The Long-term Effects of After-school Care*

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Abstract

I investigate the long-term effects of after-school childcare on children's human capital investment. I exploit the timing and intensity of an after-school care reform in the Netherlands, and build a 20-year panel with administrative data to track affected cohorts from childhood through adulthood. I find that university graduation rates increased by 8%, with the strongest impact among students from less educated families. This effect stems from higher after-school care use rather than maternal employment responses, highlighting childhood environment as the key mechanism. I consider three potential channels: improved skills, stronger preferences for university, and shifting beliefs about returns to university. I find evidence supporting changes in preferences and beliefs as the main drivers, rather than skills. I show that the reform increased exposure to peers from high-SES families in after-school care, potentially driving these changes.

JEL Codes: J13, I24, J16, J22, I28, J24

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1 Introduction

School days are usually shorter than full-time working hours, creating care constraints for families (OECD, 2015). As a result, mothers are much more likely to work part-time compared to fathers in families with young children — a pattern that persists as a key driver of the gender earnings gap and negatively impacts their career formation and pensions (Adda et al., 2017; Bonnet and Rapoport, 2020). Many high-income economies allocate sizable public budgets to fund after-school care programs, where children play, do crafts, or work on homework under professional supervision, enabling mothers to work uninterrupted work days.[1] However, existing research shows mixed results regarding the efficacy of these policies, with many studies finding limited or no effects on women's employment despite considerable increases in public spending.[2]

Are these substantial public investments simply money down the drain? Even if after-school programs fail to deliver labor market gains, they could still offer meaningful benefits for children themselves. Whether they deliver on this potential, however, remains unclear. Although there is a rich literature examining the impact of early care, these findings cannot simply be extrapolated to after-school settings: the returns to investing in children's skills differ substantially across developmental stages (Cunha et al., 2010). What little research exists on after-school programs shows mixed results on immediate cognitive effects, with long-term outcomes remaining largely unexplored.

In this paper, I ask whether after-school childcare affects the human capital investment of children. Exploiting the timing and the intensity of a Dutch reform that expanded after-school care access, I show that university graduation rates are higher for the cohorts impacted by the reform, particularly for girls from less-educated families. While the reform failed to increase maternal labor supply, it significantly increased after-school care take-up, suggesting that the shift in childhood environment is the key mechanism driving the long-term effects. I find that these effects operate through changing preferences and beliefs rather than skill gains: test scores and teacher evaluations show no improvement. Instead, students pursue higher tracks in secondary school than their scores and recommendations would predict, and university attendance rises even among those from non-academic tracks – with the strongest effects among girls. Survey data reveal why: treated cohorts hold more favorable beliefs about working mothers who use childcare, increasing expected returns from education for girls. Exploiting variation in peer composition within childcare, I find suggestive evidence that these changes stem from exposure to high-socioeconomic status (high-SES hereafter) peers in after-school care centers, where disadvantaged children benefit significantly from such interactions.

I leverage the 2007 childcare reform in the Netherlands to estimate the long-term effects of after-school care. In the early 2000s, the Netherlands had high childcare costs and strong cultural norms against using market-based care, creating significant barriers to maternal employment. The 2007 reform, aiming to enhance maternal employment, dramatically increased childcare subsidy rates—reaching a 40 percentage point decline in costs for middle-income households—and required schools to facilitate after-school care arrangements. This comprehensive reform doubled the public budget spent on childcare subsidies from €1 billion in 2005 to €2 billion in 2007.[3] The enhanced affordability and logistical support addressed both cost and accessibility barriers simultaneously, leading to dramatic increases in formal childcare enrollment, particularly for after-school care among school-age children.

I combine comprehensive administrative data on childcare use, educational attainment, school reg-

[1] For a review of public spending by children's age, see OECD (2022)

[2] Notable examples include Bettendorf et al. (2015); Felfe et al. (2016) and Dehos and Paul (2023)

[3] While the Childcare Act was introduced in 2005, the 2007 reform was more comprehensive and effective for after-school care, combining increased subsidies with mandatory school arrangements. I discuss the detailed policy evolution in Section 2.

istries, and income with rich survey data on norms and beliefs to study the impact of the reform. Using restricted-access microdata from *Centraal Bureau voor de Statistiek* (CBS)—the statistics bureau of the Netherlands—I link population records, childcare registries, education records, test scores and tax data to track approximately 1 million individuals born between 1992-1999 from their childhood (when they were exposed to the 2007 childcare reform) through their young adulthood (when they are 24 and older). This provides comprehensive measures of the childhood environment, allowing me to observe their skills, peer interactions, academic progression, and socioeconomic background over time. I supplement these administrative records with survey data from CBS and LISS to examine changes in norms and beliefs across cohorts.

I exploit variation in children's exposure to the 2007 reform, which depends on their birth cohort and household income, and employ a differences-in-differences approach. The reform, implemented in January 2007, affected only cohorts born in 1995 or later who were in primary school at the time, creating a natural treatment and control group based on birth cohorts. Moreover, because the subsidy structure depends on household income, the reform generated heterogeneous changes across income brackets, leading to variation in treatment intensity. To address potential endogeneity concerns arising from households' behavioral responses to the policy, I follow the simulated instruments literature (Currie and Gruber, 1996; Gruber and Saez, 2002) and construct a simulated subsidy change measure by fixing household income at its 2005 pre-reform level. This measure captures the subsidy increase households would have received *solely based on their pre-reform income and the new policy schedule*, thus isolating exogenous variation that is unaffected by post-reform income adjustments or other behavioral responses. While this measure is based on pre-reform income and could therefore be correlated with unobserved household characteristics that influence both income and outcomes, such confounders are likely to be time-invariant across cohorts. By comparing outcomes across cohorts, these confounders are differenced out. Consequently, any systematic divergence in outcomes between treated and control cohorts that varies with the simulated subsidy change can be interpreted as the causal effect of the reform.

Leveraging variation in exposure to the 2007 reform, I find that the policy significantly shifted children's care environments, increasing after-school care take-up by 50%. However, contrary to the policy's intended goals, this change in childcare use did not translate into gains in maternal labor supply – I find no effects on either the extensive or intensive margin of maternal employment. The absence of employment effects suggests the reform primarily shifted existing care arrangements rather than changing mothers' labor supply. To test this hypothesis, I proxy informal care availability by whether a non-working grandmother lives in the same municipality as the family. I find that take-up of subsidized childcare increased substantially more among families with access to informal care, suggesting that the policy displaced informal childcare rather than increasing mothers' labor supply. While these results suggest that the policy failed to achieve its primary objective, the reform still generated a meaningful shift in children's environments from home-based to center-based care settings.

I use university graduation rates to measure children's human capital investment and show that this shift in environment generated significant long-term benefits for treated cohorts. I find that children who experienced greater exposure to the reform are 8% more likely to graduate from university by age 24, with results robust to different age cutoffs and family controls. The reform's impact, however, was far from uniform: children from low-SES families, particularly girls, experienced the largest increases. To examine broader impact on human capital investment beyond university completion, I analyze field of study, labor supply, and the timing of marriage and childbearing. I find evidence consistent with increased human capital investment across these dimensions, though many outcomes remain partially unrealized given the impacted cohorts' ages, limiting my ability to fully assess the reform's impact across these margins.

A natural question is how the reform increased children's university graduation rates — I consider three potential channels: improving skills, shifting preferences for university attendance, and changing

beliefs about returns to a university degree. I provide a stylized model to illustrate how households' decisions on maternal work and childcare use can affect university graduation rates through these channels. Using this framework, I derive comparative statics that characterize households' responses to a policy change such as the 2007 reform. These predictions help establish how the reform shifted children's social environment and the resulting implications for their skills, preferences, and beliefs.

I exploit students' academic progression to distinguish between preference and skill channels, and find evidence for changing preferences rather than improving skills. Specifically, I examine track assignment after primary school, where students' skills are measured through test scores (cognitive) and teacher evaluations (non-cognitive) that determine track recommendations, though students make the final choice. Standardized test scores at age 12 show no improvement, nor do teacher evaluations of non-cognitive development, suggesting the effects operate through preferences rather than skills. Consistent with this, I find students increasingly choose higher tracks than implied by their test scores and teachers' recommendations, with university attendance rising even among those completing non-academic tracks – particularly among girls from less educated families.

Using survey data, I show the reform changed beliefs about mothers using childcare to work, thereby increasing girls' expected returns from university, and amplifying the impact for them. Notably, track choices at age 12 show symmetric effects across genders, while university graduation rates increase substantially more for girls, indicating a gender-specific mechanism that becomes salient at university entry rather than at age 12. In line with my model, I consider expected returns from university, which depend on beliefs about career trajectories that differ by gender. In the Netherlands, women typically switch to part-time work after childbirth, which diminishes their returns from university education (Rabaté and Rellstab, 2021). Using survey data about norms and beliefs, I show that the reform normalized mothers using childcare to work longer hours, increasing girls' expected returns from university by extending the horizon over which education premia accrue. Consistent with this mechanism, I document a shift from university majors associated with part-time work to those with full-time career paths among girls, whereas boys show no comparable pattern.

Given that preferences and beliefs are shaped through social interactions, I conclude my analysis by examining peer dynamics in childcare. I find suggestive evidence that exposure to higher-SES peers is associated with higher university graduation rates. This is consistent with the reform's shift from home-based to center-based care having altered children's social environments: the reform disproportionately increased enrollment among affluent families, exposing all children to higher-SES peers in childcare settings. To study these peer interactions, I treat schools as fixed networks and leverage the reform's requirement that schools arrange after-school care to identify which peers attend childcare together. Exploiting variation in peer composition within childcare centers, I find that children from disadvantaged backgrounds benefit significantly from being exposed to peers from high-SES families in childcare. These peer effects could operate through high-SES families serving as role models that broaden educational horizons, or through friendships with university-bound peers inspiring similar aspirations.

The 2007 reform exemplifies how public policies can change social norms, generating consequences that extend far beyond their original objectives. At first glance, the reform appears to be a policy failure: it doubled public spending without achieving its stated goal of increasing maternal labor supply. Moreover, it appears regressive, transferring public funds primarily to middle and high-income families. However, this evaluation overlooks its substantial benefits to children. The reform generated significant returns through increased human capital investment: higher university graduation rates can translate into greater lifetime earnings and tax revenues. Additionally, reducing families' reliance on informal care may have improved welfare for family members, such as grandparents, who previously provided this care, often unpaid. My findings suggest the reform also produced positive externalities through increased interactions between children from different socioeconomic backgrounds, with the largest educational gains accruing

to children from uneducated families. Looking forward, the reform may ultimately increase female labor supply in future generations as girls invest more in their human capital, benefiting from shifting social norms around maternal work and childcare acceptability that emerged from their own childhood exposure to formal care.

My study contributes to two strands of literature: first, I contribute to the literature on the impact of childcare on human capital development. While substantial evidence documents the impact of early-care on cognitive and non-cognitive skills (Datta Gupta and Simonsen, 2010; Black et al., 2014; Felfe et al., 2015) and later-life outcomes (Havnes and Mogstad, 2011; Gray-Lobe et al., 2022; García et al., 2023), evidence on after-school care remains limited. Existing studies find positive effects on non-cognitive skills of children from lower socioeconomic backgrounds (Schmitz, 2022) but no clear impacts on development (Felfe and Zierow, 2014) or academic performance (Drange and Sandsør, 2024). Importantly, there is virtually no evidence on the impact of after-school care on human capital beyond the childhood years. Lacking exact evidence, it might be tempting to seek guidance from the evidence on the long-term impact of early care. Unfortunately, these findings cannot be generalized to after-school care – as Cunha et al. (2010) points out, investment in children's skills has different returns based on their age. I contribute to this literature by providing novel evidence on the long-term effects of after-school care on human capital investment of children.

While a substantial body of research documents the long-term effects of childcare programs on adult outcomes (Thompson, 2018; Gray-Lobe et al., 2022; García et al., 2023), most studies establish causal effects without exploring underlying mechanisms. Most closely related to my work, Havnes and Mogstad (2015) finds that Norwegian childcare affects earnings but not cognitive test scores – suggesting non-cognitive gains –when DeMalach and Schlosser (2024) proposes that improved school environments may explain the long-term benefits of Israeli preschool. However, the literature typically infers potential mechanisms from patterns in empirical findings, *rather than directly observing and testing whether childcare changed these outcomes*, often due to data limitations. I link outcomes from childhood to adulthood with detailed measures of behavioral responses, development, and beliefs, allowing me to move beyond demographic heterogeneity and directly test the individual-level mechanisms that drive long-term program effects.

Secondly, my paper relates to the growing literature on how public policies can change norms. Research demonstrates that role models and peer networks play crucial roles in shaping gender norms, with mothers' work behavior influencing preference formation (Fernandez et al., 2004) and mothers of peers affecting gender-role identity (Olivetti et al., 2020). Recent evidence shows that family policies can successfully reshape gender norms: paternity leave reforms generate peer effects in program participation (Dahl et al., 2014) and reshape gender norms across generations, with exposed children exhibiting more egalitarian attitudes and counter-stereotypical career choices (Farre et al., 2023). However, evidence on how childcare programs can generate norm shifts remains limited. My findings contribute by showing that childcare policies can serve as vehicles for gender norm change through peer exposure mechanisms, demonstrating how policies not explicitly designed to target norms can nonetheless reshape attitudes about maternal work and family arrangements through children's social interactions.

The remainder of this paper is organized as follows. Section 2 provides background on the Dutch childcare system and describes the 2007 reform, followed by a description of the comprehensive administrative records and survey data I use. Section 3 presents the empirical strategy and main results, documenting the reform's effects on after-school care take-up, maternal labor supply, and children's long-term educational outcomes. Section 4 investigates the mechanisms underlying these effects, testing whether changes operate through cognitive skills or preference shifts, and examines the role of peer interactions in driving norm change. Section 5 concludes with a discussion of the broader implications for childcare policy and intergenerational effects of social programs.

2 Data and context

This section describes the childcare system in the Netherlands, highlighting the baseline conditions and beliefs towards childcare use. Then, I introduce the changes in childcare policy, explaining how childcare system transformed over time. Finally, I describe the comprehensive administrative data and surveys that I use in my analysis of the long-term effects of after-school care.

2.1 Context: Childcare in the Netherlands

Before 2005, the Netherlands had a fragmented childcare system that varied significantly across municipalities, creating unequal access. Strong cultural preferences for parental care, combined with limited availability and complex financing, resulted in low formal childcare usage—only 25% of young children used center-based care.

The Netherlands has undergone significant reforms to its childcare system over the past two decades, transforming from a predominantly municipal-based system to a market-oriented approach, where subsidies were overseen by the tax authorities. Prior to 2005, childcare subsidies were administered by individual municipalities, leading to substantial variation in eligibility criteria, subsidy levels, and availability across the country. This fragmented system created inequalities in access and limited the effectiveness of childcare as a tool for promoting maternal labor force participation. The Childcare Act of 2005 (and the further reform in 2007) changed this system fundamentally.

Formal childcare in the Netherlands serves two main age groups through distinct programs. Early care targets children aged 0-4, while after-school care serves children aged 4-12, as primary school hours often end around 15:00, with Wednesdays being half-days. Both types of care are provided through two primary modes: center-based care and childminders (similar to nannies). Center-based care offers up to 10 hours per day with qualified staff, maintaining specific child-to-caregiver ratios (up to eight children per teacher for early care). After-school care offers a range of structured activities, including outdoor play, crafts, reading, and homework assistance. Childminders offer more flexible arrangements, including evenings and weekends, and can care for up to six children either in their own homes or in dedicated care centers.

Pre-Reform Conditions: Before the 2005 reforms, Dutch women's participation in the labor market was characterized by high rates of part-time employment and relatively modest full-time participation compared to other developed nations. By 2004, the participation rate of women in the Netherlands had reached close to 70%, yet the share of women working part-time was 60% – by far the largest in the OECD (OECD, 2014). Many mothers worked reduced hours or interrupted their careers to accommodate childcare responsibilities, reflecting not only the limited availability and high cost of childcare options but also prevailing social norms about appropriate childcare arrangements.

The pre-reform childcare system operated through a complex three-tier structure. The majority (76%) of center-based daycare places were subsidized directly by employers and local governments, while the remaining 24% were "unsubsidized" places whose costs were partly tax deductible for parents. To qualify for subsidies and tax deductions, both parents in two-parent households and the single parent in single-parent households needed to work (Bettendorf et al., 2015). This system had been developing since the first Child Care Stimulation Act in 1990, when the Dutch government chose to increase availability and share the costs of childcare between government, employers and parents (Wetzels, 2005).

Despite this institutional framework, formal childcare utilization remained low.[4] The limited use of

[4] Bettendorf et al. (2015) states that, before the reform, only 25% of children aged 0-3 were enrolled in center-based care, and below 6% of children aged 4-12 used center-based out-of-school care. Survey data collected by SEO research supports these patterns: only 43% of parents with children aged 0-12

formal childcare stemmed from multiple factors beyond cost and availability alone: cultural norms played a particularly important role, as the largest group of non-users across all age groups cited the belief that "a child should be cared for by parents" as their primary reason for avoiding formal childcare (Kok and Berden, 2009). Responses from the 1999 wave of European Values Survey confirm these findings: close 40% of respondents agree with the statement *'A pre-school child is likely to suffer if his or her mother works'*.[5] This combination of limited formal provision, complex financing arrangements, and strong cultural preferences for parental care meant that otherwise identical families could face dramatically different childcare costs and availability depending on their municipality of residence and employment situation, limiting both full-time work and equitable access to early childhood services.

2.2 Policy: The Childcare Act (2005) and Its Reform (2007)

The Childcare Act of 2005: 2005 marked a fundamental shift in Dutch childcare policy with the introduction of the Childcare Act, which replaced the previous fragmented system of municipal and employer subsidies with a unified national framework administered through demand-side financing (Ministerie van OCW, 2024). This reform standardized eligibility criteria and subsidy calculations across all municipalities, requiring both parents to work, be in education, or participate in a reemployment program. Subsidy rates were inversely related to household income, where the highest subsidies were available to lower-income families and gradually phased out as income increased (see Figure 1a below).[6] Rather than prescribing detailed quality standards, the Act established general quality requirements and delegated supervision to municipalities.[7] Crucially, the new system expanded formal childcare eligibility to include childminder care (*gastouderopvang* in Dutch) – small-scale care provided either at the childminders home or at the children's home – bringing this previously informal arrangement under the formal childcare umbrella for the first time (Kok and Berden, 2009).

The 2005 centralization initially had modest financial impact, with public spending actually decreasing slightly from 1.028 billion euros in 2004 to 1.001 billion euros in 2005, partly because subsidies were reduced for the highest income groups (Bettendorf et al., 2015). This limited initial impact occurred because employer contributions remained voluntary under the 2005 law, leaving childcare expensive for many families, particularly those with lower incomes. The period between 2005-2007 represents a transitional phase where the structural changes laid the groundwork for the more dramatic subsidy increases that would follow in 2006 and 2007, where the average parental cost share would drop from 37% to 18% according to Bettendorf et al. (2015).

The 2007 Reform: Building on the 2005 foundation, the Dutch government implemented a major expansion of childcare subsidies in 2007 alongside the Van Aartsen-Bos motion, which required schools to arrange after-school care for their students. The 2007 subsidy expansion involved two key changes: dramatic increases in government contribution rates, particularly for middle-income households with subsidy rates rising by 20 to 40 percentage points, and the introduction of mandatory employer contributions

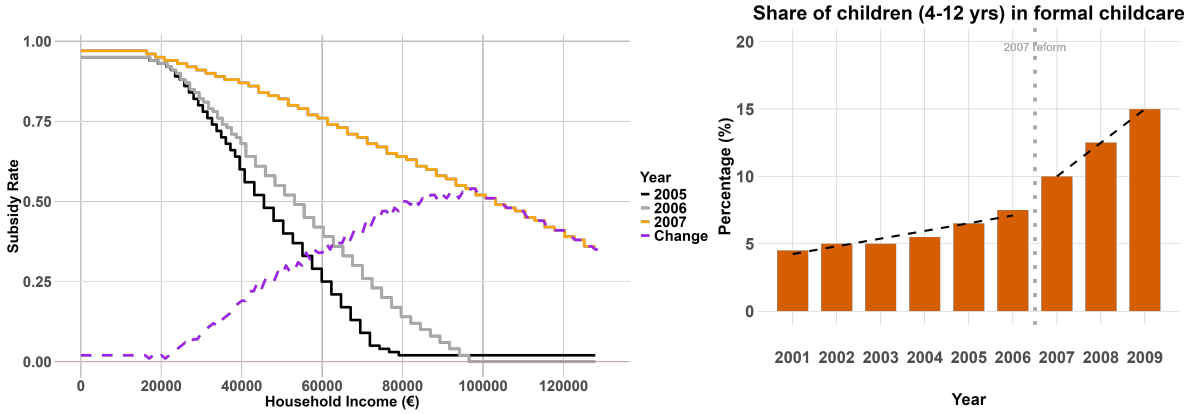
used any form of childcare for their oldest child in 2004 – and among those who did use childcare, there was a strong preference for informal arrangements: 54% relied on informal care, while only 26% used formal daycare centers and 13% used after-school programs (Kok and Berden, 2009)

[5] 1999 EVS is provided by GESIS-Leibniz-Institut Für Sozialwissenschaften (2012).

