UNIVERSITAT DE BARCELONA

Essays on Gender Economics

Thu Ha Luong

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PhD in Economics

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To my dad, Nhan Luong, in heaven
To my mom and my sister, Khanh Hoang and Phuong Luong
To my brother-in-law, my niece & nephew, Chinh Do, Van and Kiet

"Excluding women simply makes no economic sense—and including them can be a tremendous boon to the 21st century global economy."

Christine Lagarde, IMF Chief (2011 – 2019)

Acknowledgments

Embarking on this PhD journey has proven to be far more challenging than I ever anticipated. Beginning my doctoral studies immediately following the peak of the Covid pandemic forced the first year to transition online, severely limiting my interactions with professors and colleagues. Just as life began to regain some semblance of normalcy, a devastating blow struck with my father's cancer diagnosis in December 2021. Tragically, he passed away a mere five months later. During his final days, I made a promise to him that I would complete my PhD with determination and perseverance. Now, as I stand on the brink of fulfilling that promise, I am deeply grateful for the unwavering support of numerous incredible individuals who have aided me on this journey.

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Thu Ha Luong
Barcelona, 2024

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1 Introduction

The intersection of gender and economics is a critical area of examination and intervention in contemporary society. In his seminal work, Eswaran (2014) emphasizes the significance of gender in economic decisions, contexts, and outcomes, highlighting substantial and consistent differences between men and women. Nelson (2016) further underscores the importance of gender in economics from a feminist perspective. She posits that gender matters in economics owing to divergent economic experiences between men and women, entrenched stereotypical linkages between gender and various traits and activities, and historical biases favoring *masculine* over *feminine* activities.

Over the past few decades, the literature has extensively documented gender gaps across various social and economic outcomes.[1] These gaps manifest at different life stages, ranging from childhood nutrition intake (Jayachandran and Kuziemko, 2011; Hafeez and Quintana-Domeque, 2018), to school enrollment (Duflo, 2012; Evans et al., 2020), and choice of field of study (Bharadwaj et al., 2016). They extend further to labor force participation (Alesina et al., 2013; Bernhardt et al., 2018), unpaid care work (Ferrant et al., 2014), and occupational pensions (Zhao and Zhao, 2018).

In addition, the literature presents various potential explanations for these gaps, including gender bias, social norms (Fernández and Fogli, 2009; Jayachandran, 2015), gender differences in choices or preferences (Bertrand, 2020), and disparities in psychological attributes between men and women (Niederle and Vesterlund, 2007; Croson and Gneezy, 2009; Recalde and Vesterlund, 2020).

Despite the abundance of theories and evidence, addressing key questions about the existence and drivers of gender gaps remains essential: Where do gender gaps exist? Why do they persist? Which factors contribute to their perpetuation? How can we effectively mitigate them? This dissertation aims to enhance our understanding of gender gaps and their underlying causes to inform policy formulation. Comprising three chapters, the thesis contributes to two strands of research in gender economics.[2] The first strand examines gender differences in economic outcomes in both developed and developing countries. The second strand delves into drivers of gender disparity, specifically exploring factors contributing to their formation and evolution.

[1] Gender gaps refer to the observed differences between men and women or between boys and girls in the relevant outcomes (Shang, 2022).

[2] The field of gender economics is grounded in economic theories and empirical methodologies to comprehend the mechanisms underlying gender inequalities (Sevilla, 2020).

The first line of research includes Chapter 2, published in Plos One in 2022, and Chapter 3, a collaborative work with Judit Vall Castello from the University of Barcelona and Lidia Farre from the Institut d'Anàlisi Econòmica. In Chapter 2, titled *"Business grants following natural disasters and their different impact on the performance of female and male-owned microenterprises: Evidence from Sri Lanka"*, I investigate how business grants affect the performance of microenterprises owned by females and males after the 2004 tsunami in Sri Lanka. Using panel data from an experiment providing business grants to microenterprises in affected districts, I find a positive impact on male-owned firms' performance, but no effect on female-owned firms' performance. Potential mechanisms include gender differences in business investment, household expenditure, and initial business closures. Additionally, the study reveals a positive effect of business grants on the psychological recovery of recipients, with no significant gender differences observed in this dimension. This chapter offers policy implications for business recovery programs aimed at supporting female microentrepreneurs following natural disasters.

In Chapter 3, titled *"Are female-dominated cancers underfunded?"*, transitioning to a developed context, we present evidence of systematic underfunding for female-dominated cancers in Europe.[3] We analyze novel own-collected datasets of projects awarded by the European Research Council (ERC) and by the European Commission under the Seventh Framework Programme (FP7) and the Horizon 2020 (H2020) Framework Programme. Our findings reveal a significant correlation: a 10-percentage point increase in male relative mortality corresponds to approximately a 0.3% increase in the awarded research fund in the ERC dataset, and a 0.8% increase in the awarded research fund in the FP7 & H2020 dataset.[4] We discuss potential reasons for this unequal distribution of funding. These include over-representation of male scholars, funding bias against female researchers, a higher share of male members in the evaluation panel favoring male-dominated cancer projects, and the prevalence of male-dominated cancers. This chapter contributes to our understanding of unequal cancer research funding, emphasizing the impact of gender dynamics within cancer research.

In the second line of research, Chapter 4, titled *"Unintended Consequences of CCT Programs on Gender Role Attitudes"*, delves into the impact of policies on gender norms, a fundamental driver of gender inequalities in developing countries. This investigation focuses on Juntos, the largest conditional cash transfer (CCT) program in Peru. Using data from the Young Lives Survey and employing the fuzzy

[3] Female-dominated cancers refer to types of cancer wherein the number of male deaths is equal to or fewer than female deaths.

[4] Male relative mortality is defined as the ratio between the number of male deaths and the total deaths caused by a specific type of cancer.

regression discontinuity design, I find that the program reinforces traditional gender role attitudes among children in beneficiary households. These attitudes align notably with children's behaviors, particularly among girls. Beneficiary girls allocate more daily time to caregiving and unpaid household labor, which, is in line with their lower test scores in reading and mathematics. Investigating potential mechanisms reveals that beneficiary mothers are more likely to prioritize their time on home production over paid work or self-employment. This shift in mother's time priority serves as a channel for perpetuating traditional gender role attitudes among children. This chapter contributes to our understanding of the complex relationship between policies and gender norms.

All together, the three chapters offer comprehensive insights into diverse aspects of gender gaps and their underlying causes across various contexts, making significant contributions to the broader field of gender economics. Each chapter will be discussed in more detail in Chapters 2, 3 and 4, highlighting their unique contributions to the existing literature. Chapter 5 will then conclude by summarizing the findings and proposing avenues for future research.

2 Business Grants Following Natural Disasters and Their Different Impact on the Performance of Female and Male-owned Microenterprises: Evidence from Sri Lanka[1]

Keywords: Gender; Small Business; Cash Transfer; Natural Disaster

JEL Codes: J16; L26

2.1 Introduction

Natural disasters have posed massive challenges for humans throughout history. On average, such extreme large-scale events kill 45,000 people per year and account for 0.1% of global deaths (Ritchie and Roser, 2014). Moreover, natural disasters resulted in massive economic losses of approximately one trillion U.S. dollars from 1980 to 2004 (Strömberg, 2007). Out of all the highly vulnerable groups, micro, small and medium-sized enterprises (MSMEs), which are arguably the backbone of economic growth, have been affected particularly severely by these catastrophic

[1]This chapter benefits greatly from comments and discussions with Judit Vall, Lidia Farre, Guillem Riambau, and Albert Sole Olle. Special thanks are given to the academic editor, Maria del Carmen Valls Martinez, and three anonymous referees for their invaluable suggestions, which have substantially improved the paper. The useful feedback was obtained from seminar participants at the University of Barcelona, Autonomous University of Barcelona, the 13th IES conference, SAEe 2021, and the 16th ACEGD ISI Delhi. Previously, this chapter was circulated under the title "Natural disasters and enterprise recovery: A gender approach". It was published in PLOS One on December 21, 2022, as *Luong H (2022) Business grants following natural disasters and their different impact on the performance of female and male-owned microenterprises: Evidence from Sri Lanka. PLOS ONE 17(12): e0279418. https://doi.org/10.1371/journal.pone.0279418.*

weather events. Owing to their limited preparedness and inadequate financial resources, the physical damage and lifeline disruption caused by natural disasters often lead to negative consequences on MSME operations. The Pakistan floods of 2010, for example, caused 75.4% of surviving firms to run at a loss compared to their situation before the floods, and only 7.7% were able to keep their operation at the same level (Asgary et al., 2012). Moreover, large-scale catastrophes can force MSMEs to close down or relocate in their aftermath (Ballesteros and Domingo, 2015). For instance, around 43% of U.S. enterprises that have experienced disasters have never reopened, and another 29% of them have closed within two years (Sarmiento et al., 2016).

With regard to the gender of owners, the disaster literature suggests that female owners are more likely than their male counterparts to face greater obstacles. In the context of the United States, female-led enterprises are more likely to be rejected than male-led enterprises when they apply for Small Business Administration (SBA) disaster loans (Nigg and Tierney, 1990). In addition, natural disasters tend to reinforce the disadvantages of female owners compared to male owners when they begin their businesses. For example, they have lower capital and less insurance, which in turn leads to slower recovery and lower rates of survival (Marshall et al., 2015). In the wake of natural disasters, a common way to support MSMEs is to provide business grants to remove credit constraints, assist in the recovery process and strengthen resilience. A few papers report a positive impact of business grants on firm survival (Gallagher et al., 2023) and on firm revenue, profits and savings (Berkel et al., 2021). However, there is little evidence about gender differences in relation to the impact of business grants on firm performance following extreme weather events.

Given the gap in knowledge, this chapter aims to investigate whether female-owned and male-owned microenterprises reap the same benefit from a business grant following the 2004 Indian Ocean tsunami in Sri Lanka. Sri Lanka provides an interesting context for study. First, the country was completely unprepared for the tsunami since the previous tsunami generated by the Krakatoa volcanic eruption, which happened in 1883, had little effect on Sri Lanka. By contrast, the 2004 Indian Ocean tsunami is considered to be one of the deadliest natural disasters in the country, resulting in over 36,000 deaths and the displacement of 800,000 people (Department of Census and Statistics, 2005). Second, MSMEs are the foundation of the Sri Lankan economy, contribute 52% to the country's gross domestic product (GDP) and account for 90% of all businesses. Following the tsunami, it is estimated that around 25,000 microenterprises were damaged by the large-scale disaster. Third, despite some significant progress on women's rights, gender inequality is still a prevalent issue in Sri Lanka. Sri Lankan women face several persistent

challenges such as limited education, intimate partner violence and traditional gender roles around family responsibilities. Moreover, the post-tsunami period created more challenges for women in the country since they faced economic hardship and increased care-giving stress and burnout (Banford and Froude, 2015).

To shed light on the issue, this study uses a panel dataset from an experiment that was conducted in Sri Lanka after the 2004 Indian Ocean tsunami. Carried out by researchers from the World Bank Group, Sri Lanka's University of Peradeniya and the United Kingdom's University of Warwick (De Mel et al., 2005-2010), the experiment focused on low-capital microenterprises in three coastal districts that were severely affected by the tsunami. A baseline survey was conducted in April 2005 after a screening survey of households from 25 divisions in the 2001 Sri Lankan census. Following the baseline survey, the research group randomly assigned one-time grants of either 10,000 or 20,000 Sri Lanka rupees (LKR), which was equivalent to 100 U.S. dollars or 200 U.S. dollars (exchange rate in 2005) in the form of cash or in-kind payments to enterprises. Researchers interviewed enterprises in 11 waves from April 2005 to April 2008 and then 2 follow-up waves in 2010. This study mainly focuses on the first 11 waves to measure the short-term impact of the business grant. The results suggest that the business grant has different effects on the performance of male-owned firms and female-owned firms. The potential underlying mechanisms include gender differences in business investment, household expenditure and initial business closures. Moreover, the grant has a positive effect on the psychological recovery of small business owners. Note that even though gender refers to the socially constructed characteristics of women and men while sex refers to the different biological and physiological characteristics of males and females, in this chapter, gender and sex are used as synonyms.

