondamental de mieux comprendre la formation, l'évolution et les implications des différences de genre en matière de préférences vis-à-vis des nouvelles formes de travail. En particulier, nous souhaiterions savoir si les politiques gouvernementales, les cycles économiques, l'influence des pairs, ou l'augmentation de l'offre de substituts marchands au travail domestique peuvent faire évoluer ces préférences.

Enfin, pour mieux comprendre comment la dynamique des normes de genre se matérialise dans différents types de couples, il serait intéressant d'étudier les tendances du marché du mariage. Les évolutions récentes de la mise en couple suggèrent que le taux de mariage des femmes diplômées est toujours en augmentation aux États-Unis. Il serait intéressant de voir si ces tendances sont également observées dans les pays européens, si ces femmes diplômées choisissent des partenaires qui eux aussi ont des emplois du temps inflexibles, et comment ces formes de travail peuvent potentiellement avoir un impact sur le bien-être et la réussite scolaire des enfants.

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