[6] Under the new system, families choose their preferred childcare provider and pay the full market price upfront, then receive partial reimbursement from the government through the childcare allowance based on their household income (Ministerie van OCW, 2024). This market-based approach aimed to promote competition among providers while ensuring financial accessibility (Kok and Berden, 2009).

[7] The specific quality standards were developed through industry self-regulation: the Parents' Association in Child Care (BOinK) and employers' associations created a quality covenant in late 2004 that became the basis for the official policy rules governing childcare quality.

Figure 1: Change childcare subsidies and childcare use over the years



(a) Change in subsidy scheme

(b) Change in after-school care use

Notes: Panel 1a displays subsidy rates by household income for years 2005, 2006, and 2007 (gathered from Overheid.nl), along with a "change" measure that represents 2007 rates minus 2006 rates. Panel 1b shows the number of children (×1000) enrolled in after-school care and early care from approximately 2002 to 2008, taken from Bettendorf et al. (2015).

centralized through the Tax and Customs Administration, replacing the previous voluntary employer contribution system (Sociaal en Cultureel Planbureau, 2023). Simultaneously, the Van Aartsen-Bos motion mandated that primary schools facilitate after-school care arrangements when requested by parents, ensuring systematic availability of care services at or near school locations (Kok and Berden, 2009). This comprehensive reform increased childcare subsidies to €2 billion in 2007, representing approximately a 100% increase from 2005 levels[8], and was explicitly designed to boost maternal labor supply by addressing both affordability and accessibility barriers and allowing mothers to work undisrupted work days (Ministerie van OCW, 2024).

The 2007 reform created substantial variation in treatment intensity across income groups. Figure 1a outlines the changes in subsidy scheme: families earning between €30,000-€100,000 experiencing the most generous increases in government support, while higher-income families (above €100,000) saw more modest changes and the lowest-income families already received near-universal coverage under the 2005 system. The Van Aartsen-Bos motion's requirement for school-facilitated after-school care addressed logistical barriers by eliminating the need for parents to independently locate and coordinate after-school services, instead making schools responsible for ensuring such arrangements were available (Kok and Berden, 2009). The combination of enhanced affordability through both increased subsidies and mandatory employer participation, alongside improved logistical support, created the conditions for substantial increases in after-school care use as demonstrated in Figure 1b.

Subsequent Adjustments (2009 onwards): In 2009, facing fiscal pressures, the government made modest reductions to subsidies for higher-income households while maintaining generous support for lower and middle-income families. More substantial retrenchment began after 2011, with childcare allowances reduced in several phases and additional restrictions implemented. However, trends in formal childcare use, as demonstrated in Figure 1b, indicate that these modest reductions in 2009 did not significantly deter families from using formal childcare services. To avoid confounding effects from these later policy reversals, I limit the sample to cohorts who remain in the childcare system until 2011.

[8]Table 1 in Bettendorf et al. (2015) shows childcare subsidies increased from €1.001 billion in 2005 to €2.058 billion in 2007.

2.3 Data

I leverage restricted-access microdata from *Centraal Bureau voor de Statistiek* (CBS), the statistics bureau of the Netherlands. I combine administrative records on childcare use, education, and income using unique identifiers, which allows me to track individuals from their childhood (when they were exposed to the 2007 childcare reform) through their young adulthood. I complement these records with surveys on opinions towards careers and childrearing.

Demographics: I begin by identifying children in eligible cohorts using the population records. I link these to demographic records and household registry to identify single-parent and two-parent households, as well as siblings, grandparents, and future family formation patterns (marriage and fertility of these children in adulthood).

Formal Childcare Use: The childcare registry provides annual records of formal childcare use for all families receiving subsidies from 2005 onwards, capturing both early care (ages 0-4) and after-school care (ages 4-12). Records become richer from 2007 onwards, recording the hours used as well as the type of care arrangement preferred (central-based care or childminder care). This allows me to identify the families that took-up childcare subsidies before and after the reform, and use these records to proxy formal childcare use.[9] I merge these records to residential locations to be able to control for municipal-level variations in childcare availability.

Income records: I link parents to their income to determine subsidy eligibility and construct the treatment intensity measure. I use two main sources: the employer-employee data (providing annual data from 1999 and monthly data from 2006 onwards), and household income records for self-employed individuals (from 2003 onwards).[10] This comprehensive income data enables me to construct pre-reform household income measures from 2005 and subsidy eligibility, given the realized household income, as well as the detailed labor supply records for employed parents, including employer id, days worked, full-time equivalent days in a year, gross and net wages.

Education Records: I utilize administrative records that track degree completion and field of study from 2006 onwards to construct my primary outcome variable: university graduation. To examine potential mechanisms, I incorporate a registry of students in primary schools (available from 2008 onwards) and standardized test scores (available from 2006 onwards). The registry of students allows me to link each child to their peers and their outcomes to examine peer interactions. Standard test scores, on the other hand, come from centralized examinations (CITO) taken by students at the end of primary school (at age 12), which allow me to assess whether the reform affected cognitive skill development.

Survey on norms and beliefs: I complement these administrative records with survey data from the CV-SLI. The CV-SLI is a biannual survey of approximately 13,000 unique individuals aged 15 and older, providing repeated cross-sectional data from 2010 to 2020. It includes statements that test opinions on mothers working and using childcare, enabling me to examine whether exposure to the reform influenced social preferences across cohorts and study changing social norms around childcare use. I complement these with LISS panel on 'Personality' to assess whether non-cognitive gains can be an important driver of the observed results.

Final Sample: My primary sample consists of individuals born between 1992-1999 that I can consistently track over the years, yielding approximately 1,100,000 unique individuals. This cohort range

[9] Formal childcare use is censored for families who opt to use formal childcare without requesting any subsidies associated with it. I discuss the implications of this omission in Section 3.2 upon presenting the findings for formal childcare use.

[10] I restrict this source to households where there are only two earners, and the main income source is one of the parents. Unfortunately, I am not able to differentiate between the income of the mother and father for families that both parents are self-employed, however this limitation only occurs for 8% of my final sample.

creates a natural comparison design: the 1992-1994 cohorts were too old for after-school care when the 2007 reform was implemented (ages 13-15 in 2007), serving as the control group, while the 1995-1999 cohorts were still eligible for after-school care (ages 4-12 in 2007), constituting the treatment group. I restrict the sample to families with complete information on household income, maternal labor supply status, and residential location in 2005 to ensure accurate construction of pre-reform characteristics. Additionally, I exclude families with children younger than 4 to isolate the effects on after-school care and maternal labor supply from potential confounding due to younger children's care needs. This leaves my sample with approximately 1m unique individuals.

The administrative nature of this data provides comprehensive population coverage and objective outcome measures, though some limitations exist. First, the childcare registry captures only subsidized formal care, missing informal arrangements. To remedy this, I impute the availability of informal care using the residential location and labor market participation of grandmothers for each household. Second, education records begin in 2006, and while they provide comprehensive coverage for recent cohorts, coverage diminishes for older generations. Consequently, analyses incorporating parental education controls are restricted to approximately half of the original sample. Finally, standardized test scores are only available after 2006 and are limited to schools that administer the CITO test, which covers most but not all schools in the Netherlands.[11]

3 Impact of the 2007 Reform

In this section, I introduce the sources of variation that I use to estimate the impact of the 2007 reform: cohort exposure and intensity of subsidy change. Exploiting these sources of variation, I use a continuous differences-in-differences model and show that childcare use increased by 54%; however, there has been no change in mothers' labor supply. Finally, I connect these immediate effects on the family environment to long-term effects, and study the impact of the reform on human capital investment of children. I show that university graduation rates increased by 8%.

3.1 Empirical Strategy: Exposure to the 2007 reform

I leverage the exposure to the 2007 reform, which varies by the children's birth cohort and households' income levels. Utilizing changes in subsidy schemes, I construct a simulated subsidy change measure and exploit this simulated subsidy change and the timing of policy to uncover the impact of the reform.

Sources of Variation

Cohort variation: The reform created a natural division between cohorts based on their age eligibility for subsidized after-school care. Children born before 1995 were older than 12 in 2007, making them too old to benefit from the expanded after-school care subsidies. In contrast, children born in 1995 and later were aged 4-12 in 2007 and thus eligible for the subsidized after-school care programs. This creates a clear treatment and control group based on the birth cohort of children.[12]

[11] Specifically, I miss part of the control group (1992-1994 cohorts) who had already completed primary education by 2006, and schools that administer a different test than CITO – I capture 83% of unique school IDs.

[12] Additionally, there is variation in treatment dosage within the treatment group: younger cohorts accumulated more years of exposure to the expanded subsidies before aging out at 12, generating additional identifying variation in treatment intensity. I make use of this variation in the long-run outcomes in Section 3.3

Intensity of Subsidy Change: The 2007 reform modified the subsidy schedule, making childcare more generous, particularly for middle-income families. Figure 1a illustrates this change: the reform created substantial variation in the expansion of subsidies across the income distribution. The new subsidy schedule extended eligibility to higher-income households and increased subsidy rates most dramatically for families with household incomes between approximately €40,000-€100,000, while low-income families saw modest increases. This differential impact across income levels provides a continuous measure of treatment intensity that complements the cohort-based variation.

I construct a simulated measure of subsidy change to capture the intensity of treatment exposure for each household i:

$$\text{Change}_i = \text{Subsidy}_{2007}(\text{Income}_{i,2005}) - \text{Subsidy}_{2006}(\text{Income}_{i,2005}) \tag{1}$$

Following the simulated instruments literature (Currie and Gruber, 1996; Gruber and Saez, 2002), I construct this measure using each household's pre-reform income (in 2005) instead of real-time income to avoid endogeneity from families adjusting their labor market behavior in response to the policy. By fixing income two years before the reform, my treatment intensity measure reflects the subsidy increase households would have experienced based *solely on their pre-reform income and the new policy scheme*, generating exogenous variation purged of post-reform behavioral responses. The key assumption is that, conditional on observables, a household's position in the 2005 income distribution is independent of unobserved determinants of their post-2007 outcomes—that is, pre-reform income affects post-reform behavior only through the subsidy change it generates, not through other channels. This approach is crucial because families might adjust their labor supply in response to more generous subsidies, which would confound the results.

I leverage the interaction of simulated subsidy change and cohort exposure to study the reform's impact on children. The identifying assumption is that treated and control cohorts would have followed parallel trends across the income distribution absent the reform. This differences-in-differences strategy exploits the fact that any contamination from unobservable characteristics correlated with pre-reform income (and thus the simulated subsidy change) affects *both treated and control cohorts similarly, and is therefore differenced out*. Following Jakobsen and Søgaard (2022), I validate this assumption through several tests: I examine pre-reform trends and provide placebo tests where feasible.

Empirical Model

I estimate the following model to assess the impact of the policy:

$$Y_{it} = \alpha\text{Change}_i + \tau\text{Change}_i \cdot \text{Eligible}_{it} + f(\text{Income}_{i,2005}) + \beta\text{LS}_{i,2005}^{mother} + \gamma_t + \mathbf{\Gamma} + \epsilon_{it} \tag{2}$$

where Y_{it} is the relevant outcome for individual i in year t, Change_i is the simulated subsidy change measure defined in Equation 1, Eligible_{it} binary indicator of whether individual i is eligible to benefit from the reform ($\text{Eligible}_{it} = 1$ when $\text{Cohort}_i \geq 1995$ and $t \geq 2007$). I control for household income using flexible functions ($f(\text{Income}_{i,2005})$), time trends ($\gamma_t$), and whether the mother participates in the labor market pre-reform using a binary indicator ($\text{LS}_{i,2005}^{\text{mother}}$). Finally, $\mathbf{\Gamma}$ stands for a set of fixed effects: I control for the pre-reform residential location (municipality household i resided in 2005) and parental education. Across all my analyses, I cluster standard errors at the municipality level unless stated otherwise.[13]

[13]It can be argued that exposure to policy varied spatially: Families who reside in districts with more childcare providers can make use of the expanded subsidies faster than households that live in municipalities that offer limited childcare slots. In the absence of childcare availability indicators, I use municipality fixed effects to tackle this issue and cluster my estimates in the municipality level.

Equation 2 identifies the reform's impact through the interaction between change in subsidy and eligibility. The key challenge is separating subsidy effects from income effects: control cohorts (too old for the reform) identify the income effect, while the income-cohort interaction isolates the subsidy effect. Since the subsidy change is inherently a function of baseline income, controlling for household income raises collinearity concerns. I address this by exploiting the non-linearity of the piecewise subsidy structure and using flexible functions of household income. This empirical strategy relies on the assumption that, without the 2007 reform, outcomes would have evolved similarly across income groups over time.

3.2 The reform's impact on childhood environment

Exploiting the simulated subsidy change and timing of policy, I show that the take-up of after-school care increased following the reform, while maternal supply did not change. I explain these patterns by families crowded out informal care in favor of subsidized formal care without mothers increasing their labor supply, and provide suggestive evidence documenting this shift.

Increasing take-up of after-school care

To study the 2007 reform's impact on after-school care use, I focus on households that have children aged 4-12 in the years 2005 to 2008, and use Equation 2.[14] I measure after-school care use by subsidy receipt, where outcome Y_{it} is whether household i received childcare subsidies in year t. As childcare use typically declines with child age, I control for the youngest child's age in each household and provide subsample analysis by age group for this exercise.[15] Figure 2 shows trends in childcare use across income levels before and after the reform, revealing that the share receiving subsidies diverges from pre-reform trends as the subsidy increase grows larger. To illustrate this relationship more clearly, Appendix Figure A2a plots the difference in childcare use before and after the reform across the income distribution, normalized relative to households facing negligible subsidy increases. I formally test the increase exhibited in these plots using Equation 2.

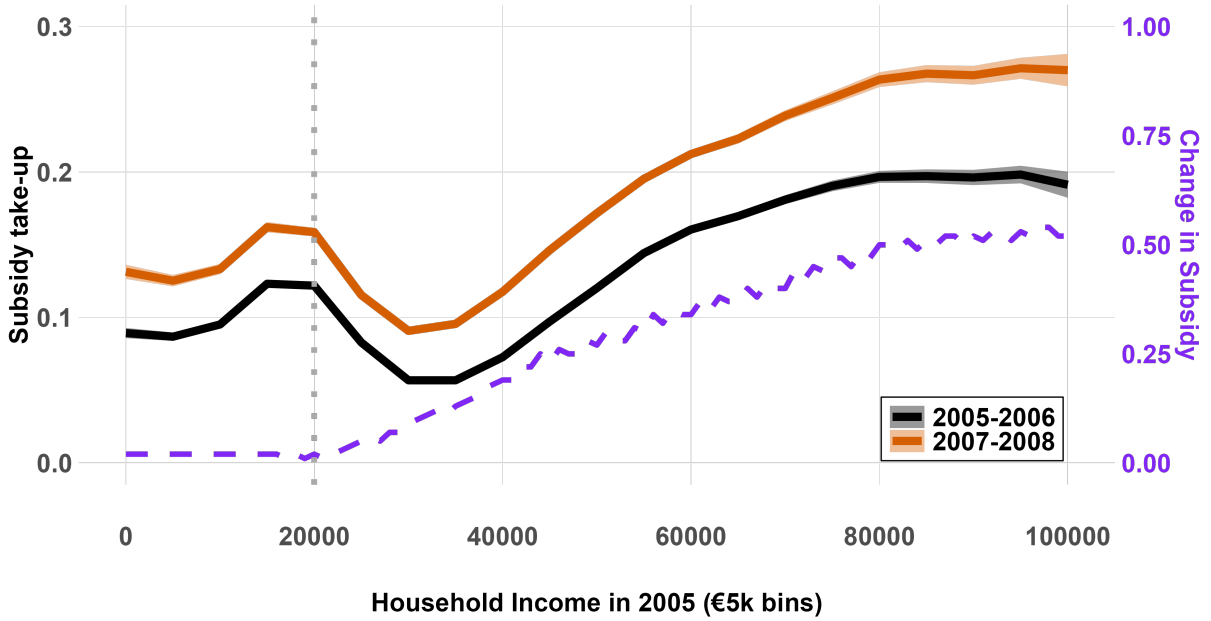
I find that the reform increased the use of after-school care. Table 1 reports the coefficient estimate of τ from Equation 2. The first column shows that improving access and affordability of after-school care led to a 6 percentage points increase in the take-up of after-school care following the reform – which is equivalent to a 54% increase. I show that the impact is smaller for the families with older children, but remains significant for all age groups. These estimates confirm the visual pattern observed in Figure 2: take-up of after-school care increased following the reform, particularly for families who experienced a larger drop in childcare costs.

As an alternative specification, I estimate the relationship between subsidy changes and childcare use year by year, interacting $Change_i$ with year dummies and normalizing by 2006 levels. Panel A2b plots these coefficient estimates, revealing a clear increase in the responsiveness of childcare use to subsidy changes after the reform. I test for the robustness of my results to demographic characteristics that could impact childcare use decision, such as parental education, single parenthood, and the availability of informal care arrangements. I report these estimates in Table A1 and show that the impact is robust to family types, availability of informal care and parental education.

[14] In this exercise, I balance the sample by child age rather than time. A time-balanced panel would introduce downward bias since older children use less childcare. Instead, for each year, I include households where the youngest child is aged 4-12.

[15] It's important to note that this measure of childcare excludes families using formal care without subsidies. This creates a potential downward bias: higher-income families (who face stronger treatment) are more likely to forgo subsidies when using formal care.

Figure 2: Trends in childcare use across income levels



Notes: This figure illustrates trends in childcare use over the years. The Y-axis on the left denotes the share of households receiving childcare subsidies across all households with the youngest child between ages 4 and 12. The x-axis denotes the income of households in the year 2005, discretized in 5k bins. The solid lines denote the trends in childcare use. The dashed purple indicates the change in subsidy across income levels between years 2006-2007, constructed using Equation 1 and their level denoted by the Y-axis on the right. The vertical gray line marks the income threshold below which the subsidy offers full coverage, and above which the change in subsidy starts to increase.

Impact of the reform on maternal labor supply

A natural question is whether this increase in after-school care use is a result of increasing maternal labor supply – which is what the reform intended to achieve. To capture the reform's impact on mothers, I use several different measures of labor supply: labor force participation (*LFP* hereafter), full-time equivalent days worked in a year (*FTE days* hereafter), and daily wage.[16] These measures intend to capture a set of dynamics that might be changing after the reform: extensive margin (LFP), intensive margin (FTE days), or job changes that result in better wages.

To study the impact of the reform on maternal labor supply, I extend my sample to include mothers with the youngest children aged 4-15. Mothers with older children (13-15) serve as controls – unaffected by the reform but exposed to the same financial conditions, particularly the the global financial crisis of 2007 – allowing me to separate the impact of the reform from business cycles.

Figure 3 illustrates changes in mothers' labor market outcomes after the reform, averaged over €5k income bins. Panel A plots the mean change in the extensive margin following the reform ($\overline{\Delta LFP}$) across income brackets, and illustrates that there is no differential increase for mothers of treated cohorts post-reform. Panel B reports the average change in the intensive margin following the reform ($\overline{\Delta FTEDays}$) for each income bin. While there is a visible increase for households with lower incomes, this pattern is pretty consistent across treatment and control group, ruling out the hypothesis that this is a respond to the 2007 reform. I provide a formal test of these findings in Appendix Table A2, which confirms the visual patterns observed: the reform did not generate a significant increase in the labor market outcomes

[16]Here, daily wage is defined by dividing the personal income in a given year by full-time equivalent days worked.