There are three related research articles that utilize data from this experiment. De Mel et al. (2008) and De Mel et al. (2009) examine the return to capital and the gender gap in the treatment effect among a sub-sample of indirectly affected and unaffected firms, since they argue that the recovery process of directly affected firms might have an impact on the return to capital. More specifically, the authors in De Mel et al. (2008) explore the effects on firm performance of four treatment types, which are classified by method (cash or in-kind) and amount (10,000 or 20,000 LKR). Their results suggest that all treatments (10,000 LKR cash, 10,000 LKR in-kind, 20,000 LKR cash, 20,000 LKR in-kind) have positive impacts on capital stock, while three treatments have positive effects on firm profit. In addition, they show that the real return to capital in the experiment is higher than the market interest rate. They then provide evidence of heterogeneous treatment effects across the characteristics of owners and the household of owners. Their results indicate that the high real return to capital is likely to reflect credit constraints among microen-

terprises.

In De Mel et al. (2009), the authors investigate the mean treatment effects and returns to capital by gender. They find a large positive and significant effect for male-owned firms, but zero effect for female-owned firms. Subsequently, they offer some potential mechanisms, including gender differences in investing the grant in capital stock, the association between behaviors of female recipients and whether they were in male or female-dominated sectors, and the evidence that grants to women were "captured" by their spouses. The same group of authors explore enterprise recovery following a natural disaster, but without the gender perspective in De Mel et al. (2012a). In order to estimate the treatment effects on capital stock, business income and enterprise recovery, they compare firms in directly affected zones with firms in indirectly affected and unaffected zones. Their key findings are that business grants speed up the recovery of small enterprises, and that firms in retail sectors benefit more from the grants than firms in manufacturing and service sectors.

The present study differs from the aforementioned papers in the following ways: (i) the study treats all firms in the experiment as if they experienced some potential impacts of the tsunami, but not uniformly so; (ii) it provides new insights into possible mechanisms that are closely related to the recovery process, including household expenditure on basic needs and initial business closures; (iii) it explores the treatment effect and potential gender differences in the psychological recovery of owners following the tsunami; and (iv) the external validity of the main results is tested using microenterprise level data in the context of coronavirus disease (COVID-19) pandemic.

First, the results suggest that the business grant has a significantly positive impact on the performance of male-owned firms, but zero effect on that of female owned-firms. On average, male-owned firms have a 1,878 LKR increase in profit, which is 41.5% of the baseline profit of the control group. The profit of female-owned firms is around 1,552 LKR smaller than their male counterparts. The overall female treatment effect on profit is then tested, and the results indicate that the null hypothesis of zero treatment effect on the performance of female-owned firms is not rejected. The baseline result holds when other observable characteristics that might differ between female and male owners besides their gender are added to the regression model. In addition, treatment effects are heterogeneous across treatment amounts, sectors and levels of asset damage caused by the tsunami.

Next, the study explores the underlying mechanisms that drive the results. The heterogeneous treatment effects within the subgroups receiving 10,000 LKR and 20,000 LKR suggest that the two treatment amounts should be analyzed separately. The findings suggest that female owners in the subgroup receiving the smaller treat-

ment amount invest less in capital stock and inputs, but pay more interest on firm loans than their male counterparts. In the subgroup receiving the higher treatment amount, female owners spend more on their household basic needs than male owners. In addition, the chapter investigates gender differences in closing the initial business. The results indicate that female owners in the treatment group, especially in the subgroup receiving 10,000 LKR, are more likely to change the line of their business or change both the location and line of their business, or no longer be engaged in self-employment, than other subgroups.

Further, the chapter presents evidence of treatment effects on the psychological recovery of small business owners following natural disasters. The finding suggests that receiving a business grant has a significant and positive impact on recipients' mental recovery. However, there is no evidence supporting gender differences in this dimension.

Finally, the external validity of the main results is confirmed in the context of the COVID-19 pandemic. The findings indicate that the sales of female-owned firms decrease significantly more than those of male-owned firms even though they receive similar business supports. This result provides suggestive evidence that the main results appear to hold in other contexts, and are not limited to Sri Lanka.

2.2 Literature Review

There are two main doctrines related to the literature concerned with gender differences in firm performance: liberal feminism and social feminism (Black, 1989). Liberal feminist theory explains that outcomes are different between men and women because women face discrimination that prevents them from accessing vital resources (Fischer et al., 1993). If women and men are given equal opportunities, women and men will attain their capacities more equally, and the observed differences in outcomes will then diminish. On the contrary, social feminist theory holds the belief that men and women are not the same by nature, and these differences (such as traits and/or experiences) may cause them to have different behaviors that affect firm performance. In the situation that female-owned firms and male-owned firms receive the same business intervention, liberal feminism theory suggests that they should benefit equally from the intervention. Similarly, despite men and women being inherently different by nature, social feminist theory does not imply any differences in their firm performance based on these characteristics. Therefore, female-owned firms and male-owned firms should reap similar benefits from the same business intervention under both theories.

In most experimental studies, however, the empirical literature documents that gender differences do exist in relation to the return on business interventions under

normal circumstances. For instance, Gine and Mansuri (2014) find that a business training program in rural Pakistan has a positive effect only on the business outcomes of small male businesses, not on those of their female counterparts. In the context of Ghana, Fafchamps et al. (2014) report an increase in profit from an in-kind grant to both male and female-owned firms, but the effect on male-owned firms is larger. Moreover, only female-run businesses with high initial profit (the largest 40% of firms) benefit from the in-kind grant. With respect to a cash grant, they document some impacts on male businesses, but no impact on female businesses. A more recent work by Fiala (2018) confirms gender differences in the effects of micro-credit in Uganda, finding that there is zero effect on the business outcomes of female-run businesses, but a positive and significant effect on those of male-run businesses. While previous studies focus solely on normal situations, this chapter extends the literature by shedding light on gender differences in returns to a grant given in the context of post-disasters. More specifically, the study tests the following hypothesis: *An experimental business intervention following natural disasters has the same impact on the performance of female and male-owned microenterprises*.

In addition, the present study is connected to the literature that investigates the relationship between small business grants and firm survival. Previous studies investigate the grant effect on the survival probabilities of all firms without addressing the gender aspect of owners or by focusing only on female-owned firms. Overall, in both normal situations and recessions, small businesses tend to benefit from business grants through an improvement in their likelihood of survival. Pellegrini and Muccigrosso (2016), for example, report the positive effect of capital subsidies on start-up survival in the south of Italy. In the context of Croatia, Srhoj et al. (2019) document that entrepreneurship grants to women increase the chance of firm survival among both young and mature women entrepreneurs. The recent work of Srhoj et al. (2021), also in Croatia, provides evidence of a positive effect from business development grants on young small firm survival during the recession from 2009 to 2014. The chapter contributes to this body of literature by exploring gender differences in initial business closures in the short term after receiving an experimental business grant following natural disasters. More specifically, small women-owned businesses are more likely than small men-owned businesses to close their firms.

Finally, this chapter is relevant to the growing literature that examines the relationship between cash transfer programs and mental health outcomes. Previous studies focus mostly on children or households, and the results have been inconclusive. Several papers report a positive impact from cash transfers on the mental health outcomes of beneficiaries, including Haushofer and Shapiro (2016), Kilburn et al. (2016) and Shangani et al. (2017) in Kenya, Angeles et al. (2019) in Malawi,

Ohrnberger et al. (2020) in South Africa, and Tozan et al. (2019) in Uganda. In contrast, some papers document zero effect of cash transfer programs on the psychological well-being of household members. For instance, Paxson and Schady (2010) suggest no improvement in maternal mental health from the Bono de Desarrollo Humano program in Ecuador. Özler et al. (2020) find a similar result on the effect of a gender mentoring and cash transfer intervention on girls aged 13 or 14 in Liberia. However, there is scarce evidence in the context of post-disasters and when small business owners are the targeted beneficiaries. This chapter is the first attempt to experimentally examine the effect of receiving a business grant on the psychological recovery of microentrepreneurs.

2.3 Materials and Methods

The main data in the study come from an experiment that was conducted by researchers from the World Bank Group, the University of Peradeniya in Sri Lanka and the University of Warwick in the United Kingdom (De Mel et al., 2005-2010). The investigators confirmed that Human Subjects approval for the study was obtained from the University of California, San Diego's Human Research Protections Program, project number 061050S. The project's title is "Rebuilding Sri Lankan Microenterprise After the Tsunami". Information on the general purpose of the study was provided to participants and their written informed consent was obtained (De Mel et al., 2012b).

2.3.1 Experiment

2.3.1.1 Experimental Design and Survey Data

On December 26, 2004, a tsunami struck Sri Lanka in the wake of a magnitude 9.2 earthquake in Sumatra. This is considered to be the most devastating tsunami in Sri Lankan history. The total amount of physical damage was approximately 1.5 billion U.S. dollars, which was 7.2% of Sri Lanka's GDP in 2004 (Perera, 2007). The coastlines were severely affected, resulting in over 30,000 deaths, the displacement of thousands of households, and major losses of livelihood capital, community infrastructure, buildings and roads (World Vision, 2007). Following the tsunami, researchers from the World Bank Group, the University of Peradeniya in Sri Lanka and the University of Warwick in the United Kingdom designed a randomized control trial to quantify the impact of providing a business grant to microenterprises in three coastal southern and south-western districts (Kalutara, Galle, and Matara). The three districts were severely impacted with large numbers of deaths, missing people, displaced families, and losses of assets, poultry and livestock.

The target population of the experiment consisted of low-capital enterprises with less than 100,000 LKR in capital (excluding land and buildings), no paid employees, and owners who worked at least 30 hours per week and were from 20 to 65 years old. Using the 2001 Sri Lankan census, researchers selected 25 Grama Niladhari divisions (GNs) in Kalutara, Galle, and Matara. A GN is an administrative unit consisting of around 400 households on average. The choice was made based on a number of factors, including a high percentage of own-account workers and modest education levels, in order to yield a sufficient number of enterprises whose invested capital lay below the threshold. In the next step, researchers administered a screening survey of 3,361 households to identify firms with owners that met the experiment's criteria. The baseline survey was then carried out with 659 firm owners in April 2005. After reviewing the baseline data, researchers dropped 42 firms whose capital exceeded the threshold, leaving 617 microenterprises in the baseline sample. However, the number of firms dropped from 617 to 608 between the first and second waves. Following De Mel et al. (2012a), the present study focuses on the 608 firms that appeared in both waves. Microenterprises in the sample were classified into three groups, including firms in directly affected zones, firms in indirectly affected zones and firms in unaffected zones, which were located 410 meters (205 firms), 750 meters (208 firms) and 5.2 kilometers (195 firms) from the coast, respectively.

After the baseline survey, a one-time grant of either 10,000 or 20,000 LKR in the form of cash or business equipment was randomly provided to enterprises in May 2005 and November 2005. With respect to business equipment, first the enterprise owner chose the material, and then research staff from the project purchased the material for the firm. In the case of cash grants, the owners were told to purchase anything without restriction. In the experiment, the number of firms that received the business grant of 10,000 LKR and 20,000 LKR accounted for two-thirds and one-third of all treated firms, respectively. Note that the larger grant was approximately 80% of the median pre-tsunami capital stock of firms that suffered some damage from the tsunami.