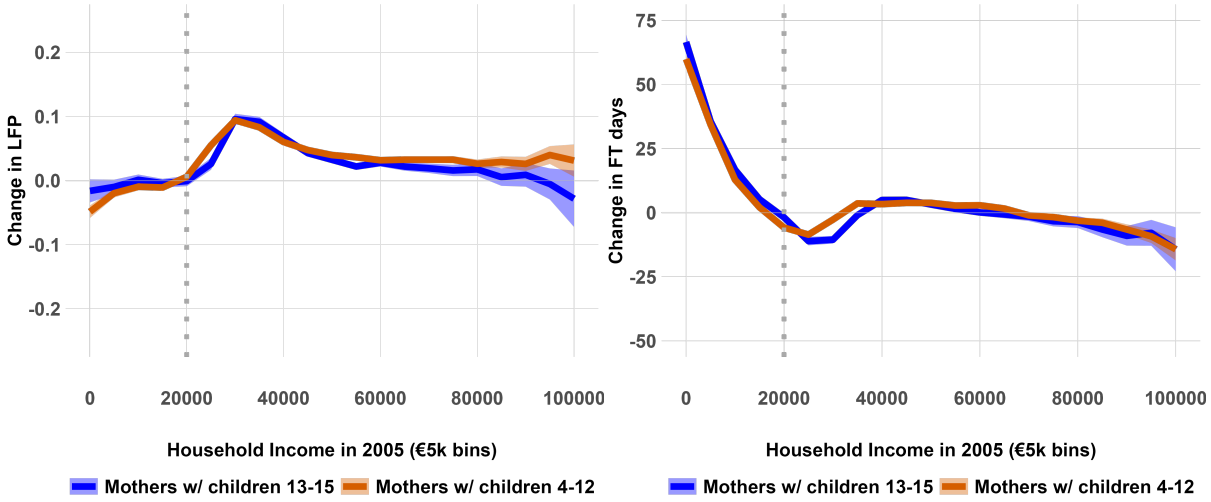
Table 1: Impact of the reform on After-school care takeup

	All sample	By the age of youngest child		
		4-6	7-9	10-12
Change	0.01	0.05	-0.03	-0.04
	(0.031)	(0.050)	(0.043)	(0.026)
Working mother	0.12***	0.19***	0.10***	0.03***
	(0.004)	(0.005)	(0.004)	(0.002)
Change × Eligible	0.06***	0.10***	0.11***	0.04***
	(0.004)	(0.007)	(0.006)	(0.004)
Fixed-effects				
Municipality	✓	✓	✓	✓
Year	✓	✓	✓	✓
Youngest child's age	✓	✓	✓	✓
Baseline:	0.12	0.20	0.090	0.027
S.E.: Clustered	Municipality	Municipality	Municipality	Municipality
Observations	2,948,552	1,209,922	932,859	805,771
R^2	0.128	0.131	0.068	0.034

Notes: This table presents the impact of the 2007 reform on after-school childcare take-up for families with children aged 4-12 (2005-2008). Coefficients are estimated from Equation 2, with samples split by youngest child's age. Mean childcare use is calculated pre-reform. Change in subsidy uses Equation 1 based on baseline household income. Eligible indicates post-2007 reform years. Standard errors clustered at municipality level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05.

of mothers with young children.

Figure 3: Change in maternal labor supply after the reform



(a) Change in FLP after the reform (b) Change in FT days worked after the reform

Notes: This figure summarizes changes in the extensive and the intensive margin of mothers' labor market outcomes, averaged over €5k income bins. The Y-axis denotes the change between pre-reform period and post-reform period for labor force participation and number of FT days worked. The x-axis denotes the income of households in the year 2005, discretized in 5k bins. The solid lines denote the change between pre- and post-reform outcomes for mothers who were impacted by the reform (in orange), and those who were not (in blue). The vertical gray line marks the income threshold below which the subsidy offers full coverage, and above which the change in subsidy starts to increase.

From home to care-center: Changing childhood environment

My findings highlight a notable gap between the reform's intended goals and its actual effects. While the 2007 reform successfully increased take-up of childcare subsidies by 6 percentage points—a substantial 54% increase from baseline levels—this enhanced participation in after-school care did not translate into any measurable increase in maternal labor supply. This finding aligns with a growing body of literature documenting limited maternal labor supply responses to childcare subsidies (Fitzpatrick, 2010; Havnes and Mogstad, 2011; Black et al., 2014; Bettendorf et al., 2015). Instead, the reform's main consequence was a significant expansion in government spending on childcare subsidies, without generating any tax returns from enhanced labor force participation. One potential explanation for this pattern, suggested by Havnes and Mogstad (2011), is that increased subsidies may not create new demand for childcare, but rather redirect existing demand towards subsidized options. I examine this hypothesis in the rest of this section, and discuss its implications for affected cohorts.

Lack of new demand for childcare can be explained by a barrier beyond childcare costs. Strong cultural norms against childcare would explain why increasing childcare subsidies didn't translate to *new* childcare users. By merging survey responses from parents with childcare registries, I find that norms toward childcare acceptability are strongly correlated with childcare use in the households impacted by the reform. Figure A3a illustrates these patterns: 70% of parents who use childcare believe that *'mothers can work while children are young'*, compared to only 35% of parents who do not use childcare. This finding reinstates that there are non-financial barriers to childcare use: *some families might not be using childcare on purpose despite having access to subsidies* due to their preferences for parental care and concerns about childcare quality.

The most plausible explanation for the observed increase in after-school take-up without corresponding labor supply effects is substitution from informal to formal care: children were already receiving informal care that enabled existing maternal employment levels, but the reform made formal care more attractive relative to informal care for these families. Evidence from Berden and Kok (2009) supports this interpretation: costs were cited as a barrier to formal childcare use before the reform, while informal care arrangements were more prevalent among families already using some form of childcare. To test this hypothesis, I examine heterogeneous effects of the 2007 reform across families with varying access to informal care, exploiting the fact that grandparents are the most common providers of informal care in the Netherlands.[17] I compare take-up patterns between families with a non-working grandmother living in the same municipality and those without such nearby grandparent support. The results, presented in Columns 3 and 4 of Table A1, provide compelling evidence for the crowding-out hypothesis: families with access to informal care experienced 45% increase in formal after-school care take-up following the reform, while families without grandparents nearby – who already relied more heavily on formal care arrangements before the reform – experienced a more modest 16% increase in take-up.[18]

These findings show that even though the reform failed to increase maternal labor supply, it led to a significant shift in children's care environments from home-based informal care to formal after-school centers. Informal care, typically provided at home by extended family members, creates a familiar, family-centered environment. In contrast, after-school care presents a fundamentally different setting: children are supervised by professional caretakers and interact with peers in structured environments featuring organized games, crafts, reading, and homework activities. These environmental differences – from intimate family settings to structured environments with peers present – can shape children's skills and

[17] Responses to 'Family and Household' panel in LISS Core Study highlight that grandparents provide informal care more often than other extended family members/neighbors

[18] I test the significance of the difference between the coefficient estimates presented in Table A1 with a formal test where I interact informal care availability with $ChangexEligible$, and find that the difference is .01 with t-stat=1.1.

preferences with lasting implications for their human capital investment.

3.3 Long-term effects: Human Capital Investment of Children

In section 3.2, I have shown that the childhood environment changed drastically due to the 2007 reform. In this section, I show that the changes in the childhood environment led to an increase in the human capital investment of the children.

Empirical strategy

I measure the long-term impact of the 2007 reform on children's human capital investment by examining university graduation status by age 24. While human capital investment can be measured through various indicators, I focus on university graduation rates as they represent the only fully-realized outcome available for cohorts born between 1992-1999.[19] The age 24 cutoff reflects typical Dutch graduation patterns: students can graduate as early as age 21, but many graduate later due to gap years and alternative educational tracks, with the average graduation age being 23.5 years according to OECD (2020). I test the robustness of this cutoff by repeating all exercises at ages 25 and 26 in Appendix A.3. However, using older age cutoffs reduces the number of treated cohorts I can observe, given the cohort composition of my data.

To study the impact of the reform on university graduation rates, I use Equation 2, where Y_{it} is a binary indicator of whether individual i of cohort c has graduated from university by year t, where $t - c = 24$. I account for intergenerational persistence in university attendance by including parental education dummies in the control vector $\mathbf{\Gamma}$, as well as pre-reform residential location.[20] The identification assumption is that without the 2007 reform, university graduation rates would move in parallel across cohorts and income groups.

Impact of the reform on university graduation rates

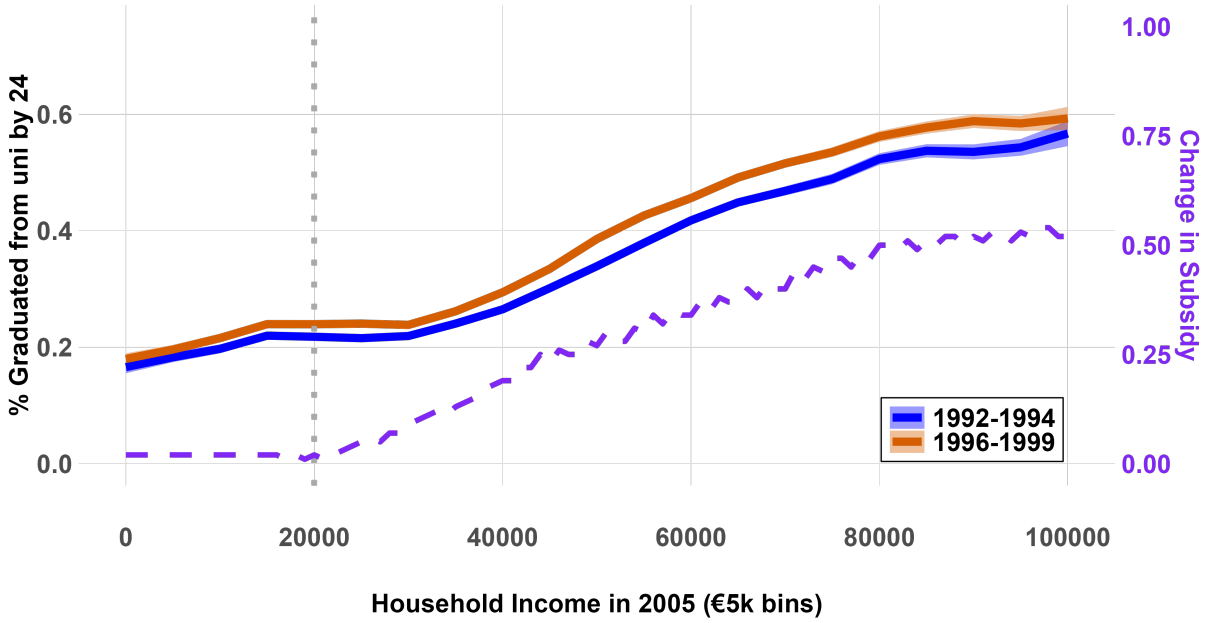
I find that the reform significantly increased university graduation rates among treated cohorts. Figure 4 illustrates this effect visually: the share of children graduating from university is consistently higher among treated cohorts compared to control cohorts, across all income levels, though the effect is most pronounced for children from families who experienced the largest subsidy changes. To exhibit this pattern more clearly, Figure A4a plots the difference in university graduation rates between treated and control cohorts across the income distribution, normalized relative to the difference experienced by households facing negligible subsidy changes.

I formally test these patterns using Equation 2 and report my findings in Table 2: the reform increased university attendance by 5 percentage points, which is equivalent to a 20% increase. The second column represents the results with parental education controls: the impact declines to 2.8 percentage points (8%), yet remains significant. Finally, I examine the heterogeneity across genders in the impact of the reform, motivated by recent evidence that university graduation rates are diverging between women and men (Buchmann et al., 2025). I find that the impact is positive and significant for both boys and girls. As a robustness check, I assess alternative age cut-offs by which the outcome is measured and find similar results (presented in Table A3).

[19] Although the oldest treated cohort has reached age 30, the youngest (1999 cohort) remains in their early twenties, making labor market outcomes an incomplete proxy for human capital investment at this stage.

[20] In this setup, I cannot distinguish between time fixed effects and cohort fixed effects: Since I measure the university graduation at age 24, I observe each cohort only for a year, implicitly assuming $\delta_c = \delta_t$.

Figure 4: Trends in university graduation rate across income levels



Notes: This figure presents the university graduation patterns at age 24 across treated and control cohorts. While the blue line represents the rates for cohorts 1992-1994, orange line represents treated cohorts, born after 1995, across household income bins. The dashed purple line represents the treatment intensity, change in subsidy measure, which is defined by Equation 1 based on baseline household income. Vertical line marks the income level where the change in subsidy starts to increase.

Table 2: Impact of the reform on university graduation by age 24

	All Sample		Parents' Edu < University	
	Basic	w/ Parents' Edu	Girls	Boys
Working Mother (2005)	0.007***	0.002	0.005	-0.011***
	(0.001)	(0.002)	(0.003)	(0.002)
Change × Eligible	0.052***	0.029***	0.084***	0.044**
	(0.007)	(0.011)	(0.019)	(0.018)
Fixed-effects				
Municipality (2005)	✓	✓	✓	✓
Birth year	✓	✓	✓	✓
Parent edu		✓		
Baseline	0.33	0.33	0.34	0.20
S.E.: Clustered	Muncplty	Muncplty	Muncplty	Muncplty
Observations	964,634	420,685	132,360	139,080

Notes: This table presents the impact of the 2007 reform on university graduation rates at age 24. Coefficients are estimated from Equation 2. Column 1 shows basic results, column 2 adds parental education fixed effects, columns 3-4 split by gender. Mean graduation rate is calculated for the 1994 cohort (last control group). Change in subsidy uses Equation 1 based on baseline household income. Eligible indicates cohorts born after 1995. Standard errors clustered at municipality level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05.

I assess the sensitivity of my findings to time trends and the functional form assumptions underlying Equation 2 by estimating alternative empirical models, and show that the reform's impact is robust across specifications. First, I conduct a falsification test to ensure that the observed impact is not driven by a secular trend in which children from middle- to high-income families are increasingly likely to graduate from university. I limit my analysis to cohorts born between 1990-1993 and define a placebo treatment for cohorts born after 1992. Figure A4b shows no diverging patterns for the placebo treatment, validating my identification strategy. Second, I discretize cohort exposure to the reform and estimate the relationship between subsidy changes and graduation rates cohort by cohort, interacting $Change_i$ with cohort dummies normalized to 1994 levels. Figure A4c illustrates the coefficient estimates: while there are no pre-trends, cohorts who were younger in 2007 show stronger impacts, consistent with greater treatment exposure. Finally, I test the linearity assumption in Equation 2 using a non-parametric approach that estimates changes in university graduation rates by income bins. I illustrate my findings in Figure A4d, which confirms that while the impact is not strictly linear, it is strongest for families experiencing the largest childcare cost reductions, aligning with the childcare use patterns shown in Figure 2.

Beyond university attendance, I explore whether the reform affects other human capital outcomes, and show that my findings are consistent with greater investment in human capital by impacted cohorts. I examine three indicators among university graduates: field of study choice, hours worked in early career, and family formation using Equation 2. Table A4 presents the coefficient estimates from the field of study and shows that girls are shifting out of female-dominated fields and into STEM, while we do not see this pattern for boys. For hours worked and family formation, I provide descriptive evidence by childcare attendance, as well as causal estimates using Equation 2; however, these results are only suggestive as the cohorts in my sample are too young for these outcomes to be fully realized. The descriptive evidence presented in Figure A5, suggest that individuals who attended after-school care are delaying family formation, and work for longer – a pattern that is especially crucial for cohorts who start to have children. Table A5 provides coefficient estimates for monthly hours worked, marital status, and parenthood. While these estimates are noisy given the aforementioned data limitations, they point toward potentially broader long-term effects of after-school care on human capital investment.

4 How did the reform increase human capital?

What exactly increased the human capital investment of these children? In Section 4.1, I provide a stylized model to illustrate how attending after-school care can affect human capital investment. I argue that an individual's decision to attend university depends on their preferences, returns, and costs associated with this human capital investment, and an increase in graduation rates must result from changes in these aspects following the reform. I propose three main hypotheses: lower costs ("*After-school care benefits children's skills*"), changing preferences ("*Children who attend after-school care want to go to university more*"), and changing beliefs ("*After-school care increases expected returns from university*"). I test these hypotheses in Section 4.2 and show that while there is no change in cognitive skills, subsample analyses and survey responses indicate that the reform might have changed preferences towards university attendance and beliefs about expected returns from university for girls. I conclude this section by illustrating how the 2007 reform transformed peer interactions in childcare, leading to these changes children's preferences and beliefs in 4.3.

4.1 A short model of childcare and human capital investment

In this section, I present a stylized model that maps households' maternal labor supply and childcare use decisions to long-term changes in children's human capital. While I keep this section concise as it is aimed to guide the discussion on the potential mechanisms through which the reform might have worked, I provide a detailed discussion of this model in Appendix B.1.

Model Setup

Households: Each household i is comprised of two agents $j \in \{p, c\}$: parents and a child in ages 4-12. These agents are heterogeneous in education $E_i^j \in \{0, 1\}$ (where $E_i^j = 1$ indicates university degree), skills $\gamma_i^j \in [0, 1]$ and beliefs toward the acceptability of childcare $\theta_i^j \in [0, 1]$ (where $\theta_i^j \sim F(\theta_i^j | E_i^j)$).[21] Agents make income-maximizing decisions subject to costs and preferences, where income Y_i^j is increasing in education E_i^j and skills γ_i^j.

Timeline: There are two periods. In the first period, parents decide on maternal labor supply and childcare use $k \in \{0, 1\}$ to maximize U_i^p. In the second period, the children decide to go to university or not $h \in \{1, 0\}$ to maximize U_i^c, depending on the implications of parents' decision $k \in \{0, 1\}$.

First Period: Maternal Labor Supply and Childcare Decision

Parents maximize the household utility U_i^p by choosing between two options indexed $k \in \{0, 1\}$: the mother works full-time and uses childcare $(k = 1)$, or the mother works part-time and provides childcare herself $(k = 0)$. Household income Y_i^p is the sum of parents' income: Mothers earn Y_i^m when they work full-time, and $\frac{Y_i^m}{2}$ when they work part-time. Fathers work full-time and earn income Y_i^f in both cases. Households that use childcare pay a subsidized price P_i^{cc} depending on scheme s and their income Y_i^p, and consume their entire disposable income without saving, such that: $c_i = Y_i^p - P_i^{cc}$.

The utility of household i choosing option $k \in \{0, 1\}$ is denoted $U_{i(k)}^p$ and has two components: utility from consumption $u(c_{i(k)})$, and a taste-based disutility $1/\theta_i^p$ whenever they use childcare $(k = 1 \implies CC_i = 1)$:

$$U_{ik}^p = u(c_{ik}) - \frac{CC_i}{\theta_i^p} = u(Y_i^f + \frac{Y_i^m}{2} + CC_i \cdot (\frac{Y_i^m}{2} - P_i^{cc})) - \frac{CC_i}{\theta_i^p} \tag{M1}$$

The subsidized childcare price depends on the subsidy household i is eligible to under the scheme $s(.)$: $P_i^{cc} = (1 - s(Y_i^p))p_c$, where p_c is the market price of formal childcare and $s(Y_i^p)$ is the subsidy rate.

Second period: Child's decision to go to university

This period represents the adulthood of the children, and they are the decision makers. They maximize the household utility U_i^c by choosing whether to attend university or not, indexed by $h \in \{1, 0\}$. This decision depends on their idiosyncratic preferences α_i^c for a university degree, expected income $E[Y^c(\cdot)]$, and the cost of university $\kappa > 0$.[22]

Income $Y(\gamma_i, E_i)$ follows a log-normal distribution and is an increasing function of education $(Y(\gamma_i, 1) > Y(\gamma_i, 0))$ and skills $(\frac{\partial Y}{\partial \gamma} > 0)$ with random shocks that are $N(0, \sigma^2)$. Girls discount their expected income by a future parenthood penalty $\zeta(1 - \theta_i^c)$: ζ represents the common parenthood penalty, attenuated by

[21] I assume Corr$(\theta_i, E_i) > 0$ based on the patterns observed in Figure A3b.

[22] This cost κ represents the common fixed cost of university attendance (tuition, opportunity cost of time, etc.). While students with lower skills may face higher effort costs or longer completion times, the increasing returns to skills are already captured through the skill-dependent earnings function $Y^c(\gamma_i^c, E_i^c)$.

beliefs toward childcare acceptability θ_i^c. More favorable beliefs (higher θ_i^c) diminish the parenthood penalty, as girls expect to use childcare services and minimize labor supply disruptions upon parenthood.

The utility of option $h \in \{0, 1\}$ is denoted with $U_{i(h)}^c$, defined as follows:

$$U_{i(h)}^c = \mathbf{E}[Y^c(\gamma_i^c, E_i^c = h)](1 - \zeta(1 - \theta_i^c)\mathbf{1}_i^{girl}) + \mathbf{1}\{E_i^c\}(\alpha_i^c - \kappa) \tag{M2}$$

Thus, the decision to go to university is characterized by three key parameters: children's skills γ_i^c, their preferences α_i^c, and beliefs θ_i^c. Next, I present the implicit form of these parameters to illustrate their underlying components. I discuss their functional forms and derivations of the conditions below in Appendix B.1.

Skill accumulation: Child i's cognitive skills γ_i^c relies on parental skills γ_i^p, parental investments Y_i^p, and childcare attendance CC_i:

$$\gamma_i^c = f_\gamma(\gamma_i^p, Y_i^p, CC_i) + \xi_i \tag{M3}$$

$\xi_i \sim N(0, \sigma_\xi^2)$ captures health shocks and unmeasured environmental influences.[23]

Preference Formation: Children's preferences for university attendance are shaped by their social environment (Genicot and Ray, 2017) and the role models around them (Bettinger and Long, 2005). Following this literature, I model children's preferences as influenced by the role models in their environment: the educational attainment of their own parents (E_i^p), the parents of the peers in school ($\overline{E}_{s(i)}^p$) and in childcare ($\overline{E}_{cc(i)}^p$):

$$\alpha_i^c = f_\alpha(E_i^p, E_{s(i)}^p, E_{cc(i)}^p, CC_i) + \omega_i \tag{M4}$$

$\omega_i \sim F(0, \sigma_\omega^2)$ signifies information that can't be captured with peer measures.

Belief Formation: Beliefs are transmitted both vertically (parent to child, following Fernández (2007); Kleven et al. (2024) and horizontally (through peer networks, as shown in Olivetti et al. (2020)). Following this literature, I model children's beliefs about childcare acceptability as influenced by three sources: parental beliefs θ_i^p, the prevalence of childcare use across peers in school $\overline{CC}_{s(i)}$, and direct childcare experience CC_i:

$$\theta_i^c = f_\theta(\theta_i^p, CC_i, CC_{s(i)}) + v_i \tag{M5}$$

where the error term v_i represents cultural innovations with $\mathbb{E}[v_i] = 0$ and $\text{Var}(v_i) = \sigma_v^2$.

Optimization and Comparative Statistics

Next, I formalize the household decision-making process within this two-period framework and derive key propositions that highlight how changes in the subsidy regime affect household behavior and children's long-term outcomes.

Decision rule of the children: The child chooses to attend university when the expected net benefits of doing so exceed zero: $U_{i(1)}^c \geq U_{i(0)}^c$

Parents' optimization problem: The parents maximize total discounted utility while making the decision to use childcare or not:

$$\max_{CC_i \in \{0,1\}} U_i = U_i^p + \beta U_i^c$$

where U_i^p is the first period utility, and U_i^c is the second period utility discounted by β.

Assumption 1: ***Parents do not internalize the direct impact of attending childcare on children***

[23] The normality assumption reflects that cognitive skills result from the accumulation of multiple independent developmental inputs over childhood (Cunha et al., 2010).

I assume that parents do not consider the potential benefits of childcare for their children's human capital investment, such that $\mathbf{E}^p[U_i^c|CC_i = 1] = \mathbf{E}^p[U_i^c|CC_i = 0]$.[24] Thus, their decision relies on the first stage utility U_i^p, and only the components of the second stage utility that they can anticipate, $\tilde{U_i^c} = \mathbf{E}[Y^c(\gamma_i^c)]$. Formally:

$$\max_{CC_i \in \{0,1\}} \tilde{U_i} = U_i^p + \beta \tilde{U_i^c} = u(c_i) - \frac{CC_i}{\theta_i^p} + \beta \mathbf{E}[Y^c(\gamma_i^c(c_i))]$$

Decision rule of the parents: The parents choose full-time work and childcare if $\tilde{U}_{i(1)} \geq \tilde{U}_{i(0)}$:

$$u(c_{i(1)}) - u(c_{i(0)}) + \beta(\Delta \tilde{U_i^c}) \geq \frac{1}{\theta_i^p}$$

where $\Delta \tilde{U_i^c} = \mathbf{E}[Y^c(\gamma_i^c(c_{i(1)}) - Y^c(\gamma_i^c(c_{i(0)})]$. Next, I use the following propositions to characterize households' decision, and analyze what happens under a new subsidy regime.

Proposition (1) ***Childcare is not used when childcare acceptability is very low:*** There is an acceptability threshold θ_i^* such that $\theta_i^* = \frac{1}{u(c_{i(1)}) - u(c_{i(0)}) + \beta(\Delta \tilde{U_i^c})}$. Then, each household in which $\theta_i^p < \theta_i^*$ chooses for the mother to work part-time without using any childcare, since for any subsidy rate $s(Y) \in [0, 1]$, $u(c_{i(1)}) - u(c_{i(0)}) + \beta(\Delta \tilde{U_i^c}) < \frac{1}{\theta_i^p}$

Proposition (2) ***Income-Gradient in Childcare Adoption:*** When the subsidy scheme becomes flatter while remaining progressive, such that $\frac{\partial s}{\partial Y^p} < \frac{\partial s'}{\partial Y^p} < 0$, households above the acceptability threshold $\theta_i^p \geq \theta_i^*$ become more likely to use childcare as their income increases: $\frac{\partial P(CC_i = 1 | \theta_i^p \geq \theta_i^*)}{\partial Y^p} > 0$.

For simplicity, I abstract from informal childcare choices in this framework.[25] With the first-period decision of households under changing subsidies characterized, I now turn to the second stage and examine how changes in the subsidy scheme affect the probability of university attendance through different channels.

Proposition (3)*The impact of changing subsidies on university attendance:*

When the subsidy scheme $s(Y)$ changes such that $\frac{\partial s}{\partial Y^p} < \frac{\partial s'}{\partial Y^p} < 0$. Then, the probability of university attendance $P_i(E_i^c = 1)$ changes as:

$$\frac{dP_i}{ds} = \underbrace{P_\gamma \left(\frac{\partial f_\gamma \Psi}{\partial CC_i} + \frac{\partial f_\gamma}{\partial s}\bigg|_{Y_i^p} \right)}_{\text{skills}} + \underbrace{P_\alpha \left(\frac{\partial f_\alpha \Psi}{\partial CC_i} + \frac{\partial f_\alpha}{\partial s}\bigg|_{E_{cc(i)}} \right)}_{\text{preferences}} + \underbrace{\mathbf{1}_i^g P_\theta \left(\frac{\partial f_\theta \Psi}{\partial CC_i} + \frac{\partial f_\theta}{\partial s}\bigg|_{CC_{s(i)}} \right)}_{\text{beliefs (girls)}} \tag{M6}$$

where $P_\gamma \equiv \frac{\partial P_i}{\partial \gamma_i^c}$, $P_\alpha \equiv \frac{\partial P_i}{\partial \alpha_i^c}$, $P_\theta \equiv \frac{\partial P_i}{\partial \theta_i^c}$, and $\Psi \equiv \frac{\partial CC_i}{\partial s} > 0$ when $\theta_i^p \geq \theta_i^*$.

Assumption (2) ***Changing subsidies do not increase household income:*** In Section 3.2, I demonstrated that maternal labor supply or household income did not change, hence, empirically $\frac{dY_i^p}{ds} \approx 0$ (no income response, see Table A2), and thus $\frac{\partial f_\gamma}{\partial s}\Big|_{Y_i^p} \approx 0$.

Without an income effect, a reform that changes subsidies can impact university graduation only through *direct* effect of attending childcare: $\Psi = \frac{\partial CC_i}{\partial s}$. Now, with a framework that conceptualizes how the 2007 reform can impact children's human capital investment, I study the impact of childcare take-up on children's skills, preferences, and beliefs using administrative data and survey responses.

[24] This assumption is supported by the literature: In their report, Kok and Berden (2009) show that the price is the dominant factor in childcare choices while only 9-22% of parents cite quality considerations. For a detailed discussion of this assumption, see Appendix B.1.

[25] Without this option, high-SES families would enter formal childcare and increase maternal work. Including informal care preserves the proposed patterns in childcare use while reducing maternal labor responses– for a detailed discussion of this assumption, please see Appendix B.1

4.2 Testing the model: skills, preferences, and beliefs

The theoretical framework presented in Section 4.1 shows that the reform can increase human capital investment through increasing skills (γ_i^c), changing preferences (α_i^c), and shifting beliefs on perceived returns from the university (θ_i^c). In this section, I test these mechanisms. To do so, I exploit the institutional context that shapes the academic path of students, as well as survey responses. I use standardized test scores to measure the cognitive skills of children, and show that there are no detectable improvements in test scores. Next, I focus on the recommendations teachers give for high-school tracks to test for changes in non-cognitive skills, and find no change there either. To test for preferences, I exploit differences in the recommended track, and the track students chose to take, find that there is a shift in preferences that leads to increasing enrollment in more-university-oriented tracks. Finally, I exploit survey responses to study beliefs, and find a shift in beliefs about childcare acceptability and maternal work.

Institutional Framework

I exploit the institutional context that shapes the academic path of students to test for changes in skills and preferences. There are several different academic paths students can follow to go to university in the Netherlands. All students attend primary school between ages 4 and 12. In the final year of their studies, they receive recommendations on which track to follow in highschool. Upon completing highschool, they might choose to attend university, conditional on completing the entry requirements specified by the track they attended.

Students can follow academic tracks (*HAVO* and *VWO*), mixed tracks (*VMBO-G/T*), and vocational tracks (*VMBO-B/K*) in high-school. Track placement is primarily determined by recommendations students receive in their final year of primary school. These recommendations draw on two sources of information: classroom performance and academic achievement. Classroom performance is evaluated by teachers based on children's cognitive development, attitudes toward learning, interests, and motivation. Academic achievement is measured by centralized end-of-primary-school examinations (*Centrale Eindtoets*), which assess students' academic knowledge and skills in language and mathematics. While these two sources of information typically converge, discrepancies can occur, with teachers occasionally recommending either a higher or lower track than the test result suggests. Although most students follow these recommendations, they were not legally binding until the 2014-2015 school year.[26]

The track students follow have direct implications for access to university: students from academic tracks have immediate eligibility, while students in mixed and vocational tracks lack direct access upon graduation. However, alternative pathways exist: students from non-academic tracks can complete additional years of education to obtain the required qualifications, or pursue university entry through examinations available to individuals aged 21 or older without traditional qualifications. Consequently, while university attendance is not zero for students from non-academic tracks, the additional time and effort costs associated with these indirect pathways result in substantially lower university enrollment rates compared to students who initially followed academic tracks.

Improving skills

Equation M3 characterizes children's skill accumulation and illustrates that the 2007 reform can potentially increase children's skills through two channels. Firstly, the reform can potentially shift maternal

[26]From 2015 onwards, policy reforms mandated that teachers fill their recommendation before the centralized tests are taken, and secondary schools accept students at minimum at the level recommended by their primary school teachers.

labor supply, increasing the pool of available resources to invest in children's skills. I test whether the reform had an impact on household income and maternal labor supply in Table A2 and conclude that there have been no detectable changes, eliminating this channel. Secondly, the 2007 reform can impact children's skills through their participation in childcare, characterized by $\frac{\partial f_\gamma}{\partial CC_i}$ in Equation M6. This partial derivative corresponds to coefficient β_2, defined in Equation B1 that states the functional form of skills.[27]

I use the Cito test to show that there is no significant change in cognitive skills after the reform. The Cito test (*Cito-toets* in Dutch) is one of the independent standardized tests that schools can choose to administer as part of the end-of-primary-school examinations to assess students' academic skills. While other test providers exist, Cito is used by 80% of schools in my sample, making it the dominant assessment tool. Its timing proves ideal for my design, as it coincides with the last year students can use after-school care, and students receive track recommendations for their high-school education based on their performance on the exam. I use the empirical model presented in Equation 2 with two outcomes: first, where Y_{it} is defined as the z-score of individual i from the mathematics section of the Cito test in year t, and second, where Y_{it} is an indicator equal to one if the Cito test recommends an academic track for individual i in year t. I account for inherent differences in school quality by including school fixed effects in the control vector $\mathbf{\Gamma}$, as well as parental education fixed effects.[28]

Table 3: Impact of the reform on skills of students

	Math score		Secondary track	
	w/ Parental edu	Parents < Uni	Test Rec=Acdmc	Teacher Rec=Acdmc
Working mother	-0.0265***	-0.0299***	0.0011	0.0039**
	(0.0048)	(0.0064)	(0.0016)	(0.0019)
Female	-0.3471***	-0.3729***	-0.0288***	-0.0139***
	(0.0039)	(0.0051)	(0.0014)	(0.0016)
Change × Eligible	-0.0252	0.0117	0.0008	0.0073
	(0.0331)	(0.0472)	(0.0106)	(0.0122)
Fixed-effects				
School	✓	✓	✓	✓
Academic Year	✓	✓	✓	✓
Baseline	0.111	-0.053	0.372	0.372
S.E.: Clustered	Schools	Schools	Schools	Schools
Observations	232,914	144,131	535,145	388,367

Notes: This table shows how the 2007 reform affected children's cognitive and non-cognitive skills. math scores on the CITO exam (standardized as Z-scores). I include controls for the academic year and primary school. Columns 1-2 show results for all students, with and without parental education controls. Columns 3-5 focus on children whose parents didn't attend university - first for both genders, then split by gender. The subsidy change measures how much each family's childcare subsidy increased based on their income. Eligible is a dummy for cohorts who take the CITO test after year 2007. Standard errors are clustered at the school level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05.

The first column of Table 3 suggest that the reform did not increase the cognitive skills of children on average. Even though skills seem unchanged on average, Equation B1 suggests that if there is an impact ($\beta_2 > 0$), it should be more pronounced for children with limited baseline parental investment, so we

[27] While not modelled explicitly, it might be argued that the reform *indirectly* changes the school quality of children: the Van Aartsen-Bos Motion (part of the 2007 reform) required schools to facilitate after-school care arrangements, which might lead to parents strategically switching schools. Using registry of primary-school students, I find that only 10% of students in my sample change schools, ruling out this channel as well.

[28] As each child takes the cito test once, I cannot distinguish between time fixed effects and cohort fixed effects: implicitly assuming $\delta_c = \delta_t$.

might simply not be capturing them due to compositional factors. To test this possibility, I restrict my sample to parents who are not university graduates, and repeat my analysis.[29] While coefficients are indeed positive, they remain insignificant, confirming that the observed patterns cannot be attributed to skill changes on average. I provide additional tests using alternative outcome measures: Column 3 shows the reform does not impact the likelihood of students to get recommended to academic tracks based on test results, whereas Appendix Table A6 exhibits impact on other test topics. These findings reinstate that my results are robust to the choice of measure for cognitive skills.

Even though I find no impact on cognitive skills, the reform may have affected non-cognitive skills development; however, I find no significant changes there either. To examine whether the reform impacted non-cognitive skills, I take two separate approaches. First, I exploit the recommendation teachers give for high-school tracks. Since these recommendations incorporate teachers' assessments of students' attitudes toward learning beyond test performance, they can capture non-cognitive skills. I study whether the reform changes the likelihood of teachers recommending academic tracks in the last column of Table 3, and find no changes. Secondly, to account for the inherent difficulty in measuring non-cognitive skills through external assessments, I analyze personality and social skill measures from the LISS panel across birth cohorts at age 18, just before university entry. I generate composite scores for goal-orientedness and academic social skills. While goal-orientedness takes organization, persistence, and attention to detail into account, academic social skills are a composition of communication, networking, and collaboration scores. Using these composite scores, I show that there is no statistically significant difference between cohorts – ruling out the hypothesis that the reform had meaningful effects on non-cognitive skill development. I present these findings in Figure A6.

Shifting preferences

Equation M6 illustrates that a change in subsidy can influence children's preferences through peers in childcare. Given the absence of direct preference measures in my data, I cannot test whether the 2007 reform altered preferences for human capital investment directly. However, having shown that the reform did not increase students' skills or lead to changes in track recommendations, I can interpret track choices and academic progression after high school as evidence of changing preferences.

First, I examine whether students who were recommended to a lower track by both the teacher and the centralized test were more likely to pursue academic tracks following the reform. While most students abide by the recommendations they receive, these are not binding; students can choose to attend a higher or lower track than they were recommended, as long as they are admitted. Since the reform did not affect test scores or recommendations they received, choosing a more academically-oriented path would reflect a shift in preferences for human capital investment. I report my findings in the first two columns of Table 4. Column 1 shows that the reform significantly increased the share of students who were recommended to lower tracks by both teacher and test but chose to attend academic tracks instead. Column 2 documents a similar increase among students who were recommended to vocational tracks, but instead chose to attend mixed tracks. Since attending higher tracks reduces barriers to university access, these upward shifts can indicate a change in preferences for university attendance.

Second, I examine university attendance rates conditional on track completion. Appendix B.2.1 demonstrates that when preferences for university increase, individuals with lower skill levels become more likely to attend as the net benefits rise. Thus, if preferences shifted, we should observe the strongest

[29] Equation M3 defines parental investment in terms of household income and parental skills, however, subsample analysis by income would be confounded by the fact that treatment intensity is a measure of household income. Lacking measures for parental skills, I do subsample analysis by parental education, as $\frac{\partial P(E_i=1)}{\partial \gamma_i} > 0$ by Equation M2.

Table 4: The impact of the reform on preferences for higher education

	Secondary track		University graduation	
	Academic w/out rec	Mix w/out rec	After mix track	After voc track
Working mother	-0.0053***	-0.0028	0.0114***	-0.0001
	(0.0019)	(0.0031)	(0.0021)	(0.0011)
Change × Eligible	0.0802***	0.0948***	0.0512***	0.0234***
	(0.0160)	(0.0272)	(0.0138)	(0.0077)
Fixed-effects				
School	✓	✓		
Municipality			✓	✓
Academic Year	✓	✓		
Birth Year			✓	✓
S.E.: Clustered	Schools	Schools	Municipality	Municipality
Baseline	0.114	0.042	0.246	0.041
Observations	98,617	56,283	204,863	213,606
R^2	0.096	0.142	0.023	0.009

Notes: This table presents the impact of the 2007 reform on the academic path of students. Coefficients are estimated from Equation 2. Columns 1-2 present coefficient estimates for children who received the same track recommendation from their test scores and teachers, however chose to attend a higher track. Columns 3-4 present the change in the share of students from non-academic tracks that attend university. The mean rates are calculated for the cohorts before 1995. Change in subsidy uses Equation 1 based on baseline household income. Eligible indicates cohorts born after 1995. Standard errors clustered at school level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05

effects among students facing the highest costs of reaching university—namely, those in mixed and vocational tracks who must complete additional years of education or pass entrance examinations. Columns 3 and 4 of Table 4 test this prediction. Column 3 shows that students who completed mixed tracks were more likely to attend university following the reform, while Column 4 documents the same pattern for vocational track students. These findings suggest that preference shifts extend beyond track choices: even among students who remained in non-academic tracks, the reform increased willingness to incur substantial additional costs for university access. This pattern is particularly striking given that the upward sorting documented in Columns 1-2 implies students remaining in non-academic tracks likely had lower baseline academic aspirations.

In light of these findings, the pattern documented in Table 2 – that the reform's impact on university attendance is strongest among children from lower socioeconomic backgrounds – provides further support for preference shifts as the underlying mechanism. Equation M6 shows that, absent changes in skills (γ_i^c), increasing university graduation rates might be coming from changes in preferences (α_i^c) or beliefs (θ_i^c), which are shaped by family and peers. The peer channel would be particularly salient for children from lower socioeconomic backgrounds who lack university-educated role models in their families. Columns 3 and 4 of Table 2, confirm this pattern: the reform's effect is significantly stronger for students from less-educated families, with coefficients exceeding the average impact for both genders. Since boys do not incorporate beliefs into their expected returns from university, their positive response provides supportive evidence of preference shifts.

One might argue that these patterns reflect parents' preferences rather than students' own preferences. While it is difficult to fully disentangle parental and student preferences for such consequential decisions in children's academic lives, I provide suggestive evidence that parental ambitions alone cannot explain the observed patterns. In Appendix Table A7, I examine heterogeneity of my findings in the column 1 of Table 4 by parental education. If the results were driven primarily by parental ambitions, we would expect university-educated parents to exert stronger influence on their children's track choices. However,

the evidence shows the opposite: the reform's impact on upward track mobility is concentrated among children from less-educated families (Columns 1-2). Moreover, I find no evidence of gender differences in track choices at this stage (Column 3), which aligns with the preference-shift mechanism discussed above: children from lower socioeconomic backgrounds are more susceptible to peer-induced preference changes due to the absence of familial role models, and this channel should affect boys and girls similarly at the track choice stage.