At the first point of treatment (May 2005), the grant was received by 88 firms in directly affected zones, 72 firms in indirectly affected zones and 54 firms in unaffected zones, leaving 394 firms in the control group. At the second point of treatment (November 2005), out of the 394 firms that did not previously receive the business grant, 29 firms, 39 firms and 60 firms in directly affected, indirectly affected and unaffected zones, respectively, were provided cash or business equipment in one of two treatment amounts. From April 2006, the research team also initiated giving a token cash payment of 2,500 LKR to enterprises that had not received any treatment as an incentive to take part in the survey. In total, the survey

includes thirteen waves of data collection. Figure 2A.1 in Appendix 2A shows the timeline of the treatment and survey waves in detail. Moreover, in four waves of the panel, a complementary household survey was administered to gather information about the households of baseline owners.

While the experiment included firms in unaffected zones, the present study treats all enterprises as if they had experienced some potential impacts of the tsunami, though not uniformly so. This is because natural disasters often lead to broken supply chains (Carvalho et al., 2020), harder market conditions and shrinking demand for firms in affected regions owing to financial difficulties and the displacement of clients. The data from the baseline survey suggest that in the unaffected zones, approximately 32% of firms bought inputs from suppliers in the same divisional secretariats (DS) but different GNs, while 25% of firms bought inputs from suppliers in the same district but different DS.[2] Moreover, 36% of those firms had customers in the same GN more than one kilometer from businesses, while 28% had customers in the same DS but a different GN. With respect to business demand, in the unaffected zones, 36% of firms reported that they had fewer customers in the baseline survey compared to their usual number of customers before the tsunami, and 14% of owners of those firms directly witnessed the tsunami. Further, 10% of firms in the indirectly affected zones had business assets damaged or destroyed by the tsunami. Therefore, the chapter argues that all firms in the experiment found themselves in a context of post-disaster recovery.

Attrition in data collection is quite low. In the baseline survey, there were 311 male-owned and 297 female-owned firms. Out of all the firms that reported their profits, 271 male-owned firms (90.6%) and 253 female-owned firms (89.7%) continued to provide information about profits and sales over the five waves. Moreover, the attrition rates in the female and male sub-samples are very similar, with 77.9% of 299 male-owned firms and 76.2% of 282 female-owned firms reporting their profits in all 11 waves.

2.3.1.2 Randomization Check

The randomization was stratified by computer based on district (Kalutara, Gale and Matara) and level of damage caused by the tsunami (directly affected, indirectly affected and unaffected). Since gender is not a criterion in the randomization process, it is necessary to verify randomization in regard to the gender of owners.

Table 2.1 provides the balance test on observable characteristics in the male and female sub-samples. In terms of owner characteristics, on average, the treatment group and the control group in both sub-samples are very comparable, without any statistically significant differences. With respect to firm characteristics, on average,

[2]DS are administrative sub-units of districts in Sri Lanka with a population of around 60,000.

there are no significant differences between treated and control female-owned firms. In the male sub-sample, treated and control male-owned firms are different only by sector, which is represented by the variable *Retail/trade* that equals 1 if the firm is in the retail or trade sectors, and 0 when the firm belongs to the manufacturing or service sectors. On average, the treatment group has more male-owned firms in retail and trade sectors than the control group. The result suggests that even though the randomization is not stratified by gender, the treatment group and control group by gender are balanced on observable characteristics. Table 2A.1 in Appendix 2A sets out the list and definition of variables used in the study.

Table 2.1: Randomization Check by Gender

	Male			**Female**		
Variable	Control	Treat	P-val. diff	Control	Treat	P-val. diff
Owner characteristics						
Ability	-0.071	0.009	(0.578)	0.010	0.025	(0.923)
Experience	0.695	0.652	(0.440)	0.639	0.591	(0.414)
Age	42.370	42.528	(0.902)	41.030	41.741	(0.583)
Married	0.815	0.881	(0.106)	0.748	0.790	(0.393)
Migrant	0.148	0.091	(0.119)	0.119	0.148	(0.458)
Working hour	0.593	0.608	(0.785)	0.385	0.383	(0.965)
Household size	4.948	5.085	(0.493)	4.867	4.833	(0.872)
Firm characteristics						
Pre-investment	0.637	0.631	(0.909)	0.459	0.500	(0.486)
Retail/trade	0.407	0.506	(0.085)*	0.333	0.352	(0.739)
Firm age	10.170	12.108	(0.119)	10.176	10.578	(0.738)
Real profit	4,523	4,500	(0.961)	2,813	2,819	(0.986)
Real sales	14,036	14,259	(0.911)	8,802	8,541	(0.847)
Invested capital without land	32,472	30,394	(0.551)	21,524	24,355	(0.338)
Total number of workers	1.356	1.466	(0.133)	1.407	1.457	(0.497)
Interest payment	50.000	136.875	(0.178)	136.874	82.407	(0.426)
Observations	135	176		135	162	

Note: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table 2.2 further reports comparability within gender groups in two sub-samples of firms with and without tsunami-induced asset damage. In both sub-samples, there is no statistically significant difference, on average, between treated and control female-owned firms, except for owner ability in the sub-sample of firms with asset damage. With regard to male-owned firms, the treated group is weakly but significantly different from the control group in terms of owner ability, owner migration, firm sector (in the sub-sample of firms without asset damage) and total number of workers (in the sub-sample of firms with asset damage). Overall, even though the number of treated and control units in each category (classified by level of business asset damage and gender of owners) is not very large, the treatment and control groups are still quite comparable.

Table 2.2: Balance Test by Gender and by Asset Damage Caused by the Tsunami

	With asset damage						*Without asset damage*					
	Male			*Female*			*Male*			*Female*		
Variable	**Cont.**	**Treat**	**P-val.**	**Cont.**	**Treat**	**P-val.**	**Cont.**	**Treat**	**P-val.**	**Cont.**	**Treat**	**P-val.**
Owner characteristics												
Ability	0.351	0.004	(0.167)	-0.061	0.363	(0.062)*	-0.308	0.012	(0.066)*	0.054	-0.206	(0.194)
Experience	0.778	0.627	(0.112)	0.698	0.689	(0.922)	0.651	0.664	(0.851)	0.608	0.523	(0.272)
Age	40.146	42.897	(0.199)	41.625	42.373	(0.720)	43.598	42.347	(0.438)	40.701	41.295	(0.722)
Married	0.833	0.914	(0.212)	0.813	0.791	(0.779)	0.805	0.864	(0.252)	0.713	0.789	(0.232)
Migrant	0.083	0.069	(0.783)	0.167	0.179	(0.864)	0.184	0.102	(0.091)*	0.092	0.126	(0.462)
Working hours	0.500	0.569	(0.483)	0.250	0.313	(0.463)	0.644	0.627	(0.809)	0.460	0.432	(0.704)
Household size	4.542	4.672	(0.675)	4.750	5.119	(0.310)	5.172	5.288	(0.648)	4.931	4.632	(0.227)
Firm characteristics												
Pre-investment	0.604	0.586	(0.853)	0.500	0.537	(0.696)	0.655	0.653	(0.969)	0.437	0.474	(0.620)
Retail/Trade	0.458	0.483	(0.804)	0.208	0.328	(0.159)	0.379	0.517	(0.051)*	0.402	0.368	(0.641)
Firm age	10.833	13.707	(0.160)	11.522	11.303	(0.915)	9.805	11.322	(0.333)	9.447	10.074	(0.675)
Real profit	4,619.768	4,237.719	(0.716)	2,304.889	2,613.594	(0.502)	4,475.000	4,632.301	(0.745)	3,089.819	2,966.000	(0.786)
Real sales	11,832.292	14,422.414	(0.482)	7,016.042	7,613.060	(0.737)	15,252.874	14,179.695	(0.650)	9,787.988	9,196.000	(0.755)
Invested capital without land	34,293.645	31,615.346	(0.722)	22,413.438	28,311.270	(0.263)	31,467.068	29,794.660	(0.642)	21,033.391	21,565.684	(0.879)
Total number of workers	1.417	1.638	(0.088)*	1.417	1.448	(0.816)	1.322	1.381	(0.500)	1.402	1.463	(0.473)
Interest payment	45.833	248.276	(0.198)	340.583	80.597	(0.119)	52.299	82.119	(0.584)	24.483	83.684	(0.122)
Observations	48	58		48	67		87	118		87	95	

Note: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

2.3.2 Empirical Model

The objective of the study is to measure the difference in treatment effects on the performance of male-owned firms and female-owned firms. The chapter employs an empirical model that is close to the model of De Mel et al. (2009). However, the variable of interest in the study is *Treatment*, which is a binary variable and indicates whether a firm received a grant in a specific survey wave. In De Mel et al. (2009), the authors use the treatment amount that was assigned to each enterprise as the variable of interest. Moreover, they include the 2,500 LKR payment as treatment, but they note that the result is unchanged if the payment is ignored. Therefore, there is a little concern in using a binary treatment variable. Provided that there are two treatment amounts (10,000 LKR and 20,000 LKR) and two methods of assigning treatment (cash and business equipment), it is important to test whether there is any difference in the average treatment effects across the four types of treatment. Table 2A.2 in Appendix 2A indicates that there are no statistically significant differences in the average treatment effects on firm outcomes across all types of treatment. Therefore, the study proceeds with a binary treatment variable.

To capture the treatment impact on the performance of male-owned and female-owned firms, the chapter uses a panel data model with firm fixed effects and wave fixed effects. Firm fixed effects are included in the model to control for any time-invariant characteristics of a firm that might affect firm performance. Wave fixed effects assume that the time paths of firm outcomes are the same for male-owned firms and female-owned firms. The specification of the model is as follows:

$$Y_{it} = \alpha + \beta Treatment_{it} + \gamma Treatment_{it} \times Female_i + \lambda_i + \sum_{t=2}^{11} \omega_t + \varepsilon_{it} \qquad (2.1)$$

where Y_{it} is firm performance as measured by real monthly profit and real monthly sales of firm i in wave t. The real profit and sales correspond to firm profit and sales that are deflated to the baseline survey time and obtained from the following questions:

1. *What was the total income the business earned DURING MONTH X after paying all expenses including wages of employees, but not including any income you paid yourself? That is, what were the PROFITS of your business DURING MONTH X.*

2. *What was the total sales DURING MONTH X of products your business makes or alters (for manufacturing firms)/of products your business did not make (for retail/trade firms)/from selling services (for service firms)?*

Following De Mel et al. (2009), the chapter trims large changes in profits, in particular, the top one percent both in percentage and absolute changes. The variable of interest is $Treatment_{it}$, which equals 1 if firm i received the grant in wave t, and equals 0 otherwise. $Female_i$ equals 1 if the owner of firm i is female, and 0 otherwise. λ_i and ω_t are firm and wave fixed effects, respectively, and ε_{it} is the error term clustered at the enterprise level.

The coefficient β demonstrates the average treatment effect on the performance of male-owned firms, and γ shows the difference in treatment effects between male-owned firms and female-owned firms. The sum of β and γ is the overall average treatment effect on the performance of female-owned firms. This is an intention-to-treat analysis, which means that all firms assigned randomly to the treatment group are analyzed as being treated.

2.4 Results and Mechanisms

2.4.1 Results

2.4.1.1 Effect on Firm Performance by Gender

In this sub-section, the results of treatment impacts on firm performance by gender are provided in detail. Table 2.3 presents the estimated result from equation 2.1. Columns (1) and (2), respectively, show the $\hat{\beta}$ and $\hat{\gamma}$ coefficients when the outcomes are real profit and real sales in the whole sample, while columns (3) and (4) indicate the corresponding estimated coefficients in the sub-sample of surviving firms. Surviving firms are firms that did not change their location and their line of business in all 11 survey waves. In general, the results from the whole sample and the sub-sample of surviving firms are quite similar for both outcome variables.

The $\hat{\beta}$ coefficient is positive and statistically significant in all columns, which implies a positive treatment effect on the profit and sales of male-owned firms. On average, in the whole sample, male-owned firms have an increase in profit of 1,878 LKR, which is 41.5% of the baseline male-owned firm profit and 31% of the male-owned firm profit of the control group before the tsunami. Also, the treatment effect on sales is around 5,200 LKR.

With regard to gender differences in the impact of the business grant, statistically significant results are found only when real profit is the outcome variable. The sign of the $\hat{\gamma}$ coefficient is negative, which means that female-owned firms benefit less from the grant than male-owned firms. On average, their profit is around 1,553 LKR smaller than that of their male counterparts. The sum of $\hat{\beta}$ and $\hat{\gamma}$, which is the overall female treatment effect, is 326 LKR for all firms and 104 LKR for surviving firms. A statistical test is applied to the sum of the two estimated coefficients,

and the result indicates that the null hypothesis of zero treatment effect on female-owned firms is not rejected in all columns. This finding is similar to De Mel et al. (2009) when they take into consideration the groups of firms in indirectly affected and unaffected zones. Given these results, real profit is the only measure of firm performance used for the remainder of the chapter. Other regression results with real sales as the outcome variable are presented in Table 2A.3 in Appendix 2A.

Table 2.3: Different Treatment Impacts On the Performance of Female-owned Firms and Male-owned Firms

	All firms		**Surviving firms**	
	Real profit	**Real sales**	**Real profit**	**Real sales**
	(1)	(2)	(3)	(4)
Treatment	1878.0***	5230.1**	1984.0***	5565.2*
	(561.1)	(2590.6)	(608.9)	(2890.0)
Treatment × Female	-1552.7**	-3782.5	-1880.5***	-4543.4
	(658.6)	(3115.0)	(670.5)	(3467.6)
Firm FE	✓	✓	✓	✓
Wave FE	✓	✓	✓	✓
Overall female treatment effect = 0 (*p-values*)	0.438	0.465	0.788	0.639
Baseline Mean Dep. Var.	3688.3	11474.8	3659	11139.4
Observations	5427	5505	4743	4802
Number of clusters	601	602	492	493
R^2	0.032	0.017	0.034	0.020

Note: Standard errors, clustered at the enterprise level, are shown in parentheses. Real profits and real sales are firm profit and firm sales in LKR deflated to the baseline survey time. Firm profit is the total income that the business earned after paying all expenses including the wages of employees, but not including any income that the owners paid themselves in the month before the survey wave. Firm sales are total sales for the month before the survey wave. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

2.4.1.2 Controlling for Other Observable Characteristics

Given that the survey was conducted four months after the tsunami and the data were collected from actively operating enterprises, there might be concerns over different characteristics between male and female entrepreneurs in the sample. Female owners and male owners might not be comparable owing to selection into self-employment and their ability to keep their businesses in operation after the tsunami. Moreover, the experimental literature emphasizes a number of key differences between women and men that might affect their economic decisions, such as risk aversion (Croson and Gneezy, 2009; Eckel and Grossman, 2008), willingness to take risk (Dohmen et al., 2011), and other personality traits (Mueller and Plug,

2006). Therefore, a balance test on observable characteristics between female owners and male owners is administered in Table 2.4. Following De Mel et al. (2008), this study makes use of some of their measured characteristics of ability, personal traits, risk-taking behaviors, and locus of control.

Table 2.4: Balance Test: Male Owners versus Female Owners

	Male		Female		
Variable	**Mean**	**SD**	**Mean**	**SD**	**P-val. diff**
Father's education	7.389	(3.284)	7.433	(2.968)	(0.888)
Mother's education	7.032	(3.063)	7.086	(3.039)	(0.863)
Married	0.852	(0.356)	0.771	(0.421)	**(0.010)****
Migrant	0.116	(0.320)	0.135	(0.342)	(0.481)
Optimistic	3.083	(1.473)	3.035	(1.574)	(0.702)
Ability	-0.022	(1.188)	0.018	(1.246)	(0.695)
Experience	0.671	(0.471)	0.613	(0.488)	(0.148)
Locus of control	10.368	(1.726)	10.326	(1.759)	(0.781)
Risk aversion	0.344	(1.618)	-0.033	(1.463)	**(0.003)*****
Willingness to take risk	6.564	(1.984)	6.386	(2.192)	(0.309)
Owner age	42.460	(11.232)	41.418	(11.092)	(0.250)
Financial literacy	0.576	(0.495)	0.586	(0.493)	(0.797)
Asset index	-0.191	(1.884)	0.233	(1.778)	**(0.004)*****
Household size	5.026	(1.745)	4.848	(1.767)	(0.214)
Total number of workers	1.418	(0.642)	1.434	(0.623)	(0.750)
Retail/trade	0.463	(0.499)	0.343	(0.476)	**(0.003)*****
Firm age	11.267	(10.867)	10.397	(10.206)	(0.312)
Interest payment	99.164	(563.624)	107.165	(585.738)	(0.864)
Asset damage	0.341	(0.475)	0.387	(0.488)	(0.235)
Observations	311		297		

Note: Risk aversion is measured from a lottery exercise: the higher the value, the more risk averse. Married equals 1 if the owner is married, and 0 otherwise. Asset index is the first principal component of 17 household assets. Retail/trade equals 1 if the firm belongs to the retail or trade sectors and 0 if the firm belongs to the manufacturing or service sectors. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table 2.4 indicates that female owners and male owners have statistically significant differences in risk aversion, civil status, firm sector and asset index. Interestingly, on average, Sri Lankan female microenterprise owners are less risk averse than their male counterparts (-0.033 versus 0.344). Those four control variables are then added to regression equation 2.1 to test whether the difference in treatment effects between male-owned firms and female-owned firms is explained only by the gender of owners and not by any other observable characteristics. The regression

equation is as follows:

$$Y_{ijt} = \alpha_1 + \beta_1 Treatment_{ijt} + \gamma_1 Treatment_{ijt} \times Female_i + \sum_{j=1}^{4} \theta_j Treatment_{it} \times X_{ji} + \lambda_i + \sum_{t=2}^{11} \omega_t + \varepsilon_{ijt} \quad (2.2)$$

where Y_{ijt} is firm performance as measured by real monthly profit of firm i in wave t, of which the owner has characteristics j. $Treatment_{ijt}$ equals 1 if firm i, of which the owner has characteristics j, received the grant in wave t. $Female_i$ equals 1 if the owner of firm i is female and 0 otherwise. X_{ji} refers to characteristics j of the owner of firm i or firm i (j=1,2,3,4), which include Risk aversion, Married, Asset index and Retail/trade. *Risk aversion* is measured from a lottery game played with real money by each entrepreneur in the second wave (see De Mel et al. (2008) for more details). *Married* is a dummy variable that equals 1 if the owner is married, and 0 otherwise. *Asset index* is the first principal component of 17 household assets. *Retail/trade* is a dummy variable that equals 1 if the firm belongs to the retail or trade sectors and 0 if the firm belongs to the manufacturing or service sectors. λ_i and ω_t are firm and wave fixed effects, and ε_{ijt} is the error term clustered at the enterprise level.

Table 2.5 presents the estimated results of equation 2.2. Columns (2), (3), (4) and (5) contain the interaction term between the treatment variable and each control variable, while Column (6) contains all of the interaction terms included in the regression. The results are very consistent with the baseline results, which indicates a statistically significant and positive treatment effect on the profits of male-owned firms, and zero effect on those of female-owned firms. Moreover, the coefficients of the interaction terms between the treatment and all four control variables are insignificant, which suggests that the different treatment effects between male-owned firms and female-owned firms are explained by the gender of owners and not by other observable characteristics.

2.4.1.3 Heterogeneity in Treatment Effects

In this sub-section, the study examines whether the baseline result is heterogeneous across different subgroups of firms in the experiment. The heterogeneity of the treatment effect is investigated first through the two treatment amounts. Table 2A.2 in Appendix 2A suggests that there is no statistically significant difference in the average treatment effects between the two methods from the same treatment amount. Hence, the two treatment methods (cash and in-kind) are pooled in each treatment amount. The study uses two new binary treatment variables, which are *Treatment 10000* and *Treatment 20000* to compare the average treatment effects be-

Table 2.5: Difference in Treatment Effects After Controlling for Other Observable Characteristics

	Dependent variable is real profit					
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	1878.0***	1897.0***	1550.4*	1912.6***	1947.0***	1639.1*
	(561.1)	(589.0)	(837.8)	(561.6)	(591.5)	(908.6)
Treatment×Female	-1552.7**	-1569.7**	-1514.9**	-1548.3**	-1571.1**	-1543.9**
	(658.6)	(673.0)	(628.9)	(657.4)	(650.3)	(638.5)
Treatment×Risk aversion		-41.13				-50.53
		(238.7)				(241.5)
Treatment×Married			375.6			407.1
			(851.3)			(867.3)
Treatment×Asset Index				-138.6		-138.0
				(258.1)		(258.2)
Treatment×Retail/Trade					-124.3	-105.4
					(545.6)	(535.7)
Firm FE	✓	✓	✓	✓	✓	✓
Wave FE	✓	✓	✓	✓	✓	✓
Overall female treatment effect = 0 *(p-values)*	0.438	0.437	0.969	0.394	0.437	0.921
Baseline Mean Dep. Var.	3688.3	3688.3	3688.3	3688.3	3688.3	3688.3
Observations	5427	5427	5427	5427	5426	5426
Number of clusters	601	601	601	601	601	601
R^2	0.032	0.032	0.032	0.032	0.032	0.032

Note: Standard errors, clustered at the enterprise level, are shown in parentheses. Real profit is the dependent variable and defined as it is in Table 2.3. Risk aversion is measured from a lottery game played with real money by each entrepreneur in wave 2 (see De Mel et al. (2008) for more details). Married is a dummy variable that equals 1 if the owner is married, and 0 otherwise. Asset index is the first principal component of 17 household assets. Retail/trade is a dummy variable that equals 1 if the firm belongs to the retail or trade sectors and 0 if the firm belongs to the manufacturing or service sectors. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

tween the subgroup receiving 10,000 LKR and the subgroup receiving 20,000 LKR, respectively, with the control group.

The balance tests on observable characteristics between each subgroup and the control group are conducted to verify randomization by gender in Tables 2A.4 and 2A.5 in Appendix 2A. The results suggest that the two treatment subgroups are quite comparable to the control group despite a significant decrease in the number of observations. Regression equation 2.1 with the two new variables of interest is then used to estimate the average treatment effects. Table 2.6 shows the estimated result with the two new variables of interest.

Columns (1) and (2) of Table 2.6 show similar results to Table 2.3, in which the business grant has a positive effect on the profits of male-owned firms, and zero effect on their female counterparts for both treatment amounts. Interestingly, the higher treatment amount (20,000 LKR) has a lower effect on male-owned firms than the smaller treatment amount (10,000 LKR) (2,296 versus 1,438.2). This finding is quite counter-intuitive when the 20,000 LKR treatment yields an impact equivalent to only 63% of the impact from the 10,000 LKR treatment. With regard to gender differences, the coefficients of interaction terms between the two new treatment variables and *Female* are negative, significant and very similar in magnitude (-1,710.4 and -1,750.5).

In columns (3) and (4), the differences in average treatment effects are then examined across sectors and levels of business asset damage. Column (3) focuses on the heterogeneity of the treatment effects and gender disparity by sector. In particular, the results for firms in manufacturing and service sectors are in line with the baseline results (positive for male-owned firms: 2,191.3; and negative for the gender gap: -2,048.4). In regard to firms in the retail or trade sectors, the positive coefficient of $Treatment \times Retail/Trade \times Female$ (1,015.5) implies that female-owned firms benefit more than male-owned firms from receiving the business grant; however, it is not a significant result.