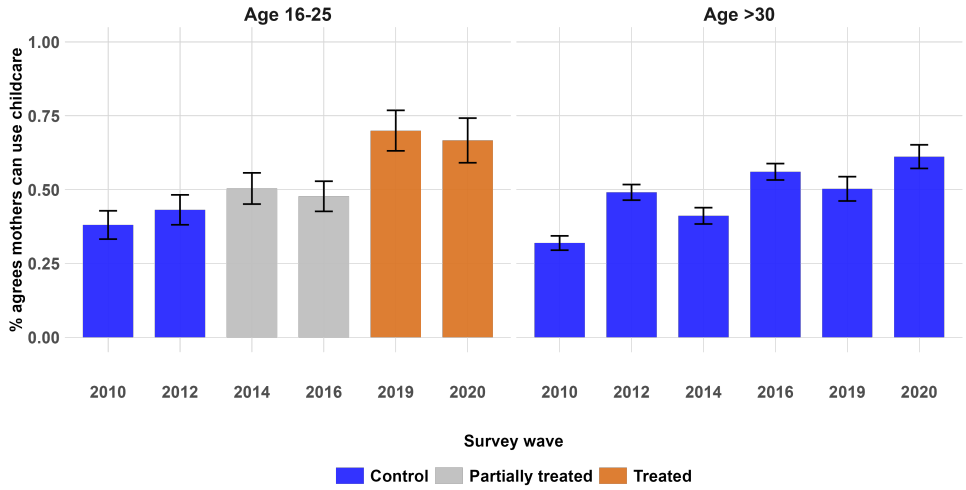
Why, then, do we observe a stronger impact for girls when examining university attendance? The symmetric effects across genders at age 12-13 in track choices, followed by the emergence of gender differences at university entry, is consistent with beliefs playing an important role for girls. Beliefs become salient when students evaluate expected returns from university, but not during earlier track decisions at age 12. In the next section, I investigate whether changes in beliefs explain the stronger response among girls.

Changing beliefs

My findings in Table 2 reveal a striking pattern across first-generation children: while girls already have substantially higher university graduation rates than boys, the reform's impact was quantitatively larger for them, pointing to an underlying gendered mechanism. Improving beliefs regarding the acceptability of childcare would explain this pattern: A potential change in θ_i^c would make university attendance more worthwhile for girls, as they would discount their future earnings less. Instead of limiting their labor supply upon having children, they would rely on the expectation of accessing childcare services, making their educational investment more valuable.

I use the CV-SLI survey from restricted microdata to examine beliefs about the acceptability of combining maternal work with childcare, showing that cohorts affected by the reform are significantly more accepting of women working and using childcare when children are young. I convert the responses to the statement *'It's okay for a woman with young children to have a job and her children to go to daycare'* to a binary measure to track changes in childcare acceptability across cohorts and years.

Figure 5: Changes in beliefs towards acceptability of maternal work and childcare



Notes: This figure summarizes the responses towards the acceptability of maternal work and childcare. The panel on the left illustrates % that agrees mothers can use childcare to work for respondents aged 16-25 over different waves of CV-SLI. The panel on the right provides the same for respondents aged 30 and older. Waves where respondents were impacted by the 2007 reform have been indicated by grey (partial treatment) and orange (treated).

Figure 5 illustrates the changes in responses to the statement *'It's okay for a woman with young children to have a job and her children to go to daycare'*. As CV-SLI is a repeated cross-section and I observe each individual only once. I present the results for two separate groups: respondents aged 16-25, and respondents older than 30 to capture eligibility and time trends over time. While no respondent was eligible for the reform in the earlier waves, almost all respondents in ages 16-25 were eligible in the last two waves. I present my findings in two panels: the left panel in Figure 5 shows that cohorts who were impacted by the reform became more and more accepting of mothers working and using childcare. The right panel, on the other hand, shows that this was not a result of broad time trends: the same patterns are not observed for the cohorts that were too old to be impacted by the reform. I test these patterns formally and report my findings across different age-cutoffs in Table A9, which confirms the visual patterns, indicating that the reform indeed shifted beliefs towards the acceptability of childcare.

If the belief mechanism indeed operates as proposed, we would expect differential treatment effects by gender, particularly among lower-skilled students. The logic is straightforward. According to Equation M2, girls face a belief-adjusted discount factor when evaluating university returns, creating a critical skill threshold γ_i^* where they are indifferent between attending university or not. This threshold is defined by $\alpha_i^c + \Pi(\gamma_i^*)(1 - \zeta(1 - \theta_i^c)) = \kappa$, where $\Pi(\gamma_i^*)$ represents the skill-dependent university premium. When preferences increase, the critical threshold decreases for both genders. However, when beliefs about childcare acceptability also improve (higher θ_i^c), the discount factor $\zeta(1 - \theta_i^c)$ decreases further, causing a sharper reduction in the skill threshold for girls compared to boys (see Appendix B.2.1 for a detailed derivation). This differential effect means that we should see treatment impacts for girls but not boys in the lowest skill students: the additional belief channel pushes more lower-skilled girls above the university attendance threshold, while boys—who lack this belief-adjusted mechanism—remain below it.

I show this is the case in Appendix Table A8. The reform increased university attendance for both genders in mixed tracks but only affected girls in vocational tracks—precisely what the belief mechanism predicts. Another complementary test would be focusing on career choices: if human capital investment is increasing due to changing beliefs about acceptability of childcare, we would expect girls to sort more into fields that provide full-time job opportunities, while boys should show no such patterns. Appendix Table A4 confirms this: following the reform, girls crowd out of fields like teaching and nursing into STEM, whereas boys show no comparable shifts.[30]

4.3 The role of peers in changing preferences and beliefs

In the previous section, I have illustrated that the reform has increased the university graduation rates by changing the preferences towards university attendance and shifting beliefs about returns from this human capital investment. Yet, we still miss the connecting piece: how did the 2007 reform change the preferences and beliefs of children? The answer lies in the social environment of children: by shifting children from home to childcare centers, the reform not only intensified their exposure to peers but also transformed who those peers are. In this section, first, I illustrate that the 2007 reform increased the share of peers from affluent families in childcare centers. Then, I use variation in peer composition to study the role of peers on children's human capital investment.

Social learning in center-based care

The shift from home-based care to after-school care centers following the 2007 reform exposed children to richer social environments and structured activities. In Section 3.2, I showed that the reform

[30] CBS (2020) shows that most workers in education, care and welfare services work part-time, whereas workers in technical jobs and managers have the highest share of full-time work.

transitioned children from informal home care to structured environments with peers and professional supervision that combine learning and play activities. Research demonstrates that peer play is crucial for promoting social-emotional, cognitive, language, and self-regulation skills that the didactic structure of school activities might not adequately foster (Yogman et al., 2018). The formative nature of these interactions is well-documented: studies show that peer exposure plays an important role in children's development (Carrell et al., 2018; Billings and Hoekstra, 2023), while Fehr et al. (2008) suggests that fundamental social preferences develop through social interactions during childhood.

However, this shift from home to childcare was not uniform across all families. The design of the 2007 reform created an asymmetric response across more educated families, since they held more positive attitudes toward formal childcare, making them highly responsive to the sharp decline in costs.[31] This led to a disproportionate increase in higher-SES children's enrollment, exposing all children to peers from families with strong career orientations and higher human capital.

I illustrate this change in the share of peers from more educated families by exploiting the Van Aartsen-Bos Motion, which was part of the 2007 reform. This motion required schools to facilitate after-school care arrangements, mandating that children attending the same school and participating in after-school care must attend the same center. Despite lacking center identifiers to directly link students to childcare facilities, I can measure the composition of peers that attend childcare within schools, which allows me to proxy the share of high-SES peers in childcare.[32] I define a high-SES family using two criteria: whether at least one parent in the household has a university degree, and whether the mother works full-time. I measure the share of high-SES peers in environment e as:

$$\Omega^{x}_{e(i)} = \frac{1}{N_{e(i)} - 1} \sum_{\substack{\ell \in e(i), \\ \ell \neq i}} X_{\ell}, \quad X \in \{\text{Uni graduate parents}, \text{Working Mother}\} \tag{3}$$

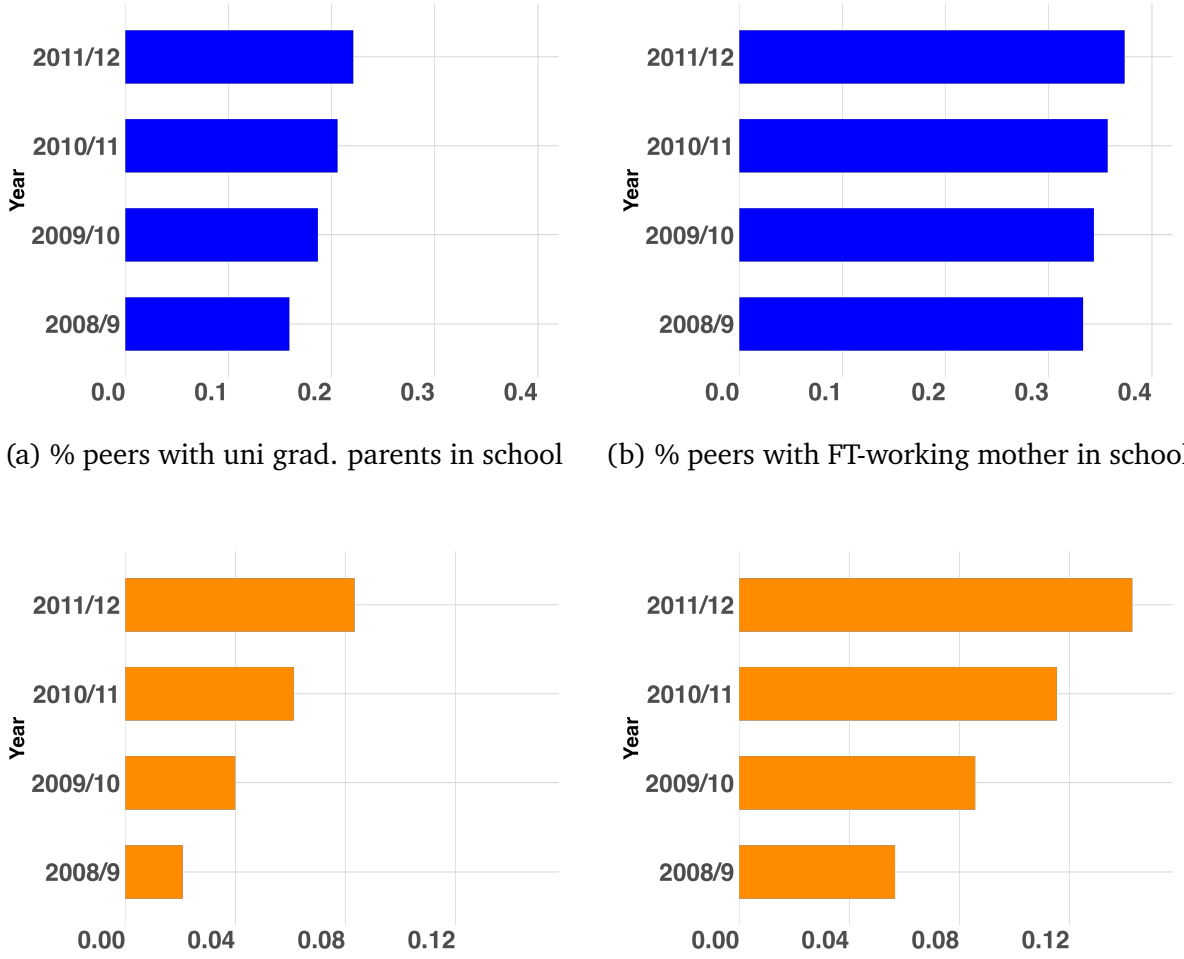
where $\Omega^{x}_{e(i)}$ represents the share of high-SES peers that child i has in environment e, which can be either schools or childcare centers. X_{ℓ} indicates whether peer ℓ meets the high-SES criteria, where X denotes either parental university education or having a full-time working mother. This measure captures, among all peers $\{\ell_1, \ell_2 ... \ell_L\}$ who are in the same environment e as child i, the proportion of peers who come from high-SES families. While this measure is correlated within environments, it remains unique to each child i, as the share is calculated based on the $N_e - 1$ peers *surrounding* the child, and excludes the child's own family characteristics.

Figure 6 illustrates the change in peer composition across years, comparing the median share in schools and in childcare. The left panels show results using only parental university education to define high-SES, while the right panels use maternal full-time employment. The share of high-SES peers in schools shows only modest growth reflecting general time trends in university attainment and maternal labor force participation (Panels 6a and 6b). In contrast, the share in childcare increased dramatically (Panels 6c and 6d) as more educated families with working mothers responded to the reform by shifting into formal care. This transformation created distinct peer environments where children engage with increasingly advantaged peers in less structured settings than traditional classrooms, potentially benefiting all children but particularly those from lower socioeconomic backgrounds.

[31] Figure A3b illustrates this pattern clearly—childcare acceptability increases with education level, signalling that higher-SES families were more likely to use childcare services due to their favorable beliefs. I provide a formal test of childcare takeup by parental education in Appendix Table A1, and confirm that both baseline levels and response to the reform is higher across parents who hold university degrees.

[32] While this cannot capture the exact composition for centers serving multiple schools, children from the same school can be expected to interact more intensively in after-school care than cross-school peers, making this a reasonable approximation.

Figure 6: Median peer composition over time



(a) % peers with uni grad. parents in school

(b) % peers with FT-working mother in school

(c) % peers with uni grad. parents in childcare

(d) % peers w/ FT-working mother in childcare

Notes: This figure shows the distribution of peer characteristics in school (top panels) and in childcare (bottom panels) across academic years. The left panels define high-SES based on parental university education, while the right panels measures whether the mother works full-time. Each plot displays the median in the corresponding leave-one-out measure of peer composition, showing the variation in peer characteristics that students are exposed to over time, estimated from Equation 3.

The role of peers in human capital investment

Having established that the reform altered children's social environment, I now examine whether increases in human capital are stronger for children most exposed to this change. My empirical approach relies on a key assumption: schools operate as fixed networks: Children were already enrolled in a primary school by 2007 and did not strategically switch schools in response to the policy. School mobility patterns support this assumption—only 10% of students ever switch schools following the reform, with no concentration around the reform timing. Nevertheless, I focus on students who remain in their original school to guard against any potential strategic switching. I restrict my sample to children from families without university degrees and leverage variation in $\Omega^X_{cc(i)}$ across schools and time to uncover heterogeneity in the reform's impact on university graduation rates.

To examine the role of peer interactions, I use the empirical model specified in Equation 2 and interact $\text{Change}_i \cdot \text{Eligible}_{t(i)}$ with a binarized version of the $\Omega^X_{cc(i)}$ measure (which indicates whether $\Omega^X_{cc(i)}$ is above or below the median measure). I conduct this analysis separately for each peer characteristic

to test distinct mechanisms. To study the importance of exposure to peers with university-educated parents ($\Omega^{Uni}_{cc(i)}$), I focus on the subsample of students from lower-educated families. This approach aligns with the discussion in Section 4.2, which suggests that peer effects on educational preferences should be particularly salient for children from lower socioeconomic backgrounds who lack university-educated role models in their families. To examine whether changes in beliefs about the acceptability of childcare arise from exposure to peers who attend childcare with full-time working mothers ($\Omega^{FT}_{cc(i)}$), I analyze boys and girls separately. Since shifts in gender norms and maternal employment attitudes should primarily affect girls' educational trajectories, we would not expect to observe significant effects for boys through this channel. Together, these exercises test whether exposure to higher-SES peers amplifies the reform's impact on university graduation rates.

Testing the impact of peer interactions on university graduation rates, I find that subsidizing childcare for high-SES families generates positive externalities for low-SES children through peer effects in university attendance. I report my findings in the second column of the Table 5: children from uneducated families benefit significantly from exposure to high-SES peers in childcare settings. This finding can be interpreted from different perspectives: high-SES peers may provide role models for academic achievement, or alternatively, since high-SES peers are more likely to attend university themselves, stronger friendship bonds may inspire low-SES children to aspire higher as well.

In the last columns of Table 5, I find that exposure to peers with full-time working mothers in childcare increases university graduation rates for girls, but not for boys. Column 3 shows that for girls, a higher share of peers with full-time working mothers significantly amplifies the reform's effect on university graduation rates. In contrast, Column 4 reveals no such effect for boys, with the interaction term being negative and statistically insignificant. This gender-specific pattern aligns with the hypothesis that exposure to peers with full-time working mothers shifts beliefs about the acceptability of childcare and maternal employment, which in turn affects girls' educational trajectories by making university education (with its implied career orientation) more attractive.

While these findings may initially appear puzzling given the absence of reform effects on maternal labor supply, the mechanism might be operating through visibility rather than behavioral change. Before the reform, most children returned home after school – potentially to mothers, grandmothers, or other caregivers – making maternal work arrangements largely unobservable to peers. The shift to center-based care created salience around families' childcare choices, making it visible to peers that some mothers were working full-time while their children attended childcare. This increased visibility, rather than changes in actual maternal employment patterns, appears to have shifted beliefs about the acceptability and feasibility of combining motherhood with career pursuits.

Table 5: The impact of exposure to high-SES peers in childcare

	Both genders		By Gender	
	All	Parents < Uni	Girls	Boys
Working mother	0.002	-0.007**	0.012***	-0.007***
	(0.002)	(0.003)	(0.002)	(0.002)
Female	0.133***	0.124***		
	(0.001)	(0.003)		
Change × Eligible	0.050***	0.027	0.008	0.061***
	(0.011)	(0.027)	(0.019)	(0.019)
% peers w/ educated fam.'s		0.011		
		(0.009)		
% w/ educated fam.'s × Change × Eligible		0.091**		
		(0.045)		
% peers w/ FT working mothers			-0.002	-0.004
			(0.008)	(0.008)
% w/ FT working mothers × Change × Eligible			0.064*	-0.018
			(0.033)	(0.032)
Fixed-effects				
School	✓	✓	✓	✓
Birth year	✓	✓	✓	✓
Academic year	✓	✓	✓	✓
S.E.: Clustered	Schools	Schools	Schools	Schools
Observations	471,785	128,081	237,504	234,277
R^2	0.133	0.148	0.137	0.112

Notes: This table reports coefficient estimates from Equation 2 examining university graduation by age 24. I limit my sample to children from uneducated families who attended public schools in the years 2006-2012. Column (1) estimates the average effect of childcare attendance across students from non-university-educated families, controlling for school fixed effects. Column (2) interacts the childcare effect with a binary measure of peer composition change. Columns (3) and (4) present subsample analyses, limiting the sample to schools where the peer measure changed significantly or not, respectively. Peer shares follow Equation 3. Standard errors clustered at the school level. Significance: *** p<0.001, ** p<0.01, * p<0.05, . p<0.1.

5 Conclusion

This study reveals how public policies can generate substantial returns through unintended mechanisms, even when failing to achieve their primary objectives. The 2007 Dutch childcare reform, while unsuccessful in boosting maternal labor supply, increased university graduation rates by 8% among treated cohorts. The policy's effectiveness stemmed not from improving cognitive skills – with test scores remaining unchanged – but from transforming children's social environments. When expanded subsidies made formal childcare affordable for middle-income families, their children entered the same after-school centers as working-class children, allowing children to interact in a less-structured environment than school, and play together. The broader use of childcare shifted beliefs about the acceptability of maternal work and childcare use, particularly benefiting girls from families without university education who experienced the largest increases in higher education attainment.

The broader implications of this results extend beyond childcare policy to questions of intergenerational mobility and social norm transmission. While the reform appeared regressive in the short term—primarily benefiting middle and high-income families through expanded subsidies—it generated positive externalities through peer effects that ultimately increased human capital investment among disadvantaged children. The cohorts who developed more egalitarian beliefs about maternal work and childcare acceptability may exhibit higher female labor force participation as adults, potentially fulfilling the reform's original objectives with a generational delay. These findings highlight the importance of considering long-term effects as well as the immediate reactions when evaluating public policies, demonstrating how interventions can reshape social norms and generate returns that materialize across generations rather than within policy evaluation windows.

References

Jérôme Adda, Christian Dustmann, and Katrien Stevens. The Career Costs of Children. *Journal of Political Economy*, 125(2):293–337, April 2017. ISSN 0022-3808, 1537-534X. 10.1086/690952.

Caroline Berden and Lucy Kok. Ontwikkelingen op de markt voor kinderopvang 2004-2008, June 2009.

Leon J.H. Bettendorf, Egbert L.W. Jongen, and Paul Muller. Childcare subsidies and labour supply — Evidence from a large Dutch reform. *Labour Economics*, 36:112–123, October 2015. ISSN 09275371. 10.1016/j.labeco.2015.03.007.

Eric P Bettinger and Bridget Terry Long. Do Faculty Serve as Role Models? The Impact of Instructor Gender on Female Students. *American Economic Review*, 95(2):152–157, April 2005. ISSN 0002-8282. 10.1257/000282805774670149.