Column (4) reports the same pattern as the baseline results in the subgroup of firms without business asset damage (1,435.2 for males and -1,708.2 for gender difference). However, there is no significant result in the subgroup of firms with asset damage. The overall effect on females is tested in both subgroups, and the result implies that the null hypothesis of zero effect on the profits of female-owned firms in the subgroup without asset damage is not rejected (p-value = 0.461). However, the overall effect on females in the subgroup with asset damage is different from zero. Given this result, the mean treatment effects on male and female-owned firms from the subgroup of firms with asset damage are then estimated separately in Table 2A.6 in Appendix 2A. The results indicate that in this subgroup, both male and female-owned firms benefit from the business grant. However, in terms of magni-

Table 2.6: Heterogeneity in Treatment Effects

	Dependent variable is real profit			
	(1)	(2)	(3)	(4)
Treatment 10000	2296.0***			
	(780.0)			
Treatment 10000 × Female	-1710.4**			
	(859.1)			
Treatment 20000		1438.2*		
		(744.6)		
Treatment 20000 × Female		-1750.5*		
		(1027.7)		
Treatment			2191.3***	1435.2***
			(651.3)	(514.2)
Treatment × Female			-2048.4**	-1708.2***
			(797.8)	(587.2)
Treatment × Retail/trade			-571.0	
			(834.8)	
Treatment × Retail/trade × Female			1015.5	
			(1077.1)	
Treatment × Asset damage				1835.3
				(1632.2)
Treatment × Asset damage × Female				460.3
				(1933.8)
Firm FE	✓	✓	✓	✓
Wave FE	✓	✓	✓	✓
Overall female treatment effect: = 0	0.193	0.684	0.783	0.461
(p-values)			*(Manu/Serv)*	*(W/o damage)*
			0.288	0.001
			(Retail/Trade)	*(W/ damage)*
Observations	4280	3462	5426	5427
Number of clusters	479	386	601	601
R^2	0.030	0.028	0.032	0.033

Note: Standard errors, clustered at the enterprise level, are shown in parentheses. Real profit is the dependent variable and defined as it is in Table 2.3. Treatment 10000 is a dummy variable that equals 1 if a firm received 10,000 LKR in cash or in-kind in wave t, and 0 if a firm did not receive either 10,000 LKR or 20,000 LKR in wave t. Treatment 20000 is a dummy variable that equals 1 if a firm received 20,000 LKR in cash or in-kind in wave t, and 0 if a firm did not receive either 10,000 LKR or 20,000 LKR in wave t. Retail/trade equals 1 if a firm belongs to the retail or trade sectors and 0 if a firm belongs to the manufacturing or service sectors. Asset damage equals 1 if a firm had asset damage caused by the tsunami, and 0 otherwise. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

tude, male-owned firms benefit more from the grant than female-owned firms (2,947 LKR versus 2,142.4 LKR, respectively). This finding implies that when firms experience direct economic losses, both male and female owners appear to use the business grant effectively to rebuild their businesses.

2.4.2 Mechanisms

In this section, the chapter explores potential mechanisms behind the main results. Table 2.6 shows that in terms of magnitude, the treatment effects on male-owned firms and the gender differences in treatment effects are quite different between the two subgroups receiving 10,000 LKR and 20,000 LKR. Moreover, the effects are different from the baseline results. In particular, the treatment effects on the performance of male-owned enterprises are 1,878 LKR for all firms, 2,296 LKR for the subgroup receiving 10,000 LKR, and 1,438.2 LKR for the subgroup receiving 20,000 LKR, while the corresponding gender differences are 1,552.7, 1,710.4 and 1,750.5 LKR, respectively. These results suggest proceeding with a separate analysis for each treatment amount.

2.4.2.1 Gender Differences in Business Investment and Household Expenditure

First, the chapter focuses on the business investment behaviors of microentrepreneurs following the tsunami. The outcome variables are the monthly investment in capital stock without land, input purchases and interest paid on loans. The variables of interest include *Treatment 10000* and *Treatment 20000*. Importantly, sectors might play a role in business investment behaviors. Therefore, the interaction term between *Retail/trade* and wave fixed effects is added to allow for the different time paths of capital stock, input purchases and interest payments of firms in different sectors.

Table 2.7 provides evidence on gender differences in business investment. Columns (1) and (3) suggest that in the subgroup receiving 10,000 LKR, the business grant has a significant and positive impact on the investment of male-owned firms in capital stock and inputs (28,699.5 and 5,259.6 LKR, respectively). Moreover, female owners invest less in their businesses than male owners (-23,290 for capital stock and -5,083.8 for input purchases).

Columns (2) and (4) show the estimated results for the subgroup receiving the higher treatment amount. Column (2) indicates that the treatment effect on male owners' investments in capital stock is significant and positive. However, they invest less than male owners in the subgroup receiving 10,000 LKR (10,457.5 versus 28,699.5 LKR, or approximately one-third). This finding is consistent with the re-

sult in Table 2.6 that the higher treatment amount has a lower effect than the smaller treatment amount on the profits of male-owned firms.

Table 2.7: Gender Differences in Business Investment

	Capital stock		Input purchases		Interest payment	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 10000	28699.5***		5259.6*		11.41	
	(10371.2)		(2937.7)		(32.39)	
Treatment 10000 × Female	-23290.0**		-5083.8*		113.5*	
	(11506.1)		(2908.6)		(68.05)	
Treatment 20000		10457.5***		-1330.2		-15.20
		(3585.4)		(3058.5)		(20.36)
Treatment 20000 × Female		14341.8		6148.2		-20.50
		(10824.1)		(5055.3)		(28.63)
Firm FE	✓	✓	✓	✓	✓	✓
Wave FE × Retail/trade	✓	✓	✓	✓	✓	✓
Observations	3989	3229	4262	3447	4133	3343
Number of clusters	472	379	479	386	477	384
R^2	0.091	0.109	0.021	0.028	0.017	0.015

Note: Standard errors, clustered at the owner level, are shown in parentheses. Capital stock is monthly firm capital stock without land (including equipment and inventories minus equipment rent). Input purchases are monthly raw material expenditure for manufacturing firms and items for resale for retail or trade and service firms. Interest payment is monthly interest paid on loans, which is a category of business expenses. Treatment 10000 and Treatment 20000 are defined as they are in Table 2.6. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

In addition, Table 2A.7 in Appendix 2A suggests that male owners in the subgroup receiving the lower treatment amount spend more time working (6.785 hours per week). However, there is no significant treatment impact in weekly working hours of male owners in the subgroup receiving the higher treatment amount. Therefore, the interesting result of the smaller treatment effect resulting from the higher treatment amount might be explained by the difference in investing grants in capital stock and in work effort between male owners in the two subgroups.

With respect to gender differences in the subgroup receiving 20,000 LKR, the estimated coefficients of the interaction term between *Treatment 20000* and *Female* in columns (2) and (4) are positive, which suggests that female owners invest more in capital stock and purchase more inputs than male owners, but the estimates are not statistically significant. This finding implies that even though female owners invest more in their businesses, their investments cannot be translated into higher profits or better performance. Columns (5) and (6) report the findings on gender differences in monthly interest paid on loans. The results indicate that female owners receiving 10,000 LKR repay loans more than their male counterparts (113.5 LKR per month). However, there is no evidence of gender differences in the subgroup receiving the higher treatment amount.

Next, the study examines whether there is any difference in household expenditure between male and female owners by using data from a complementary household survey. In light of the context following the tsunami, their expenditure on household basic needs is defined as monthly expenditure on food consumption, housing, healthcare and clothing. Moreover, the related literature supports the notion that when women increase their share of household income, they spend more on their children (Qian, 2008; Bobonis, 2009). Therefore, the chapter also focuses on monthly expenditure on education, which consists of school supplies, school fees and donations.

Table 2.8: Gender Differences in Household Expenditure

	Basic needs		**Education**	
	(1)	(2)	(3)	(4)
Treatment 10000	-154.2		-150.5	
	(893.2)		(105.7)	
Treatment 10000 × Female	-180.0		55.68	
	(871.3)		(113.2)	
Treatment 20000		193.6		29.57
		(949.7)		(80.23)
Treatment 20000 × Female		1854.3*		-84.39
		(1090.4)		(108.5)
Individual FE	✓	✓	✓	✓
Wave FE	✓	✓	✓	✓
Observations	1690	1361	1690	1361
Number of clusters	460	370	460	370
R^2	0.001	0.013	0.007	0.009

Note: Standard errors, clustered at the owner level, are shown in parentheses. Basic needs is a monthly expenditure that includes food consumption (the expenditure on groceries, food consumed at home and food consumed outside the home), housing (house rent, taxes, maintenance, water bill), healthcare and clothing. Education is a monthly expenditure that includes school supplies, school fees and donations. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table 2.8 provides the estimated results of gender differences in household expenditure. Columns (1) and (2) present findings when expenditure on basic needs is the dependent variable. Column (1) indicates that there are no significant gender differences in the subgroup receiving the smaller treatment amount. In column (2), the positive and significant coefficient (1,854.3 LKR) of the interaction term between *Treatment 20000* and *Female* implies that female owners in the subgroup receiving the higher treatment amount spend more than male owners do on their household basic needs.

In columns (3) and (4), when expenditure on education is the outcome variable,

there are no significant results in either the treatment effects on male owners or the gender differences in the treatment effects. This finding is similar to De Mel et al. (2009), and the lack of significant results on educational spending might arise from the inexpensive system of schooling in Sri Lanka.

Overall, the finding that female-owned firms benefit less from the grant than their male counterparts can be explained by the different behaviors of male owners and female owners in business investment and household expenditure. More specifically, female owners in the subgroup receiving 10,000 LKR invest less in their businesses and pay more interest on firm loans. In the subgroup receiving 20,000 LKR, female owners invest more in their businesses and spend more on their household basic needs. However, their higher business investments cannot be translated into higher profit.

2.4.2.2 Gender Differences in Initial Business Closures

Following natural disasters, firms experience several barriers such as supply chain disruptions (Carvalho et al., 2020), loss of equipment, and loss of staff and customers. These adverse impacts deteriorate business activities and even force businesses to close. In this sub-section, the chapter investigates whether there are any gender differences in initial business closures that can potentially explain the difference in treatment effects on the performance of female and male-owned firms.

First, the question *"Are you working in the same line of business and in the same location as you were working in when we interviewed you 3 months ago?"* is used across survey waves to identify whether an owner has closed their initial business. In the sample, it is possible to identify the status of 590 firms (out of 608 firms), including 290 female-owned firms (161 treatment and 129 control units) and 300 male-owned firms (172 treatment and 128 control units). Out of all female owners, 35 treated and 15 control owners shut down their initial businesses, which account for 21.6% and 11.1% of the female treatment and control groups, respectively. In the male sub-sample, 23 treated and 23 control owners closed their baseline firms. These represent 13.1% and 17% of the corresponding male treatment and control groups.

The following regression equation is then estimated:

$$Close_i = \phi_0 + \phi_1 D_i + \phi_2 Female_i + \phi_3 D_i \times Female_i + \delta X_i + \xi_i \qquad (2.3)$$

where $Close_i$ is a dummy variable that equals 1 if the owner of firm i changed their line of business or changed both their line of business and their location or was no longer self employed or was not engaged in business activity, and 0 otherwise. D_i is the variable of interest, either *Ever Treatment 10000* or *Ever Treatment 20000*

that equals 1 if firm i received 10,000 LKR or 20,000 LKR, and 0 when firm i did not receive either 10,000 LKR or 20,000 LKR from the experiment. $Female_i$ indicates the gender of the owner of firm i, which equals 1 if the owner is female and 0 if the owner is male. X_i consists of control variables that represent the owner characteristics and the firm characteristics of firm i (risk aversion, civil status, asset index and firm sector).

Next, a survival analysis is conducted to estimate the lifespan of baseline microenterprises. The event of interest is the closure of initial business. Time of origin is the time of the baseline survey, and time to event is the number of months between the time of event and the time of origin. The question *"When did you stop working in this business? Day, month"* is used to identify the *Time to event*. The study then employs a parametric regression survival time model, in which the *Time to event* is assumed to be a function of explanatory variables. The specification is as follows:

$$log(Time_i) = \rho_0 + \rho_1 D_i + \rho_2 Female_i + \rho_3 D_i \times Female_i + \pi X_i + \iota_i \tag{2.4}$$

where $Time_i$ is the number of months between the baseline time and the time of event when firm i was shut down. All independent variables in equation 2.4 are defined as they are in equation 2.3, and ι_i is the error term.

Table 2.9 presents the regression results of equations 2.3 and 2.4 when the two treatment amounts are analyzed separately. The estimation of equation 2.3 by logistic regression model and linear probability model is reported from columns (1) to (4). The positive and significant $\hat{\phi_3}$ coefficients in columns (1) and (3) (1.293 and 0.176) indicate that in the subgroup receiving 10,000 LKR, female owners are more likely to close their initial businesses, whereas there is no significant evidence for the subgroup receiving 20,000 LKR in columns (2) and (4). More specifically, the result in column (3) implies that female recipients in the subgroup receiving the lower amount have a 17.6 percentage point increase in the likelihood of closing their initial businesses. This finding provides a potential explanation for why they invest less in their businesses than male owners in Table 2.7.

Columns (5) and (6) display the result of the survival analysis on the assumption that the hazard of an event is constant over time. The estimate (1.254) indicates that in the subgroup receiving 10,000 LKR, female-owned firms have a higher hazard rate or shorter survival time than male-owned firms. This is a strong assumption; hence it is important to test the regression equation with another survival distribution. Table 2A.8 in Appendix 2A provides a robustness check when the study applies the Weibull distribution, which allows the hazard rate to change over time, and the results still hold. The estimated effects when the two treatment amounts are

pooled are reported in Table 2A.9 in Appendix 2A.

Table 2.9: Gender Differences in Initial Business Closures

	Logit		Linear probability model		Survival analysis	
	Close (1)	Close (2)	Close (3)	Close (4)	Time (5)	Time (6)
Female	-0.443	-0.431	-0.054	-0.052	-0.460	-0.437
	(0.362)	(0.366)	(0.044)	(0.044)	(0.344)	(0.347)
Ever Treatment 10000	-0.446		-0.059		-0.501	
	(0.391)		(0.05)		(0.363)	
Ever Treatment 10000 × Female	1.293**		0.176**		1.254***	
	(0.526)		(0.069)		(0.481)	
Ever Treatment 20000		-0.438		-0.055		-0.569
		(0.424)		(0.053)		(0.407)
Ever Treatment 20000 × Female		0.819		0.101		0.847
		(0.643)		(0.081)		(0.589)
Controls	✓	✓	✓	✓	✓	✓
Observations	470	377	470	377	470	376

Note: Robust standard errors are shown in parentheses. Close is a dummy variable that equals 1 if the owner changed their line of business/changed both their line of business and their location/was no longer self employed/was not engaged in business activity, and 0 otherwise. Time is the number of months between the baseline time and the time when the owner closed their initial business. Ever Treatment 10000 is the binary treatment variable that equals 1 if the firm ever received 10,000 LKR in cash or business equipment and equals 0 if the firm did not receive either 10,000 LKR or 20,000 LKR from the experiment. Ever Treatment 20000 is the binary treatment variable that equals 1 if the firm ever received 20,000 LKR in cash or business equipment and equals 0 if the firm did not receive either 10,000 LKR or 20,000 LKR from the experiment. Control variables include Married, Asset index, Retail/trade, Risk aversion. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

2.4.2.3 Gender Differences in Psychological Recovery

In this sub-section, the study explores whether the mental well-being of business owners following the tsunami can be a mechanism that drives the results relating to gender differences in the treatment impact on firm performance. The related literature points to a positive relationship between receiving grants and the mental health of recipients, including Haushofer and Shapiro (2016); Ohrnberger et al. (2020); Plagerson et al. (2011). Moreover, there is some evidence of a link between entrepreneurs' mental health and firm performance. Wincent et al. (2008) and Hessels et al. (2018) show that business owners with good mental health and well-being are more likely to endure and have better firm performance. In addition, Parida (2015) reports that in the context of post-disaster recovery, women are more likely than men to suffer from mental health issues. This evidence suggests that gender differences in the impact of receiving grants on the psychological recovery of business owners may provide an explanation for the main results.

The following Likert scale questions are used to measure the psychological status of respondents from the first to the ninth survey wave:

For each of the following, say whether you strongly agree, agree, disagree or strongly disagree with the following statements as applied to your life:

1. *I no longer talk about the tsunami these days (1 = strongly agree; 2 = agree; 3 = disagree; 4 = strongly disagree)*

2. *I have changed my outlook on life as a result of the tsunami (1 = strongly disagree; 2 = disagree; 3 = agree, 4 = strongly agree)*

The first question reveals how people retreat from natural disasters, while the second question reflects their struggle to accept the event (Tatsuki et al., 2003). A smaller value in both Likert scales indicates better psychological status. Since outcomes are ordered categorical variables, the study employs a random-effect generalized ordered probit model with an auto-fit procedure developed by Pfarr et al. (2010) to examine treatment effects.

In the traditional ordered probit model, all estimated coefficients are assumed not to vary between categories, i.e the parallel-lines assumption. This is a very strong assumption and frequently violated in practice (Long, 1997). The advantage of a random-effect generalized ordered probit model is that it provides a more flexible approach than the traditional model that allows for heterogeneous effects of explanatory variables.

Regression Framework

Let y^* be a latent variable, which is observed in discrete form through a censoring rule:

$$y = \begin{cases} 1 \text{ if } \mu_0 < y^* \leq \mu_1 \\ 2 \text{ if } \mu_1 < y^* \leq \mu_2 \\ 3 \text{ if } \mu_2 < y^* \leq \mu_3 \\ 4 \text{ if } \mu_3 < y^* \leq \mu_4 \end{cases} \tag{2.5}$$

where y is the response to question (1) or (2) that has the value of 1, 2, 3 or 4. μ_j are unknown threshold parameters (j= 1,2,3,4). y^* is defined as the function of a set of covariates Z and the error term υ, which is assumed to be normally distributed:

$$y^* = Z'\kappa + \upsilon \tag{2.6}$$

Z includes the variable of interest T_{it}, which can be one variable from the set ($Treatment_{it}$, $Treatment\ 10000_{it}$, $Treatment\ 20000_{it}$); the interaction term between the variable of interest and $Female_i$; and other control variables (dummy variables for dead relatives, injured household members as a result of the tsunami and whether the owner was hit by water during the tsunami). Moreover, μ_j is allowed to depend on the covariates:

$$\mu_j = \tilde{\mu_j} + Z'\tau_j \tag{2.7}$$

τ_j represents the impact of the covariates on the thresholds.

The cumulative probability of the generalized ordered probit model is expressed as follows:

$$Pr(y \leq j \mid Z) = F(\tilde{\mu}_j - Z'(\kappa - \tau_j)) \tag{2.8}$$

where F is a cumulative standard normal distribution, j=1,2,3,4. Let $\kappa_j = \kappa - \tau_j$, then the model has a specific $Z'\kappa_j$ for each category j of the outcome variables.

For panel data, the random-effect generalized ordered probit model takes into consideration the individual effects λ_i. The individual effects are assumed to have zero means and a constant variance. It requires that $\kappa_j > \kappa_{j-1}$, hence $\kappa_0 = -\infty$, $\kappa_4 = \infty$, or $F(-\infty) = 0$, $F(\infty) = 1$. Therefore, the outcome probabilities are as follows:

$$Pr(y_{it} = 1 \mid Z_{it}, \lambda_i) = F(-Z'_{it}\kappa_1 - \lambda_i)$$

$$Pr(y_{it} = j \mid Z_{it}, \lambda_i) = F(-Z'_{it}\kappa_j - \lambda_i) - F(-Z'_{it}\kappa_{j-1} - \lambda_i) \text{ for j= 2,3}$$

$$Pr(y_{it} = 4 \mid Z_{it}, \lambda_i) = 1 - F(-Z'_{it}\kappa_3 - \lambda_i)$$

This process leads to the estimation of three binary probit models, including category 1 versus categories 2-4, categories 1-2 versus categories 3-4 and categories 1-3 versus category 4.

Regression Result

Table 2.10 presents the regression results of the random-effect generalized ordered probit model with an auto-fit procedure. In this analysis, the study focuses on the binary probit model that compares the choice between categories 1-2 versus 3-4 (strongly agree and agree versus strongly disagree and disagree for question [1] and the opposite direction for question [2]). The coefficients of *Treatment* are strongly significant and negative in columns (1) and (5) (-0.162 and -0.129), which implies that the owners in the treatment group are more likely to report better psychological status. For the interaction term between *Treatment* and *Female*, both columns (2) and (6) report positive coefficients (0.092 and 0.101), which indicates that female owners are more likely to report worse mental status. However, these results are not statistically significant.

When each treatment amount is analyzed separately, the coefficients of *Treatment 10000* in columns (3) and (7) are negative and significant, which implies that the male owners in the subgroup receiving 10,000 LKR have a higher likelihood of reporting better mental recovery. However, the results for male owners in the subgroup receiving 20,000 LKR are inconclusive, with a negative coefficient (-0.111) in column (4) and a positive coefficient (0.012) in column (8); neither is significant. In addition, all estimated coefficients of the interaction terms between *Treatment*, *Treatment 10000* or *Treatment 20000* and *Female* are not statistically significant, hence there is no evidence supporting gender differences in the treatment impact on

psychological recovery. Table 2.10 also includes the Wald tests of the parallel lines assumption. The test statistic in all columns is insignificant at the level of 0.05, which assures that the parallel lines assumption is not violated. Hence, the results are credible.

Table 2.10: Impacts of Treatment on Psychological Recovery

	No longer talk about tsunami				**Change outlook due to tsunami**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Category 1-2 vs 3-4								
Treatment	-0.162***	-0.205***			-0.129**	-0.174**		
	(0.061)	(0.074)			(0.065)	(0.077)		
Treatment × Female		0.092				0.101		
		(0.092)				(0.094)		
Treatment 10000			-0.227**				-0.230**	
			(0.095)				(0.097)	
Treatment 10000 × Female			0.037				0.125	
			(0.117)				(0.117)	
Treatment 20000				-0.111				0.012
				(0.096)				(0.102)
Treatment 20000 × Female				0.212				-0.050
				(0.154)				(0.167)
Relatives dead	0.114	0.104	0.133	-0.009	-0.078	-0.087	-0.104	-0.009
	(0.086)	(0.086)	(0.097)	(0.107)	(0.090)	(0.091)	(0.105)	(0.111)
Hit by tsunami	0.150*	0.154*	0.136	0.235**	0.472***	0.478***	0.472***	0.413***
	(0.080)	(0.080)	(0.092)	(0.095)	(0.090)	(0.090)	(0.103)	(0.110)
Household member	0.146	0.144	0.063	0.116	0.365***	0.362***	0.475***	0.316**
injured	(0.107)	(0.106)	(0.129)	(0.131)	(0.125)	(0.126)	(0.150)	(0.140)
Wald Test	0.274	0.333	0.196	0.286	0.430	0.518	0.168	0.111
Observations	4510	4510	3556	2882	4510	4510	3556	2882

Note: Standard errors are shown in parentheses. Treatment 10000 and Treatment 20000 are defined as they are in Table 2.6. Hit by tsunami equals 1 if the owner was hit by water during the tsunami, and 0 otherwise. Relatives dead equals 1 if the owner had at least one relative killed in the tsunami, and 0 otherwise. Household member injured equals 1 if at least one member of the owner's household was injured because of the tsunami, and 0 otherwise. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

2.4.3 External Validity

The main results of the chapter suggest that there are gender differences in the treatment effect when female-owned firms and male-owned firms receive a similar business grant following natural disasters. However, this finding is based on the context of a single country. One question might arise as to the generalizability of the results, namely this: does the causal effect hold in other settings, treatments and outcomes? COVID-19 provides a context to check the external validity of the main results because it is considered to be a natural hazard according to the classification of the International Federation of Red Cross and Red Crescent Societies (IFRC).