Stephen B. Billings and Mark Hoekstra. The Effect of School and Neighborhood Peers on Achievement, Misbehavior, and Adult Crime. *Journal of Labor Economics*, 41(3): 643–685, July 2023. ISSN 0734-306X, 1537-5307. 10.1086/720323.

Sandra E. Black, Paul J. Devereux, Katrine V. Løken, and Kjell G. Salvanes. Care or Cash? The Effect of Child Care Subsidies on Student Performance. *Review of Economics and Statistics*, 96(5):824–837, December 2014. ISSN 0034-6535, 1530-9142. 10.1162/REST_a_00439.

Carole Bonnet and Benoît Rapoport. Is There a Child Penalty in Pensions? The Role of Caregiver Credits in the French Retirement System. *European Journal of Population*, 36 (1):27–52, March 2020. ISSN 0168-6577, 1572-9885. 10.1007/s10680-019-09517-0.

Claudia Buchmann, Rachel E. Dwyer, and Man Yao. The Deepening Gender Divide in Credentials, 2000–2020: Continuity, Change, and Implications. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, 11(1):154–177, January 2025. ISSN 2377-8253, 2377-8261. 10.7758/RSF.2025.11.1.08.

Scott E. Carrell, Mark Hoekstra, and Elira Kuka. The Long-Run Effects of Disruptive Peers. *American Economic Review*, 108(11):3377–3415, November 2018. ISSN 0002-8282. 10.1257/aer.20160763.

CBS. More than half of Dutch people work full-time. February 2020.

Flavio Cunha, James J. Heckman, and Susanne M. Schennach. Estimating the Technology of Cognitive and Noncognitive Skill Formation. *Econometrica*, 78(3):883–931, 2010. ISSN 0012-9682. 10.3982/ECTA6551.

Janet Currie and Jonathan Gruber. Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women. *Journal of Political Economy*, 104(6):1263–1296, December 1996. ISSN 0022-3808, 1537-534X. 10.1086/262059.

Gordon B. Dahl, Katrine V. Løken, and Magne Mogstad. Peer Effects in Program Participation. *American Economic Review*, 104(7):2049–2074, July 2014. ISSN 0002-8282. 10.1257/aer.104.7.2049.

Nabanita Datta Gupta and Marianne Simonsen. Non-cognitive child outcomes and universal high quality child care. *Journal of Public Economics*, 94(1-2):30–43, February 2010. ISSN 00472727. 10.1016/j.jpubeco.2009.10.001.

Fabian T. Dehos and Marie Paul. The Effects of After-School Programs on Maternal Employment. *Journal of Human Resources*, 58(5):1644–1678, September 2023. ISSN 0022-166X, 1548-8004. 10.3368/jhr.58.5.0120-10651R1.

Elad DeMalach and Analia Schlosser. Short- and Long-Term Effects of Universal Preschool: Evidence from the Arab Population in Israel. *SSRN Electronic Journal*, 2024. ISSN 1556-5068. 10.2139/ssrn.4711261.

Nina Drange and Astrid Marie Jorde Sandsør. The effects of a free universal after-school program on child academic outcomes. *Economics of Education Review*, 98:102504, February 2024. ISSN 02727757. 10.1016/j.econedurev.2023.102504.

Lidia Farre, Christina Felfe, Libertad Gonzalez, and Patrick Schneider. Changing Gender Norms Across Generations: Evidence from a Paternity Leave Reform. *SSRN Electronic Journal*, 2023. ISSN 1556-5068. 10.2139/ssrn.4526266.

Ernst Fehr, Helen Bernhard, and Bettina Rockenbach. Egalitarianism in young children. *Nature*, 454(7208):1079–1083, August 2008. ISSN 0028-0836, 1476-4687. 10.1038/nature07155.

Christina Felfe and Larissa Zierow. After-School Center-Based Care and Children's Development. *The B.E. Journal of Economic Analysis & Policy*, 14(4):1299–1336, October 2014. ISSN 1935-1682, 2194-6108. 10.1515/bejeap-2013-0131.

Christina Felfe, Natalia Nollenberger, and Núria Rodríguez-Planas. Can't buy mommy's love? Universal childcare and children's long-term cognitive development. *Journal of Population Economics*, 28(2):393–422, April 2015. ISSN 0933-1433, 1432-1475. 10.1007/s00148-014-0532-x.

Christina Felfe, Michael Lechner, and Petra Thiemann. After-school care and parents' labor supply. *Labour Economics*, 42:64–75, October 2016. ISSN 09275371. 10.1016/j.labeco.2016.06.009.

R. Fernandez, A. Fogli, and C. Olivetti. Mothers and Sons: Preference Formation and Female Labor Force Dynamics. *The Quarterly Journal of Economics*, 119(4):1249–1299, November 2004. ISSN 0033-5533, 1531-4650. 10.1162/0033553042476224.

Raquel Fernández. Women, Work, and Culture. *Journal of the European Economic Association*, 5(2-3):305–332, May 2007. ISSN 1542-4766, 1542-4774. 10.1162/jeea.2007.5.2-3.305.

Maria Donovan Fitzpatrick. Preschoolers Enrolled and Mothers at Work? The Effects of Universal Prekindergarten. *Journal of Labor Economics*, 28(1):51–85, January 2010. ISSN 0734-306X, 1537-5307. 10.1086/648666.

Jorge Luis García, James J. Heckman, and Victor Ronda. The Lasting Effects of Early-Childhood Education on Promoting the Skills and Social Mobility of Disadvantaged African Americans and Their Children. *Journal of Political Economy*, 131(6):1477–1506, June 2023. ISSN 0022-3808, 1537-534X. 10.1086/722936.

Garance Genicot and Debraj Ray. Aspirations and Inequality. *Econometrica*, 85(2):489–519, 2017. ISSN 0012-9682. 10.3982/ecta13865.

GESIS-Leibniz-Institut Für Sozialwissenschaften. ALLBUS/GGSS 2000 CAPI-PAPI (Allgemeine Bevölkerungsumfrage der Sozialwissenschaften/German General Social Survey 2000 CAPI-PAPI)Allgemeine Bevölkerungsumfrage der Sozialwissenschaften ALLBUS 2000 (Integrierte Version), 2012.

Guthrie Gray-Lobe, Parag A Pathak, and Christopher R Walters. The Long-Term Effects of Universal Preschool in Boston. *The Quarterly Journal of Economics*, 138(1):363–411, December 2022. ISSN 0033-5533, 1531-4650. 10.1093/qje/qjac036.

Jon Gruber and Emmanuel Saez. The elasticity of taxable income: Evidence and implications. *Journal of Public Economics*, 84(1):1–32, April 2002. ISSN 00472727. 10.1016/S0047-2727(01)00085-8.

Tarjei Havnes and Magne Mogstad. Money for nothing? Universal child care and maternal employment. *Journal of Public Economics*, 95(11-12):1455–1465, December 2011. ISSN 00472727. 10.1016/j.jpubeco.2011.05.016.

Tarjei Havnes and Magne Mogstad. Is universal child care leveling the playing field? *Journal of Public Economics*, 127:100–114, July 2015. ISSN 00472727. 10.1016/j.jpubeco.2014.04.007.

Katrine Marie Jakobsen and Jakob Egholt Søgaard. Identifying behavioral responses to tax reforms: New insights and a new approach. *Journal of Public Economics*, 212:104691, August 2022. ISSN 00472727. 10.1016/j.jpubeco.2022.104691.

Egbert L. W. Jongen. Childcare subsidies revisited. *CPB Netherlands Bureau for Economic Policy Analysis*, 2010.

Henrik Kleven, Giulia Olivero, and Eleonora Patacchini. Child Penalties and Parental Role Models: Classroom Exposure Effects. Technical Report w33002, National Bureau of Economic Research, Cambridge, MA, September 2024.

Lucy Kok and Caroline Berden. *Ontwikkelingen op de markt voor kinderopvang 2004-2008*. Number 2009-41 in SEO-rapport. SEO Economisch Onderzoek, Amsterdam, 2009. ISBN 978-90-6733-504-1.

Ministerie van OCW. Wet kinderopvang, October 2024.

T Nguyen. Information, Role Models and Perceived Returns to Education: Experimental Evidence from Madagascar. *MIT Job Market Paper*, 2008.

OECD. *Education at a Glance 2015: OECD Indicators*. Education at a Glance. OECD, November 2015. ISBN 978-92-64-24208-1 978-92-64-24209-8. 10.1787/eag-2015-en.

OECD. *Education at a Glance 2020: OECD Indicators*. Education at a Glance. OECD, September 2020. ISBN 978-92-64-50078-5 978-92-64-38261-9 978-92-64-42215-5. 10.1787/69096873-en.

OECD. Public spending by age of children, December 2022.

Publishing OECD. *OECD Labour Force Statistics 2013*. OECD Publishing, Paris, 2014. ISBN 978-92-64-21230-5 978-92-64-21222-0.

Claudia Olivetti, Eleonora Patacchini, and Yves Zenou. Mothers, Peers, and Gender-Role Identity. *Journal of the European Economic Association*, 18(1):266–301, February 2020. ISSN 1542-4766, 1542-4774. 10.1093/jeea/jvy050.

Simon Rabaté and Sara Rellstab. The Child Penalty in the Netherlands and its Determinants. 2021. 10.34932/TRKZ-QH66.

Laura Schmitz. Heterogeneous Effects of After-School Care on Child Development. *DIW Discussion Paper 2006*, 2022.

Sociaal en Cultureel Planbureau. Kinderopvang, 2023.

Owen Thompson. Head Start's Long-Run Impact: Evidence from the Program's Introduction. *Journal of Human Resources*, 53(4):1100–1139, 2018. ISSN 0022-166X, 1548-8004. 10.3368/jhr.53.4.0216.7735R1.

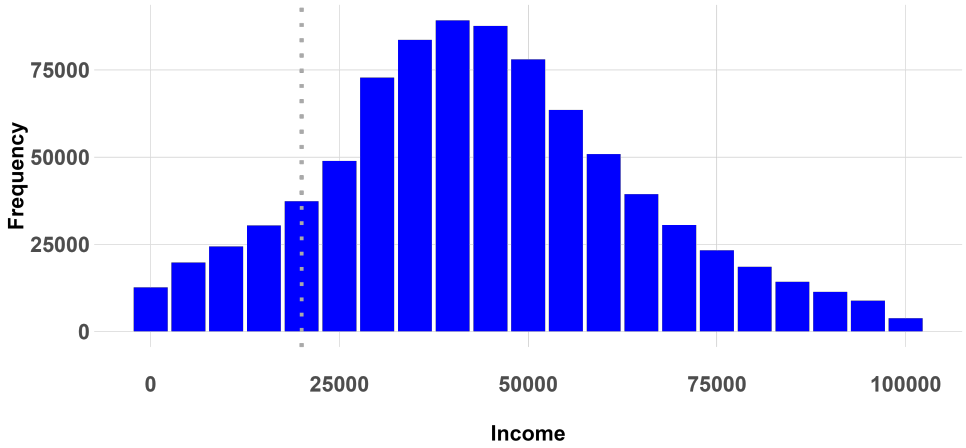
Cecile Wetzels. Supply and Price of Childcare and Female Labour Force Participation in the Netherlands. *LABOUR*, 19(s1):171–209, December 2005. ISSN 1121-7081, 1467-9914. 10.1111/j.1467-9914.2005.00326.x.

Michael Yogman, Andrew Garner, Jeffrey Hutchinson, Kathy Hirsh-Pasek, Roberta Michnick Golinkoff, COMMITTEE ON PSYCHOSOCIAL ASPECTS OF CHILD AND FAMILY HEALTH, and COUNCIL ON COMMUNICATIONS AND MEDIA. The Power of Play: A Pediatric Role in Enhancing Development in Young Children. *Pediatrics*, 142(3), September 2018. ISSN 0031-4005, 1098-4275. 10.1542/peds.2018-2058.

A Appendix: Further results on the impact of the reform

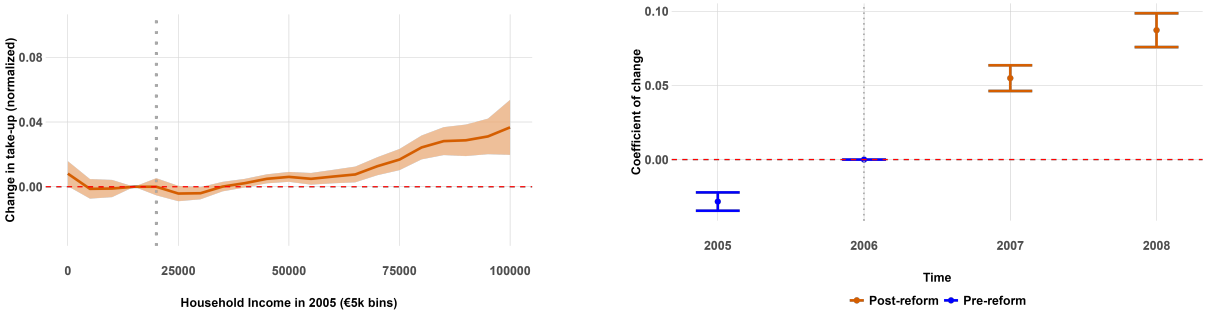
A.1 After-school childcare

Figure A1: Income distribution in 2005



Notes: This figure illustrates the income distribution across households with children aged 4-12 in the year 2005. Vertical dotted gray line marks the level change in the subsidy starts to increase following the 2007 reform. I limit my sample to households with income below 100,000 to minimize the latent measurements of childcare use: households above this level are not eligible for childcare subsidies according to the 2006 scheme (illustrated in Figure 1a), increasing the likelihood of latent observations for formal childcare use.

Figure A2: Impact of the reform on after-school care take-up



(a) Difference in take-up post-reform (b) Change in childcare use by years

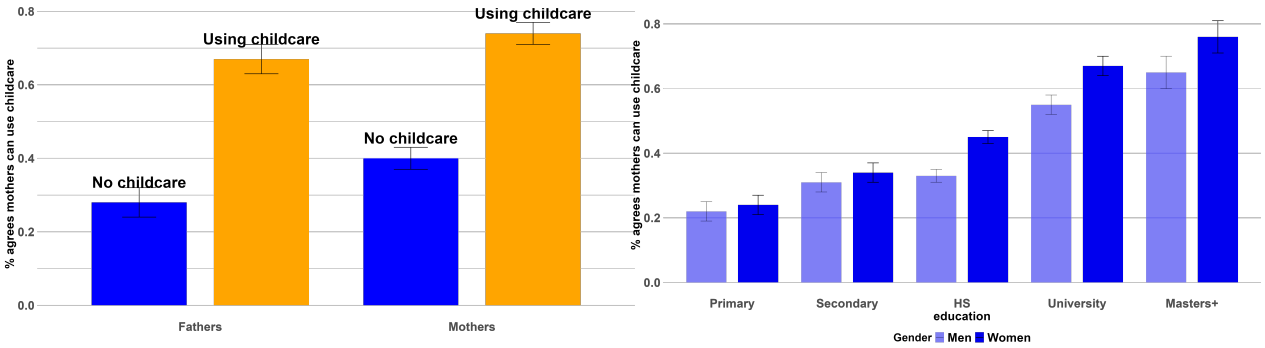
Notes: This figure illustrates changes in childcare use following the 2007 reform. Both panels use the same sample as Figure 2: households with youngest child aged 4-12, with income discretized in 5,000 EUR bins based on 2005 levels. Panel A2a plots the average pre-post reform change in the share of households receiving childcare subsidies, normalized relative to households at income=15,000 EUR. Panel A2b shows year-by-year changes in childcare use normalized by 2006 levels. The negative coefficient in 2005 reflects the increasing childcare use rates due to the small adjustment in 2006 (exhibited in Figure 1). Both panels demonstrate that larger subsidy increases led to stronger increases in childcare take-up. Vertical dotted gray line marks the level where the 2007 reform's impact starts to take place, and the horizontal red line marks 0.

Table A1: Impact of the reform on after-school care by subsamples

	Informal care		Parents Edu.		Single parent
	Available	Not	$\geq$ Uni	$<$ Uni	
Change	-0.505***	-0.205***	-0.500***	-0.509***	-.69***
	(0.044)	(0.045)	(0.050)	(0.038)	(0.100)
Change x Eligible	0.0401***	0.028***	0.043***	0.033***	0.139***
	(0.003)	(0.008)	(0.007)	(0.007)	(0.018)
Fixed-effects					
Muncplty.(2005)	✓	✓	✓	✓	✓
Year	✓	✓	✓	✓	✓
Age(youngest child)	✓	✓	✓	✓	✓
Baseline	0.083	0.169	0.23	0.104	0.225
S.E.: Clustered	Mncplty	Mncplty	Mncplty	Mncplty	Mncplty
Observations	1,296,070	352646	393,231	629,360	174,965
R2	0.074	0.112	0.118	0.066	0.114

Notes: This table presents the heterogeneity in the impact of the 2007 reform on after-school childcare take-up by subsamples. I present the coefficients estimated from Equation 2, limiting my sample to families with youngest children aged 4-12 across 2005-2008. In the first two columns, I split the sample by availability of informal childcare for families. In columns 3 and 4, I split the sample for parental education level; however, the availability of parental education data limits the sample size and time span (2006-2008). Column 5 presents the results for families with a single parent. The mean childcare use is calculated for the years before the reform. Change is calculated using Equation 1. Eligible is equal to 1 for years following 2007. Standard errors in parentheses are clustered at the municipality level. Significance levels according to p-values are as follows: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'.

Figure A3: Beliefs towards acceptability of childcare



(a) By childcare use of parents

(b) By education levels of respondents

Notes: This figure summarizes the beliefs towards the acceptability of childcare use, from CV-SLI survey. Panel A3a plots the mean response by parents' childcare use. Panel A3b by respondents' education level.

A.2 Maternal Labor Supply

Figure 3 in Section 3.2 illustrates that reform generated no visible impact on either the extensive margin (labor force participation) or the intensive margin (the full-time equivalent days) of mothers' labor supply. In this section, I test these patterns by estimating Equation 2, where Y_{it} takes several different measures of labor supply: labor force participation, full-time equivalent days worked in a year, daily wage, and household income (to test whether household optimizes their labor supply in other dimensions). The model for household income is estimated only using the cohort variation, as subsidy change is a function of household income. I include fixed effects for the youngest childs age and the mother's age on top of residential location and time in the set of controls $\mathbf{\Gamma}$. My sample comprises mothers with the youngest children aged 4-15. Mothers with older children (13-15) serve as controls – unaffected by the reform but exposed to the same financial conditions, particularly the the global financial crisis of 2007 – allowing me to separate the impact of the reform from business cycles.

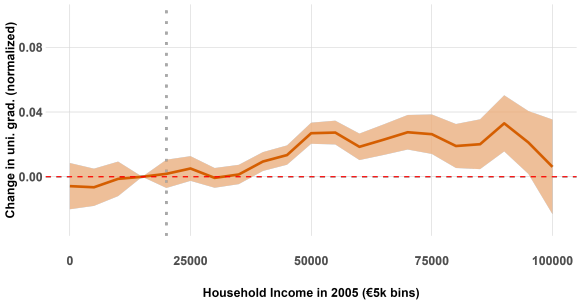
Table A2: Impact of the reform on maternal labor supply

	Unconditional		Conditional	
	Mothers LFP	log(Household Income)	FT Equivalent days	Daily Wage
Change × Eligible	0.00		-3.22***	-105.06**
	(0.009)		(0.815)	(50.422)
Eligible		-0.00		
		(0.001)		
Fixed-effects				
Municipality	✓	✓	✓	✓
Year	✓	✓	✓	✓
Youngest child's age	✓	✓	✓	✓
Mother's age	✓	✓	✓	✓
N of children	✓	✓	✓	✓
Baseline mean:	0.8309	44705.4430	104.08	230.70
S.E.: Clustered	Municipality	Municipality	Municipality	Municipality
Observations	2,818,240	2,762,540	2,074,692	2,074,692
R^2	0.058	0.643	0.086	0.000

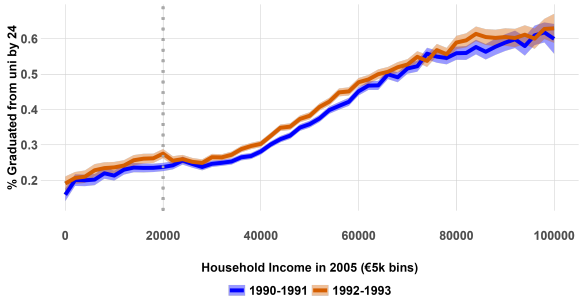
Notes: This table presents the heterogeneity in the impact of the 2007 reform on maternal labor supply by subsamples. I present the coefficients estimated from Equation 2, limiting my sample to families with youngest children aged 4-12 across 2006-2008. In the first two columns, I present unconditional estimates for maternal LFP and household income. In the last two columns, I restrict my sample to working mothers and provide estimates for FT-equivalent working days in a year, and daily wage (Income/FT Days). The means are calculated for the years before the reform. Change is calculated using Equation 1. Eligible is equal to 1 for years following 2007. Standard errors in parentheses are clustered at the municipality level. Significance levels according to p-values are as follows: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'.