In this sub-section, the study tests for external validity by using firm-level data from the World Bank Enterprise Surveys and COVID-19 follow-up surveys. According to the definition of the World Bank Group, microenterprises are enterprises with between 0 and 10 employees. Therefore, the sample is restricted to firms from developing countries that have less than 10 employees and receive business sup-

ports (cash or non-cash). The final sample includes 377 microenterprises from 22 developing countries in three sectors: manufacturing, retail and services. The list of 22 developing countries consists of Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Chad, Croatia, Cyprus, El Savador, Georgia, Guatemala, Guinea, Hungary, Jordan, Kazakhstan, North Macedonia, Malta, Moldova, Montenegro, Morocco, Romania, Serbia and Zimbabwe.

The outcome variable is the change in sales in the last month prior to the survey compared to the same month of the previous year, and it is measured in percentages. The change in sales receives a positive value if sales increase, 0 if sales remain the same and a negative value if sales decrease. Note that the COVID follow up surveys were implemented over different periods in different countries. Out of the 22 developing countries, the World Bank Group carried out the COVID follow up surveys in 16 of them in 2020. Therefore, the reference month of the previous year is a month in 2019, which was prior to COVID-19. In the other six countries, the survey was administered in 2021, and the reference months are mainly January, February and March 2020 before the World Health Organization (WHO) declared that COVID-19 was a pandemic.

The cross-sectional regression equation is as follows:

$$\Delta sales_{isj} = \kappa + \delta Female_i + \gamma X_i + \eta_s + \mu_j + \upsilon_{isj} \tag{2.9}$$

where $\Delta sales_{isj}$ is the monthly change in the sales of firm i in sector s in country j, $Female_i$ is a dummy variable, which equals 1 if the main owner of firm i is female and 0 otherwise, X_i are control variables, η_s are sector fixed effects, μ_j are country fixed effects, and υ_{isj} is the error term. The sector and country dummies are included in order to control for differences across sectors and countries.

Table 2.11 presents the estimated results of equation 2.9. In column (1), the $\hat{\delta}$ coefficient (-9.606) is negative and statistically significant, which implies that the sales of female-owned microenterprises decrease more than those of male-owned microenterprises. The results remain stable in terms of sign and significance when more control variables (firm age, labor and firm working hours) are added from column (2) to column (4). On average, the sales of female-owned firms decrease 8.73% more than those of their male counterparts, which represents 21.3% over the sample mean. Since data on firm profits after the appearance of COVID-19 are not available, it is impossible to examine the same outcome in this period. However, the findings in this sub-section provide suggestive evidence that gender differences in treatment effects on firm performance following natural disasters appear to hold in other contexts, and are not limited to Sri Lanka.

Table 2.11: External Validity of the Main Results in the Context of the COVID-19 Pandemic

	Dependent variable is the monthly change in sales			
	(1)	(2)	(3)	(4)
Female	-9.606***	-9.591***	-8.806**	-6.936**
	(3.675)	(3.682)	(3.694)	(3.394)
Firm age		0.236	0.230	0.319**
		(0.148)	(0.142)	(0.133)
Labor			3.149***	2.422***
			(0.801)	(0.694)
Working hours				-23.80***
				(3.266)
Country FE	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓
Mean Dep. Var.	-40.95	-40.95	-40.95	-40.95
Observations	377	376	376	376
R^2	0.365	0.371	0.399	0.494

Note: Robust standard errors are shown in parentheses. Dependent variable is the change in sales in the last month prior to the survey compared to the same month of the previous year, measured in percentages. Firm age is the difference between 2021 and the year that the firm started operations. Labor is the number of permanent full time employees in the last month before the survey. Working hours are the establishment's total hours worked per week in the last month before the survey compared to the same month in 2019 (1=increase, 2=remain the same, 3=decrease). Data are collected from 22 developing countries in three sectors: manufacturing, retail and services. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

2.5 Discussion and Conclusion

Natural disasters are sharply increasing in both frequency and severity around the world. According to the latest report from the Geneva-based IFRC, more than 100 natural disasters have occurred since March 2020 when the WHO declared that the COVID-19 outbreak was a global pandemic (Freebairn et al., 2020). There has been some good news regarding the vaccine for COVID-19; however, as the IFRC Secretary General Jagan Chapagain mentioned, *"Unfortunately, there is no vaccine for climate change"*. Therefore, the post-disaster recovery of vulnerable communities, especially small businesses, should receive special attention from both governmental and non-governmental organizations.

This study provides evidence relating to the different effects of a business grant on the performance of male-owned firms and female-owned firms in Sri Lanka following the 2004 Indian Ocean tsunami. The results highlight that only male-owned firms benefit from the business grant, while the treatment effects on the profits of female-owned firms is zero. Several studies in the experimental literature have

reported gender differences in treatment effects on firm performance (Gine and Mansuri, 2014; Fafchamps et al., 2014; Fiala, 2018), but only under normal circumstances. This chapter contributes to the literature by providing new evidence in the context of post-disasters. The main findings are consistent with the results of previous empirical studies, but not in line with the predictions of liberal feminist theory and social feminist theory.

Even though the main results differ from the prediction of social feminist theory, the present study provides some potential mechanisms that are related to expectations from the theory. More specifically, social feminist theory argues that there are differences in traits and experiences between men and women, which lead to different behaviors that might affect their firm performance. The chapter documents gender differences in business investment, interest payment, household expenditure and the likelihood of closing their initial businesses. In addition, the chapter shows a positive treatment effect on the psychological recovery of microentrepreneurs. This finding, which is the first experimental evidence relating to small business owners who receive grants, is in line with several previous studies that document a positive relationship between cash transfers and mental health outcomes for children, adolescents and households in developing countries (Haushofer and Shapiro, 2016; Kilburn et al., 2016; Shangani et al., 2017; Angeles et al., 2019; Ohrnberger et al., 2020; Tozan et al., 2019).

This study has a number of limitations, in particular regarding the data. First, the data pertain only to microenterprises actively operating in May 2005, which was four months after the tsunami. There is a possibility that female-owned enterprises and male-owned enterprises shut down their businesses at different rates before the baseline survey. Moreover, female owners and male owners might have different processes to select themselves into self-employment. Therefore, there might be concerns over different characteristics between male and female owners in the sample. Despite conducting a balance test on the observable characteristics of female and male owners (see Table 2.4), this might not completely resolve the issue.

Second, the follow-up survey in 2010 suggests that out of the 25 female owners that closed their initial businesses in the subgroup receiving 10,000 LKR, 52% reopened their initial businesses (8) or operated different businesses (5), 16% switched to be employees (4) and 32% chose to do housework or take care of their families (8). The main reason that 16% switched to work for a wage was to have a more stable working environment with less stress and better working hours. For the 32% that chose to do housework or take care of their families, they made the decision because of their business losses, their health problems, and the need to take care of children and their family members. For the five female owners that operated different businesses, their main reasons were a lack of money to open in their fa-

vorite sectors and the flexibility that the new sector offered them to look after family members. However, there is no information about the reason why the other eight female owners shut down and then reopened their businesses. This is an area where the survey is not able to capture some important changes. Therefore, the addition of qualitative data from interviews or focus groups might help to elucidate changes in social and gender norms that could not be captured by the quantitative survey, and provide contextual data on how and why those changes occur.

Lastly, the chapter provides suggestive evidence on the external validity of the main results by using firm-level data from the COVID-19 period. However, it is impossible to check the external validity using the same outcome (firm profit) since there are no available data. As additional data from the World Bank Enterprise Survey become available in the near future, it will be possible to examine whether the main results hold with firm performance as measured by profit in the context of COVID-19.

The main results have implications for business recovery programs aimed at supporting female microentrepreneurs following natural disasters. When both male and female-owned firms receive a similar business grant, on average, only the male-owned firms improve their performance, while the treatment impact on the performance of the female-owned firms is zero. In addition, the treatment amount has been shown to play an important role in how female small business owners behave and make decisions. The potential reasons for the main results are that (i) female owners invest less in their businesses in the subgroup receiving the smaller amount and spend more on their households in the subgroup receiving the higher amount, and (ii) female owners are more likely to close their initial businesses in the subgroup receiving the lower amount. If the first reason is due to women's preferences and behaviors, then it is difficult to undertake any intervention that changes the situation. With regard to the second reason, it might be solved by interventions that help female-owned firms to increase their likelihood of survival. Since the present study only focuses on gender differences relating to the short term impact of business grants on firm performance, it is of interest for future work to examine effects in the longer term. New research on longer term effects may also provide more insights into how to design an optimal relief program to assist female business owners in the aftermath of disasters.

Appendix 2A: Additional Tables and Figures

Figure 2A.1: Timeline for Intervention and Surveys of Micro-enterprises in Sri Lanka (13 waves)

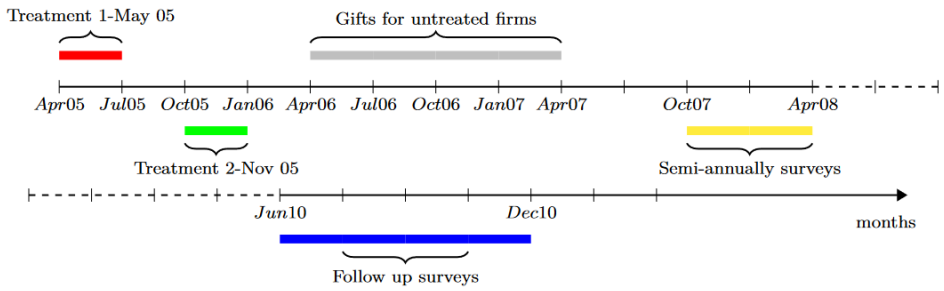


Figure 2A.2: Treatment Assignment 1 (May 2005)

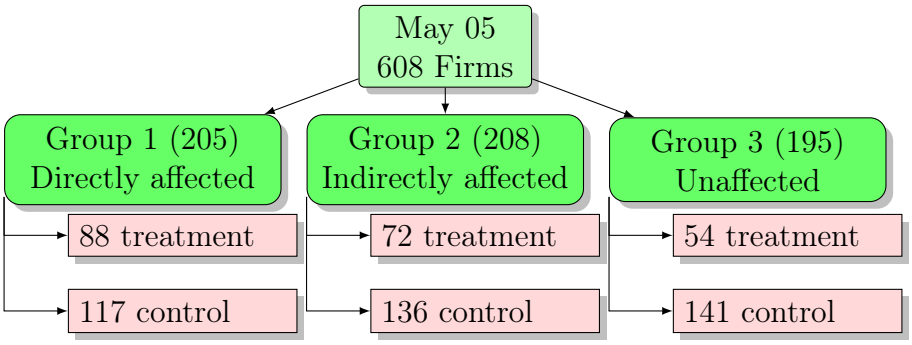


Figure 2A.3: Treatment Assignment 2 (November 2005)