A.3 Human capital investment

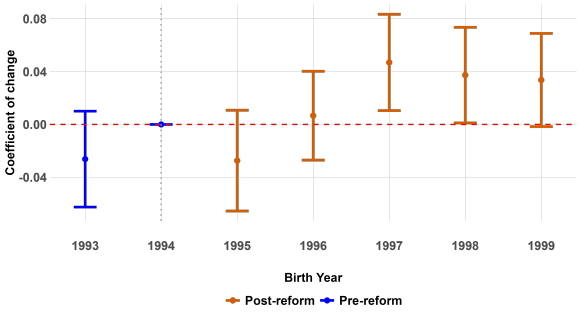
Figure A4: Impact of the reform on the university graduation rates



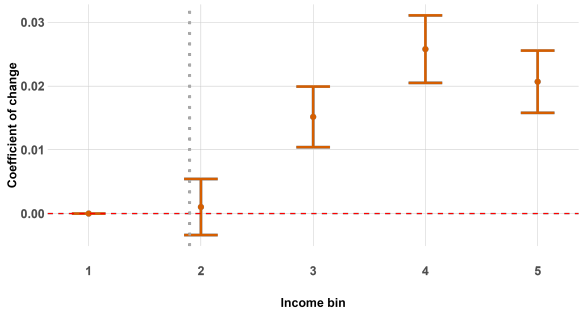
(a) Difference in graduation rates post-reform



(b) Change in grad. rates with placebo reform



(c) Change in graduation rate by cohorts



(d) Change in graduation rates by income bins

Notes: This figure illustrates the change in university graduation rate by age 24 following the 2007 reform. Panel A4a plots the average pre-post reform change in the graduation rates, normalized relative to households at income=15,000 EUR. Panel A4b plots the change in the graduation rates with respect to a placebo treatment, defined for cohorts born after 1992. Panel A4c shows cohort-by-cohort changes in graduation rates, estimated with a slight deviation of Equation 2, where instead of $Change_i \cdot Eligible_i$, I use $Change_i \cdot Cohort_i$, normalized by the levels of the 1994 cohort. Panel A4d plots the change in graduation rates by 20.000 EUR income bins, where I use a simplified version of Equation 2 without subsidy change and income controls, and instead estimate $Eligible_i$ by bins, normalized by the first bin. Vertical dotted gray line marks the level where the 2007 reform's impact starts to take place, and the horizontal red line marks 0.

Table A3: Impact of the reform on university graduation by ages 25-26

	All sample		Parents Education < University			
	Age 25	Age 26	Girls at 25	Girls at 26	Boys at 25	Boys at 26
Working Mother (2005)	0.005***	0.005**	0.009***	0.009**	-0.009***	-0.008**
	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)
Change × Eligible	0.028***	0.025**	0.091***	0.085***	0.042**	0.022
	(0.011)	(0.012)	(0.021)	(0.023)	(0.018)	(0.020)
Fixed-effects						
Municipality (2005)	✓	✓	✓	✓	✓	✓
Birth year	✓	✓	✓	✓	✓	✓
Parent edu	✓	✓				
S.E.: Clustered	Muncplty	Muncplty	Muncplty	Muncplty	Muncplty	Muncplty
Observations	360,800	303,190	115,448	98,640	121,394	103,546

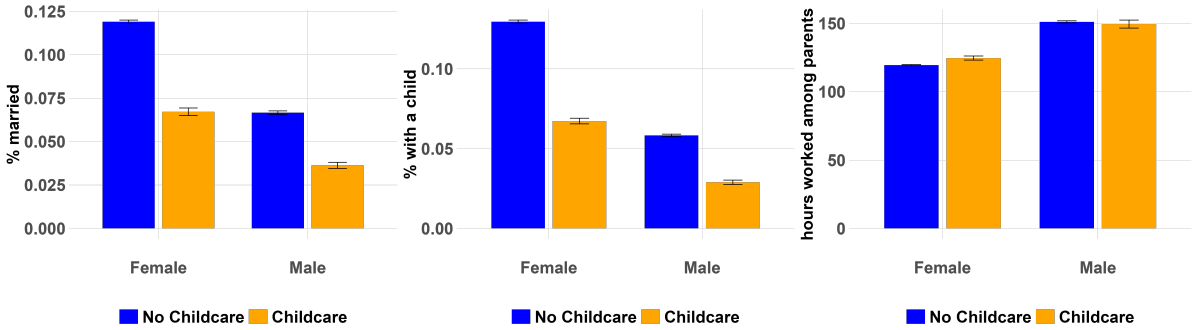
Notes: This table presents the impact of the 2007 reform on university graduation rates for ages 25-26. I present the coefficients estimated from Equation 2, limiting my sample to cohorts which I can observe at age 25 and 26. In the first two columns, I present the coefficients for all children observed at these ages. Columns 3 and 4 repeat this exercise for first-generation girls (coming from families where parents are not university graduates) at age 25 and 26. In columns 5 and 6, I repeat the same exercise for boys. The mean university graduation rate is calculated for the cohort of 1994, the last control cohort. Change in the subsidy is calculated using Equation 1, which measures the intensity of subsidy change for each income bracket according to baseline household income. Standard errors in parentheses are clustered at the municipality level. Significance levels according to p-values are as follows: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'.

Table A4: Impact of the reform on field choice in university

	STEM		Nursing		Teaching	
	Boys	Girls	Boys	Girls	Boys	Girls
Change × Eligible	-0.0038	0.0191**	-0.0001	-0.0283***	-0.0219***	-0.0150
	(0.0168)	(0.0082)	(0.0031)	(0.0074)	(0.0061)	(0.0104)
Fixed-effects						
Municipality (2005)	✓	✓	✓	✓	✓	✓
Birth Year	✓	✓	✓	✓	✓	✓
Baseline	0.288	0.076	0.008	0.057	0.031	0.132
Adj. R-squared	0.008	0.008	0.005	0.013	0.009	0.012
S.E.: Clustered			Municipality			
Observations	131,284	192,974	131,284	192,974	131,284	192,974

Notes: This table presents the impact of the 2007 reform on the choice of field for university graduates. I present the coefficients estimated from Equation 2, limiting my sample to university graduate individuals by age 24. In the first two columns, I present the coefficients for attending a male dominated field (STEM) for boys and girls. Columns 3 and 4 repeat this exercise for a female-dominated fields, nursing and teaching. Change in the subsidy is calculated using Equation 1, which measures the intensity of subsidy change for each income bracket according to baseline household income. Standard errors in parentheses are clustered at the municipality level. Significance levels according to p-values are as follows: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'.

Figure A5: Hours worked and family formation patterns by childcare use and gender



(a) Marriage rates (b) Parenthood rates (c) Hours worked

Notes: This figure illustrates family formation patterns and hours worked by childcare use and gender for university graduates. Panel A5a exhibits marriage rates are significantly lower across childcare attendees, as are parenthood levels shown in Panel A5b. Panel A5c shows hours worked across university graduates with a child, illustrating that women who attended childcare themselves work for longer hours.

Table A5: Impact of the reform on hours worked and family formation

	Hours Worked	Parent	Married
Change × Eligible	1.2015	-0.0129	-0.0259**
	(0.7688)	(0.0095)	(0.0105)
Fixed-effects			
Municipality (2005)	✓	✓	✓
Year	✓	✓	✓
Age	✓	✓	✓
Baseline	150.420	0.069	0.220
Adj. R-squared	0.066	0.102	0.049
S.E.: Clustered	Municipality	Municipality	Municipality
Observations	546,105	826,790	649,469

Notes: This table presents the impact of the 2007 reform on monthly hours worked and family formation. I present the coefficients estimated from Equation 2, limiting my sample to university graduate individuals by age 24. Change in the subsidy is calculated using Equation 1, which measures the intensity of subsidy change for each income bracket according to baseline household income. Standard errors in parentheses are clustered at the municipality level. Significance levels according to p-values are as follows: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'.

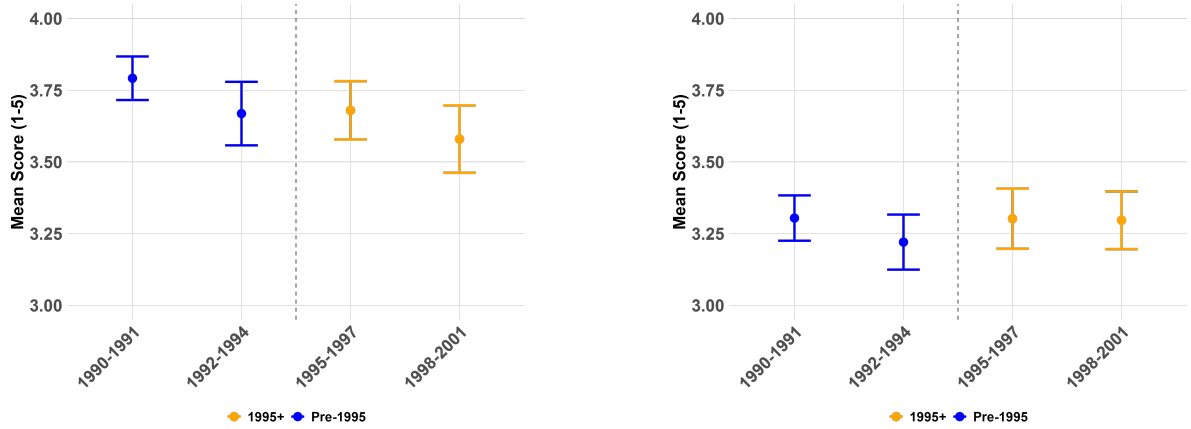
A.4 Mechanisms

Table A6: Impact of the reform on other skill measures

Outcome:	Language Score		Study Score	
	Basic	w/ Parents' Edu	Basic	w/ Parents' Edu
Change	0.793***	0.409***	0.803***	0.510***
	(0.053)	(0.072)	(0.053)	(0.073)
Working mother 2005	0.018***	-0.001	0.013***	-0.011*
	(0.003)	(0.005)	(0.003)	(0.005)
Female	0.185***	0.182***	-0.039***	-0.038***
	(0.003)	(0.004)	(0.003)	(0.004)
Change × Eligible	-0.039+	-0.062+	-0.033	0.065*
	(0.022)	(0.032)	(0.022)	(0.032)
Fixed-effects				
Municipality (2005)				
School	✓	✓	✓	✓
Academic Year	✓	✓	✓	✓
Parent Education		✓		✓
S.E.: Clustered	Schools	Schools	Schools	Schools
Observations	535875	238162	535875	238162
R^2	0.157	0.227	0.136	0.200

Notes: This table presents the impact of the 2007 reform on cognitive skills measured by CITO exam Z-scores for language (columns 1-2) and study skills (columns 3-4). Coefficients are estimated from Equation 2 with academic year and primary school fixed effects. Change in subsidy is calculated using Equation 1 based on baseline household income. Eligible is a dummy for cohorts in school after 2006. Standard errors clustered at the school level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05.

Figure A6: Impact of the reform on non-cognitive skills



(a) Composite score for academic skills

(b) Composite score for being goal oriented

Notes: This figure summarizes the mean composite indexes for non-cognitive skills at age 18, measured using the Personality survey of the LISS Panel. A6a plots the mean score of academic social skills, which takes into account communication, networking, and collaboration scores. Panel A6b plots the mean score of goal-orientedness, which takes into account individual scores of organization, persistence and attention to detail. Estimates belonging to cohorts who were not impacted by the reform are represented in blue, whereas cohorts who were impacted by the 2007 reform are represented in orange. The dashed vertical line marks the implementation of the reform.

Table A7: The impact on share of students that follow higher tracks then recommended

	Parents < Uni	Parents w/ uni	By genders
Working mother	-0.0086**	-0.0226*	-0.0053***
	(0.0034)	(0.0136)	(0.0019)
Female	0.0299***	0.0497***	0.0223***
	(0.0029)	(0.0114)	(0.0051)
Change × Eligible	0.1051***	0.0821	0.0661***
	(0.0277)	(0.1005)	(0.0203)
Change × Eligible × Female			0.0250
			(0.0320)
Fixed-effects			
School	✓	✓	✓
Academic Year	✓	✓	✓
S.E.: Clustered	Schools	Schools	Schools
Baseline	0.095	0.250	0.114
Observations	31,947	7,737	98,617
R^2	0.191	0.455	0.096

Notes: This table presents the impact of the 2007 reform on the academic path of students. Coefficients are estimated from Equation 2. Columns 1-2 present coefficient estimates by parental education. Column 3 presents the coefficient estimates by gender interaction. The mean rates are calculated for the cohorts before 1995. Change in subsidy uses Equation 1 based on baseline household income. Eligible indicates cohorts born after 1995. Standard errors clustered at school level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Table A8: The impact on share of students that attend university from non-academic tracks

	Mixed track		Vocational track	
	Boys	Girls	Boys	Girls
Change × Eligible	0.0489***	0.0575***	0.0001	0.0552***
	(0.0171)	(0.0209)	(0.0084)	(0.0138)
Fixed-effects				
Municipality	✓	✓	✓	✓
Year	✓	✓	✓	✓
Age	✓	✓	✓	✓
Baseline	0.195	0.299	0.030	0.055
Av. Z Score in Math	0.076	-0.433	-0.649	-1.205
S.E.: Clustered	Muni.	Muni.	Muni.	Muni.
Observations	104,445	100,418	118,874	94,732

Notes: This table presents the impact of the 2007 reform on the university graduation rates of students in non-academic tracks by gender. Coefficients are estimated from Equation 2. Columns 1-2 present coefficient estimates for students who attended mixed tracks in high school. Columns 3-4 present the coefficient estimates for students who attended vocational tracks in high school. The mean rates are calculated for the cohorts before 1995. Change in subsidy uses Equation 1 based on baseline household income. Eligible indicates cohorts born after 1995. Standard errors clustered at school level. Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Table A9: Changes in beliefs on childcare acceptability and maternal work

Sample:	Ages 16-19	Ages 16-22	Ages 16-25
Eligible	0.198**	0.124*	0.112*
	(0.061)	(0.064)	(0.055)
Fixed-effects			
Age	✓	✓	✓
Gender	✓	✓	✓
Education	✓	✓	✓
Baseline	0.356	0.424	0.447
Observations	270	458	617
R^2	0.070	0.048	0.052

Notes: This table plots the coefficient estimate of changes in responses to the statement 'It's okay for a woman with young children to have a job and her children to go to daycare' across different age specifications in respondents of the CV-SLI survey. The analysis uses repeated cross-sectional data where each individual's outcome is measured once, illustrated in Figure 5. Eligible is a dummy indicating cohorts born after 1995. Due to age-based sample restrictions, time fixed effects are not included as the treatment definition becomes collinear with time under age specifications. Significance levels: *** p<0.001, ** p<0.01, * p<0.05.

B Appendix: Additional derivations

B.1 Model Specifics

In this section, I present a detailed version of the stylized model specified in Section 4.1 that maps households' maternal labor supply and childcare use decisions to long-term changes in children's human capital investment.

Model Setup

Agents: Each household i is comprised of two agents $j \in \{p, c\}$: parents and a child in ages 4-12. These agents are heterogeneous along three dimensions. Education is represented by $E_i^j \in \{0, 1\}$, where $E_i^j = 1$ indicates a university graduate for parents ($E_i^p = 1$ when at least one parent is a university graduate) and the child (E_i^c). Skills are captured by $\gamma_i^j \in [0, 1]$. Additionally, each agent has beliefs about the acceptability of childcare, where $\theta_i^j \sim F(\theta_i^j | E_i^j)$. Consistent with the survey evidence presented in Figure A3b, beliefs about childcare acceptability increase with educational attainment, such that $E[\theta_i^j | E_i^j = 1] > E[\theta_i^j | E_i^j = 0]$.

Timeline: There are two periods. In the first period, parents decide on maternal labor supply and childcare use $k \in \{0, 1\}$ that maximizes utility U_i^p. In the second period, the children make the decision to go to university or not $h \in \{1, 0\}$ to maximize their utility U_i^c, depending on the implications of parents' choice in the first stage.

First Period: Work and Childcare Decision

This period represents the childhood phase, where parents are the decision-makers. They maximize the household utility U_i^p by choosing between two options indexed $k \in \{0, 1\}$: the mother works full-time and uses childcare ($CC_i = 1$), or the mother works part-time and provides childcare herself ($CC_i = 0$). Household income Y_i^p is the sum of parents' income: In both scenarios, fathers work full-time and earn income Y_i^f. When mothers work full-time, they earn Y_i^m; when they work part-time, they earn $\frac{Y_i^m}{2}$. Households that use childcare ($CC_i = 1$) pay a subsidized price P_i^{cc}.

The utility of household i choosing option $k \in \{0, 1\}$ is denoted $U^p i(k)$ and has two main components. All households derive utility from consumption $ci(k)$, and a taste-based disutility $1/(\theta_i^p)$ whenever they use childcare:

$$
\begin{aligned}
U_{i(k)}^p &= u(c_{i(k)}) - \frac{CC_i}{\theta_i^p} \\
&= \begin{cases} u\left(Y_i^f + \frac{Y_i^m}{2}\right) & \text{if } k = 0 \\ u\left(Y_i^f + Y_i^m - P_i^{cc}\right) - \frac{1}{\theta_i^p} & \text{if } k = 1 \end{cases}
\end{aligned}
$$

The subsidized childcare price depends on the subsidy household i is eligible to under the scheme $s(.)$: $P_i^{cc} = (1 - s(Y^p i))pc$, where p_c is the market price of formal childcare and $s(Y_i^p)$ is the subsidy rate that depends on gross household income $Y_i^p = Y_i^f + Y_i^m$ (I abstract from informal childcare choices in this framework: I discuss the implications of this assumption under household optimization decision). Households do not save and consume their entire disposable income after childcare expenses: they derive utility $u(c)$ from consumption $c_i = Y_i^p - P_i^{cc} \cdot \mathbf{1}\{CC_i\}$.

Second period: Child's decision to go to university

The second period represents the adulthood of the children, and now they are the decision makers. They maximize the household utility U_i^c by choosing whether to attend university or not, indexed by $h \in \{1, 0\}$. This decision depends on their idiosyncratic preferences α_i^c and expected income $E[Y^c(\cdot)]$, deducted by the cost of university $\kappa > 0$: This cost κ represents the common fixed cost of university attendance (tuition, opportunity cost of time, etc.).

Income $Y(\gamma_i, E_i)$ follows a log-normal distribution and is an increasing function of education ($Y(\gamma_i, 1) > Y(\gamma_i, 0)$) and skills ($\frac{\partial Y}{\partial \gamma} > 0$) with random shocks that are $N(0, \sigma^2)$. Girls discount their expected income by a future parenthood penalty $\zeta(1-\theta_i^c)$, where ζ represents the common parenthood penalty, attenuated by beliefs toward childcare acceptability θ_i^c. More favorable beliefs toward childcare acceptability (higher θ_i^c) diminish this discounting factor, as girls expect to use childcare services and minimize labor supply disruptions upon parenthood.

The utility of option $h \in \{0, 1\}$ is denoted with $U_{i(h)}^c$, defined as follows:

$$
\begin{aligned}
U_{i(h)}^c &= \mathbf{E}[Y^c(\gamma_i^c, E_i^c = h)](1 - \zeta(1 - \theta_i^c)\mathbf{1}_i^{girl}) + E_i^c(\alpha_i^c - \kappa), \text{where:} \\
U_{i(0)}^c &= \mathbf{E}[Y^c(\gamma_i^c, E_i^c = 0)](1 - \zeta(1 - \theta_i^c)\mathbf{1}_i^{girl}) \\
U_{i(1)}^c &= \alpha_i^c + \mathbf{E}[Y^c(\gamma_i^c, E_i^c = 1)](1 - \zeta(1 - \theta_i^c)\mathbf{1}_i^{girl}) - \kappa
\end{aligned}
$$

Thus, the decision to go to university is characterized by three key parameters: children's skills γ_i^c, their preferences α_i^c, and beliefs θ_i^c. Next, I define the functional forms for these variables:

B.1.1 Skill accumulation

Following the literature documenting that childcare is most effective for children with limited baseline parental investment (Havnes and Mogstad, 2015; García et al., 2023), I model the skill production function as:

$$
\gamma_i^c = \beta_0 \gamma_i^p + \beta_1 Y_i + \frac{\beta_2 CC_i}{1 + \lambda(\gamma_i^p + Y_i)} + \xi_i \tag{B1}
$$

where the parameter $\lambda \geq 0$ captures diminishing returns: childcare is most beneficial when baseline parental investment $(\gamma_i^p + Y_i)$ is low, consistent with evidence that formal care substitutes for missing parental investment among disadvantaged families while providing limited additional benefits to children from high-investment families.

The error term captures idiosyncratic developmental factors such as genetic endowments, health shocks, and unmeasured environmental influences, with $\xi_i \sim N(0, \sigma_\xi^2)$ and $\mathbb{E}[\xi_i \mid \gamma_i^p, Y_i, CC_i] = 0$. The normality assumption reflects that cognitive skills result from the accumulation of multiple independent developmental inputs over childhood and follows standard practice in the skill formation literature (Cunha et al., 2010).

B.1.2 Preference Formation

In this framework, preferences are constructed socially: children's preferences for university attendance are shaped by their social environment (Genicot and Ray, 2017) and the role models around them (Bettinger and Long, 2005),where role models can expand perceived choice sets by providing information about educational opportunities Nguyen (2008).

Following this literature, I model children's preferences as influenced by the educational attainment of their role models in their environment: While socioeconomic status could arguably include both parental

education and income (Y_i^p), I focus on educational attainment to simplify the theoretical setup. Including income would yield similar patterns since education and lifetime earnings are positively correlated – higher-educated parents typically earn more over their careers. Therefore, education serves as a suitable proxy for broader socioeconomic status in this context. Thus, functional form of α_i^c depends on the educational attainment of their own parents (E_i^p), the parents of the peers in school ($\overline{E}_{s(i)}^p$) and in childcare ($\overline{E}_{cc(i)}^p$):

$$\alpha_i^c = \psi_0 E_i^p + \psi_1 \frac{\overline{E}_{s(i)}^p}{1 + E_i^p} + \psi_2 \frac{\overline{E}_{cc(i)}^p \cdot CC_i}{1 + E_i^p} + \omega_i \tag{B2}$$

where the error term e ω_i represents idiosyncratic variation arising from exposure to role models and information that cannot be captured by peer composition measures, with $\mathbb{E}[\omega_i] = 0$ and $\text{Var}(\omega_i) = \sigma_\omega^2$. The peer effects are captured through the share of university-educated parents in environment e, which diminish with children's own SES since role models primarily expand choice sets by providing new information. Peers are all children ℓ such that $e(i) = e(\ell)$ and $\ell \neq i$. The share of university-educated parents across peers is:

$$\overline{E}_{e(i)}^p = \frac{1}{N_e - 1} \sum_{\ell \in e, \ell \neq i} E_\ell^p$$

where $N_e - 1$ is the number of peers in environment e, which can be either the school $s(i)$ or the childcare center $cc(i)$ that child i attended. $E_\ell^p = 1$ when parents of peer ℓ have graduated from university and $E_\ell^p = 0$ otherwise. This measure is aimed at capturing the impact of peers that come from high-SES families, where parents may serve as role models that broaden educational horizons, or friendships with university-bound peers may inspire children to pursue similar paths. While peer influence could operate through direct interactions rather than parental role models, the empirical implications remain the same.

B.1.3 Belief Formation

Beliefs about gender roles are transmitted primarily through parents, with early childhood experiences and exposure to working women having lasting effects on girls (Fernández, 2007; Kleven et al., 2024). However, parents are not the only driver: Olivetti et al. (2020) demonstrates that beliefs are transmitted not only vertically (parent to child) but also horizontally through peer networks, where children observe and internalize the gender roles modeled by their friends' families. Following this literature, I model children's beliefs about childcare acceptability as influenced by three sources: parental beliefs θ_i^p, the prevalence of childcare use across peers in school $\overline{CC}_{s(i)}$, and direct childcare experience CC_i:

$$\theta_i^c = \phi_0 \theta_i^p + \phi_1 CC_i + \phi_2 \overline{CC}_{s(i)} + v_i \tag{B3}$$

where the error term v_i represents cultural innovations with $\mathbb{E}[v_i] = 0$ and $\text{Var}(v_i) = \sigma_v^2$. The prevalence of childcare use among peers is measured as:

$$\overline{CC}_{s(i)} = \frac{1}{N_s - 1} \sum_{\ell \in s, \ell \neq i} CC_\ell$$

where $N_s - 1$ is the number of children in the school $s(i)$ excluding child i.

B.1.4 Household Optimization

Next, I formalize the household decision-making process within this two-period framework. I first characterize the child's university enrollment decision in the second stage, then examine how parents

optimize their childcare choices in the first stage. Finally, I derive key propositions that illuminate how changes in the subsidy regime affect household behavior and children's long-term outcomes.

Decision rule of the children: The child chooses to attend university when the expected net benefits of doing so exceed zero:

$$\alpha_i^c + \mathbf{E}[Y^c(\gamma_i^c, E_i^c = 1) - Y^c(\gamma_i^c, E_i^c = 0)](1 - \zeta(1 - \theta_i^c)\mathbf{1}_i^{girl}) - \geq \kappa$$

Parents' optimization problem: The parents maximize total discounted utility while making the decision to use childcare or not:

$$\max_{CC_i \in \{0,1\}} U_i = U_i^p + \beta U_i^c$$

where U_i^p is the first period utility, and U_i^c is the second period utility discounted by β.

Assumption 1: ***Parents do not internalize the impact of childcare on children***

I assume that parents do not consider the potential benefits of childcare for their children's human capital investment, such that $\mathbf{E}^p[U_i^c|CC_i = 1] = \mathbf{E}^p[U_i^c|CC_i = 0]$.[33] Thus, their decision relies on the first stage utility U_i^p, and only the components of the second stage utility that they can anticipate, $\tilde{U_i^c} = \mathbf{E}[Y^c(\gamma_i^c)]$. Formally:

$$\max_{CC_i \in \{0,1\}} U_i^p + \beta \tilde{U_i^c} = u(c_i) - \frac{CC_i}{\theta_i^p} + \beta \mathbf{E}[Y^c(\gamma_i^c(c_i))]$$

Decision rule of the parents: The parents choose full-time work and childcare if $U_{i(1)} \geq U_{i(0)}$:

$$u(c_1) - u(c_0) - \beta(\Delta \tilde{U_i^c}) \geq \frac{1}{\theta_i^p}$$

where $\Delta \tilde{U_i^c} = \mathbf{E}[Y^c(\gamma_i^c(c_1) - Y^c(\gamma_i^c(c_0)]$.

Next, I use the following propositions to characterize households' decision, and analyze what happens under a new subsidy regime. It's important to note that if parents were forward-looking and considered skill gains from childcare, low-SES families would respond more strongly to subsidies due to higher marginal skill gains from the $\frac{\beta_2}{1+\lambda(\gamma_i^p + Y_i^p)}$ term, potentially reversing the propositions that follow the decision rule of the parents below.

Proposition (1) ***Childcare is not used when childcare acceptability is very low:*** There is an acceptability threshold θ_i^* such that $\theta_i^* = \frac{1}{u(c_1) - u(c_0) + \beta(\Delta \tilde{U_i^c})}$. Then, each household in which $\theta_i^p < \theta_i^*$ chooses for the mother to work part-time without using any childcare, since for any subsidy rate $s(Y) \in [0, 1]$, $u(c_1) - u(c_0) + \beta(\Delta \tilde{U_i^c}) < \frac{1}{\theta_i^p}$

Proposition (2) ***Income-Gradient in Childcare Adoption:*** When the subsidy scheme becomes flatter while remaining progressive, such that $\frac{\partial s}{\partial Y^p} < \frac{\partial s'}{\partial Y^p} < 0$, households above the acceptability threshold $\theta_i^p \geq \theta_i^*$ become more likely to use childcare as their income increases: $\frac{\partial P(CC_i = 1 | \theta_i^p \geq \theta_i^*)}{\partial Y^p} > 0$.

As noted before, I abstract from informal childcare choices in this framework. Without this option, Proposition 2 states that the 2007 reform should induce high-SES families to enter formal childcare and increase maternal labor supply. Incorporating informal care as an alternative would preserve the observed patterns in childcare take-up while potentially dampening the maternal labor supply response, provided informal childcare prices are between the pre- and post-reform costs of formal care that households face. Specifically, $p_c^{inf} \leq (1 - s(Y))p_c^f$ when $p_c^{inf} \geq (1 - s'(Y))p_c^f$ since $\frac{\partial s}{\partial Y} < \frac{\partial s'}{\partial Y} < 0$. While I lack data on informal childcare prices, evidence from Kok and Berden (2009) and Jongen (2010) supports this scenario: the enhanced subsidies reduced parental contributions sufficiently to make formal childcare

[33] This assumption is supported by the literature: In their report, Kok and Berden (2009) show that the price is the dominant factor in childcare choices while only 9-22% of parents cite quality considerations. For a detailed discussion of this assumption, see Appendix B.1.

more attractive than informal alternatives, prompting widespread substitution from informal to formal care.

Proposition (3)*The impact of changing subsidies on university attendance:*

Assume the subsidy scheme $s(Y)$ changes such that $\frac{\partial s}{\partial Y^p} < \frac{\partial s'}{\partial Y^p} < 0$. Then, the probability of university attendance $P_i(E_i^c = 1)$ changes as:

$$\frac{dP_i}{ds} = \underbrace{P_\gamma \left(\frac{\partial f_\gamma \Psi}{\partial CC_i} + \frac{\partial f_\gamma}{\partial s}\Big|_{Y_i^p} \right)}_{\text{skills}} + \underbrace{P_\alpha \left(\frac{\partial f_\alpha \Psi}{\partial CC_i} + \frac{\partial f_\alpha}{\partial s}\Big|_{E_{cc(i)}} \right)}_{\text{preferences}} + \underbrace{\mathbf{1}_i^g P_\theta \left(\frac{\partial f_\theta \Psi}{\partial CC_i} + \frac{\partial f_\theta}{\partial s}\Big|_{CC_{s(i)}} \right)}_{\text{beliefs (girls)}}$$

where $P_\gamma \equiv \frac{\partial P_i}{\partial \gamma_i^c}$, $P_\alpha \equiv \frac{\partial P_i}{\partial \alpha_i^c}$, $P_\theta \equiv \frac{\partial P_i}{\partial \theta_i^c}$, and $\Psi \equiv \frac{\partial CC_i}{\partial s} > 0$ when $\theta_i^p \geq \theta_i^*$.

To present the derivation of Equation M6 step by step, I start from the child's probability of attending university:

$$P_i = P\big(\gamma_i^c, \alpha_i^c, \theta_i^c\big),$$

where γ_i^c is the child's skills, α_i^c their preferences, and θ_i^c their beliefs. Define $P_\gamma = \frac{\partial P_i}{\partial \gamma_i^c}$, $P_\alpha = \frac{\partial P_i}{\partial \alpha_i^c}$, and $P_\theta = \frac{\partial P_i}{\partial \theta_i^c}$. Then by the chain rule:

$$\frac{dP_i}{ds} = P_\gamma \frac{d\gamma_i^c}{ds} + P_\alpha \frac{d\alpha_i^c}{ds} + P_\theta \frac{d\theta_i^c}{ds}.$$

Next, I incorporate each element one by one:

Skills: $\gamma_i^c = \beta_0 \gamma_i^p + \beta_1 Y_i + \frac{\beta_2 CC_i}{1+\lambda(\gamma_i^p + Y_i)} + \xi_i$ Differentiating:

$$\frac{d\gamma_i^c}{ds} = \beta_1 \frac{dY_i}{ds} + \frac{\beta_2}{1+\lambda(\gamma_i^p + Y_i)} \frac{dCC_i}{ds} - \beta_2 CC_i \frac{\lambda}{(1+\lambda(\gamma_i^p + Y_i))^2} \frac{dY_i}{ds}.$$

Preferences: $\alpha_i^c = \psi_0 E_i^p + \psi_1 \frac{E_{s(i)}^p}{1+E_i^p} + \psi_2 \frac{E_{cc(i)}^p \cdot CC_i}{1+E_i^p} + \omega_i$, Differentiating:

$$\frac{d\alpha_i^c}{ds} = \psi_2 \frac{E_{cc(i)}^p}{1+E_i^p} \frac{dCC_i}{ds} + \psi_2 \frac{CC_i}{1+E_i^p} \frac{\partial E_{cc(i)}^p}{\partial s}.$$

Beliefs: $\theta_i^c = \varphi_0 \theta_i^p + \varphi_1 CC_i + \varphi_2 CC_{s(i)} + v_i$, Differentiating:

$$\frac{d\theta_i^c}{ds} = \varphi_1 \frac{dCC_i}{ds} + \varphi_2 \frac{dCC_{s(i)}}{ds}.$$

Combining: Let $\Psi \equiv \frac{dCC_i}{ds} > 0$. Then

$$\begin{aligned}
\frac{dP_i}{ds} = {} & P_\gamma \left(\beta_1 \frac{dY_i}{ds} + \frac{\beta_2}{1+\lambda(\gamma_i^p + Y_i)} \Psi - \beta_2 CC_i \frac{\lambda}{(1+\lambda(\gamma_i^p + Y_i))^2} \frac{dY_i}{ds} \right) \\
& + P_\alpha \left(\psi_2 \frac{E_{cc(i)}^p}{1+E_i^p} \Psi + \psi_2 \frac{CC_i}{1+E_i^p} \frac{\partial E_{cc(i)}^p}{\partial s} \right) \\
& + \mathbf{1}_{\{\text{girl}_i\}} P_\theta \left(\varphi_1 \Psi + \varphi_2 \frac{dCC_{s(i)}}{ds} \right)
\end{aligned}$$

where:

- $P_\gamma, P_\alpha, P_\theta > 0$ by monotonicity of university attendance in skills, preferences, and beliefs. Following Proposition 1 and Proposition 2:

- Preference terms are positive if $\psi_2 > 0$ and subsidy raises CC_i or increases $E^p_{cc(i)}$
- Belief terms are positive for girls if $\varphi_1, \varphi_2 > 0$, since both own attendance and peer prevalence rise with subsidies.

Assumption (2) ***Changing subsidies do not increase household income:*** In Section 3.2, I demonstrated that maternal labor supply or household income didnot change, hence, empirically $\frac{dY_i^p}{ds} \approx 0$ (no income response, see Table A2).

Without an income effect, a reform that changes subsidies can impact university graduation only through *direct* effect of attending childcare: $\Psi = \frac{\partial CC_i}{\partial s}$:

$$\begin{aligned}\frac{dP_i}{ds} = P_\gamma\left(\frac{\beta_2}{1+\lambda(\gamma_i^p + Y_i)}\Psi\right) \\ + P_\alpha\left(\psi_2\frac{E^p_{cc(i)}}{1+E_i^p}\Psi + \psi_2\frac{CC_i}{1+E_i^p}\frac{\partial E^p_{cc(i)}}{\partial s}\right) \\ + \mathbf{1}_{\{\text{girl}_i\}}P_\theta\left(\varphi_1\Psi + \varphi_2\frac{dCC_{s(i)}}{ds}\right)\end{aligned}$$

Now, with a complete theoretical framework, I define critical conditions that provide testable predictions in the data.

B.2 Critical thresholds in skills, preferences, and beliefs

B.2.1 Skill threshold γ_i^*

To formalize how changes in childcare exposure affect university attendance decisions, consider the critical skill threshold γ_i^* where individuals are indifferent between attending university or not. From Equation M2, this threshold is defined by:

$$\alpha_i^c + E[W(\gamma_i^*, E_i^c = 1)](1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl}) - \kappa = E[W(\gamma_i^*, E_i^c = 0)](1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl})$$

Rearranging and defining the university premium $\Pi(\gamma_i^*) = E[W(\gamma_i^*, E_i^c = 1)] - E[W(\gamma_i^*, E_i^c = 0)]$:

$$\alpha_i^c + \Pi(\gamma_i^*)(1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl}) = \kappa$$

Now let's define how does γ_i^* respond to changes in preferences α_i^c and beliefs θ_i^c:
Beliefs θ_i^c (girls only): Taking the total derivative with respect to θ_i^c when $\mathbf{1}_i^{girl} = 1$:

$$\Pi'(\gamma_i^*)\frac{\partial \gamma_i^*}{\partial \theta_i^c}(1 - \zeta(1-\theta_i^c)) + \Pi(\gamma_i^*)\cdot\zeta = 0$$

Solving for the threshold derivative:

$$\frac{\partial \gamma_i^*}{\partial \theta_i^c} = \frac{-\zeta\Pi(\gamma_i^*)}{\Pi'(\gamma_i^*)(1-\zeta(1-\theta_i^c))} < 0$$

When childcare beliefs improve (θ_i^c increases), girls experience a decrease in the discount factor $\zeta(1-\theta_i^c)$, making university more attractive at any given skill level. To maintain indifference at the fixed cost κ, the threshold skill level must decrease, creating a pool of lower-skill girls who switch from non-attendance to attendance.

Preferences α_i^c (both genders): Taking the total derivative with respect to α_i^c:

$$1 + \Pi'(\gamma_i^*)\frac{\partial \gamma_i^*}{\partial \alpha_i^c}(1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl}) = 0$$

Solving for the threshold derivative:

$$\frac{\partial \gamma_i^*}{\partial \alpha_i^c} = \frac{-1}{\Pi'(\gamma_i^*)(1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl})} < 0$$

When preferences for university increase (α_i^c increases), the threshold skill level decreases for both genders, allowing lower-skill individuals to find university attendance worthwhile. For girls, this effect is amplified by the belief-adjusted discount factor $(1-\zeta(1-\theta_i^c))$, while for boys the effect operates through the full university premium $\Pi(\gamma_i^*)$.

Changes in the skill threshold by genders: Taking the total differential of the skill threshold and substituting the derived partial derivatives:

$$d\gamma_i^* = \frac{-1}{\Pi'(\gamma_i^*)(1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl})} d\alpha_i^c + \frac{-\zeta\Pi(\gamma_i^*)}{\Pi'(\gamma_i^*)(1 - \zeta(1-\theta_i^c))} d\theta_i^c \cdot \mathbf{1}_i^{girl}$$

Factoring out the common terms and reorganizing, we get:

$$d\gamma_i^* = \frac{-1}{\Pi'(\gamma_i^*)} \left[\frac{d\alpha_i^c}{1 - \zeta(1-\theta_i^c)\mathbf{1}_i^{girl}} + \frac{\zeta\Pi(\gamma_i^*) \cdot d\theta_i^c \cdot \mathbf{1}_i^{girl}}{1 - \zeta(1-\theta_i^c)} \right] \tag{B4}$$

Since $1 - \zeta(1-\theta_i^c) < 1$, this implies: $|d\gamma_{i,girls}^*| > |d\gamma_{i,boys}^*|$

B.2.2 Preference threshold α_i^*

From the indifference condition $\alpha_i^c + \Pi(\gamma_i^c)(1-\zeta(1-\theta_i^c)) = \kappa$ we can solve for the critical preference threshold:

$$\alpha_i^* = \kappa - \Pi(\gamma_i^c)(1 - \zeta(1-\theta_i^c)).$$

where:

- $\frac{\partial \alpha_i^*}{\partial \theta_i^c} = -\Pi(\gamma_i^c)\zeta < 0$: the preference threshold α_i^* declines for girls when beliefs become more accepting of childcare.
- $\frac{\partial \alpha_i^*}{\partial \kappa} = 1 > 0$ increasing cost of university increases threshold value for preferences
- $\frac{\partial \alpha_i^*}{\partial \Pi} = -(1 - \zeta(1-\theta_i^c)) < 0$ the preference threshold α_i^* declines when returns from university become stronger.

B.2.3 Belief threshold θ_i^*

Solving the same indifference condition for θ_i^c for girls gives

$$\alpha_i^c + \Pi(\gamma_i^c)(1 - \zeta(1-\theta_i^*)) = \kappa,$$

which rearranges to

$$\theta_i^* = \frac{\kappa - \alpha_i^c - \Pi(\gamma_i^c)(1-\zeta)}{\Pi(\gamma_i^c)\zeta}.$$

where:

- $\frac{\partial \theta_i^*}{\partial \alpha_i^c} = -\frac{1}{\Pi(\gamma_i^c)\zeta} < 0$: increasing preferences decline the belief threshold that makes attending university worthwhile
- $\frac{\partial \theta_i^*}{\partial \Pi} = -\frac{\kappa - \alpha_i^c}{\Pi(\gamma_i^c)^2\zeta}$: a larger university premium reduces the belief threshold (Under the empirically relevant case $\kappa > \alpha_i^c$).