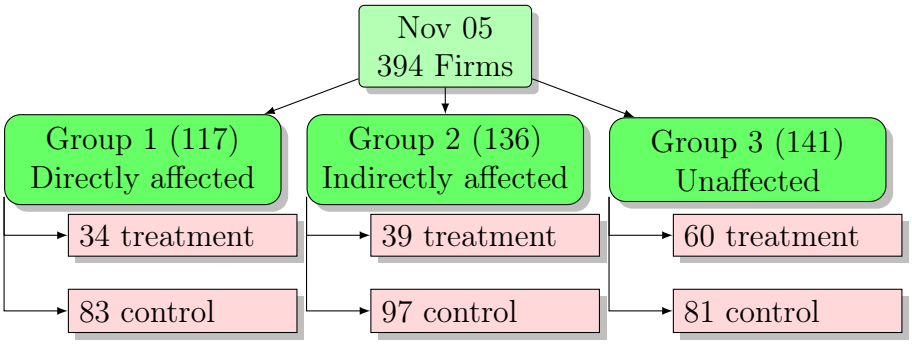


Figure 2A.4: Trends in Real Profit

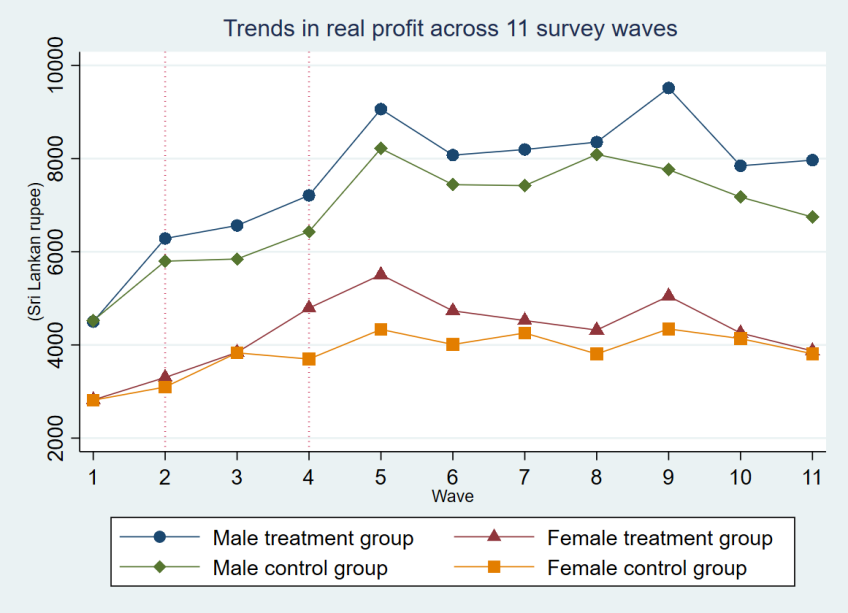


Table 2A.1: Description of Variables Used in This Study

Variable	Definition
Ability	Measure the ability of owners by principal component analysis (time to solve a maze, years of education, self efficacy and digit-span recall score)
Experience	Equal 1 if the owner worked in the same sector before, and 0 otherwise
Owner age	The age of the owner at the baseline survey time
Married	Equal 1 if the owner is married, and 0 otherwise
Female	Equal 1 if the owner is female, and 0 otherwise
Migrant	Equal 1 if the owner is migrant, and 0 otherwise
Father's education	The highest level of education attained by the father of the owner (0 = no schooling, 1 = Year 1, 2 = Year 2, Years 3 - 11 code as 3-11, 12 = Year 12, 13 = Year 13, 14 = Some years of university, 15 = University undergraduate degree, 16 = Post-graduate university work, 17 = Technical college)
Mother's education	The highest level of education attained by the mother of the owner (0 = no schooling, 1 = Year 1, 2 = Year 2, Years 3 - 11 code as 3 - 11, 12 = Year 12, 13 = Year 13, 14 = Some years of university, 15 = University undergraduate degree, 16 = Post-graduate university work, 17 = Technical college)
Household size	Measure the number of people in the household of the owner
Financial literacy	Equal 1 if the owner answers correctly at least one question related to financial knowledge, and 0 otherwise
Risk aversion	Measure from a lottery exercise: the higher the value, the more risk averse
Optimistic	Measure from questions about the owner's imagination of their best possible life and worst possible life (a picture with 9 rungs, top=best, bottom=worst)
Locus of control	The sum of responses from three likert questions: *I plan tasks carefully, I made up my mind quickly and I save regularly* (1=Disagree strongly; 2=Disagree; 3=Neutral; 4=Agree 5=Agree strongly)

Willingness to take risk	Measure from the response of this question *Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please tick a box on the scale, where the value 0 means:"unwilling to take risks" and the value 10 means: "fully prepared to take risks"* in Wave 5
Asset index	The first principal component of 17 household assets
Working hour	Number of hours that the owner worked in the week before a survey wave
Hit by tsunami	Equal 1 if the owner was hit by water during the tsunami, and 0 otherwise
Relatives dead	Equal 1 if the owner has relatives killed in the tsunami, and 0 otherwise
Pre-investment	Equal 1 if the owner invested at least 5000 Sri Lankan rupees (LKR) when opening the business, and 0 otherwise
Retail/trade	Equal 1 if the firm belongs to retail or trade sectors, and 0 if the firm belongs to manufacturing or service sectors
Firm age	The time between the establishment year of a firm and the baseline survey (in years)
Total number of workers	Number of workers in the firm, including wage or salaried workers, partners and unpaid workers
Asset damage	Equal 1 if the firm has business asset damaged or destroyed by the tsunami, and 0 otherwise
Real profit	Business income in the last month before the survey wave after deducting all expenses including the wages of employees, but not including any income that the owners paid themselves in LKR (deflated to April 2005)
Real sales	Firm sales of the last month before the survey wave in LKR (deflated to April 2005)
Capital stocks	Monthly firm capital stock without land, including equipment and inventories minus equipment rent in LKR (deflated to April 2005)
Inputs purchase	Monthly raw material expenditure for manufacturing firms and items for resale for retail and trade and service firms in LKR (deflated to April 2005)
Interest payment	Monthly interest paid on loans, which is a category of business expenses in LKR (deflated to April 2005)

Close	Equal 1 if the owner changed their line of business/changed both their line of business and their location/was no longer self employed/was not engaged in business activity, and 0 otherwise
Time	Number of months between the baseline time and the time when the owner closed their initial business
Basic needs	Monthly expenditure that includes food consumption (the expenditure on groceries, food consumed at home and food consumed outside the home), housing (house rent, taxes, maintenance, water bill), healthcare and clothing in LKR (deflated to April 2005)
Education	Monthly expenditure that includes school supplies, school fees and donations in LKR (deflated to April 2005)

Table 2A.2: Testing the Different Treatment Effects Across Four Types of Treatment

	(1) **Real profit**	(2) **Real sale**
Cash 10000	2123.0***	6115.2**
	(821.2)	(2575.9)
Cash 20000	536.9	1546.0
	(747.7)	(3623.0)
In-kind 10000	909.7*	3067.7
	(500.8)	(3485.6)
In-kind 20000	1279.0	5498.0
	(805.1)	(3917.9)
Firm FE	✓	✓
Wave FE	✓	✓
Testing the differences in treatment (p-value):		
Cash 10000 vs. Cash 20000	0.1438	0.2932
Cash 10000 vs. In-kind 10000	0.1926	0.4714
Cash 10000 vs. In-kind 20000	0.4538	0.8932
Cash 20000 vs. In-kind 10000	0.6675	0.7582
Cash 20000 vs. In-kind 20000	0.4891	0.4520
In-kind 10000 vs. In-kind 20000	0.6874	0.6375
Observations	5427	5505
Number of clusters	601	602
R^2	0.031	0.017

Note: Standard errors, clustered at the enterprise level, are shown in parentheses. Cash 10000 equals 1 if a firm received 10,000 LKR in cash, and 0 otherwise. In-kind 10000 equals 1 if a firm received 10,000 LKR in-kind, and 0 otherwise. Cash 20000 equals 1 if a firm received 20,000 LKR in cash, and 0 otherwise. In-kind 20000 equals 1 if a firm received 20,000 LKR in-kind, and 0 otherwise. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2A.3: Treatment Effects on Real Sales of Female-owned Firms and Male-owned Firms

	Dependent variable is real sale					
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	5230.1**	4757.2*	985.8	5152.2**	2465.0	-2300.3
	(2590.6)	(2487.1)	(3585.7)	(2553.7)	(2334.6)	(3524.7)
Treatment×Female	-3782.5	-3360.1	-3288.8	-3793.5	-3009.8	-2054.4
	(3115.0)	(2982.4)	(3082.9)	(3125.9)	(3039.0)	(2863.8)
Treatment×Risk aversion		1025.1				1071.7
		(1033.4)				(1035.0)
Treatment×Married			4863.7			4654.7
			(3386.1)			(3303.7)
Treatment×Asset Index				308.6		162.2
				(1034.0)		(1002.4)
Treatment × Retail/trade					4974.1*	5276.4**
					(2611.0)	(2676.3)
Observations	5505	5505	5505	5505	5505	5505
Number of clusters	602	602	602	602	602	602
R^2	0.017	0.017	0.017	0.017	0.018	0.019

Notes: Standard errors, clustered at the enterprise level, are shown in parentheses. Risk aversion is measured from a lottery game played with real money by each entrepreneur in wave 2. Married is a dummy variable that equals 1 if the owner is married, and 0 otherwise. Asset index is the first principal component of 17 household assets. Retail/trade is a dummy variable that equals 1 if the firm belongs to the retail or trade sectors and 0 if the firm belongs to the manufacturing or service sectors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2A.4: Randomization Check by Gender (10,000 LKR Treatment versus Control)

	Male			Female		
Variable	Mean control	Mean treat	P-val. diff	Mean control	Mean treat	P-val. diff
Owner characteristics						
Ability	-0.071	-0.129	(0.721)	0.010	0.104	(0.565)
Experience	0.695	0.604	(0.164)	0.639	0.620	(0.767)
Age	42.370	43.890	(0.312)	41.030	42.086	(0.457)
Married	0.815	0.870	(0.258)	0.748	0.836	(0.089)*
Migrant	0.148	0.100	(0.276)	0.119	0.155	(0.400)
Working hour	0.593	0.620	(0.673)	0.385	0.310	(0.217)
Household size	4.948	5.170	(0.348)	4.867	4.802	(0.769)
Firm characteristics						
Pre-investment	0.637	0.660	(0.717)	0.459	0.483	(0.711)
Retail/Trade	0.407	0.540	(0.044)**	0.333	0.328	(0.924)
Firm age	10.17	14.34	(0.005)***	10.17	11.21	(0.432)
Real profit	4,523	4,682	(0.769)	2,813	2,744	(0.832)
Real sale	14,036	14,748	(0.757)	8,802	8,147	(0.657)
Invested capital without land	32,472	29,829	(0.516)	21,524	23,940	(0.444)
Total number of workers	1.356	1.470	(0.178)	1.407	1.448	(0.606)
Interest payment	50.000	21.500	(0.399)	136.874	90.517	(0.558)
Observations	135	100		135	116	

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2A.5: Randomization Check by Gender (20,000 LKR Treatment versus Control)

	Male			Female		
Variable	Mean control	Mean treat	P-val. diff	Mean control	Mean treat	P-val. diff
Owner characteristics						
Ability	-0.071	0.193	(0.156)	0.010	-0.152	(0.458)
Experience	0.695	0.714	(0.782)	0.639	0.512	(0.151)
Age	42.370	40.737	(0.303)	41.030	40.870	(0.936)
Married	0.815	0.895	(0.126)	0.748	0.674	(0.330)
Migrant	0.148	0.079	(0.143)	0.119	0.130	(0.832)
Working hour	0.593	0.592	(0.995)	0.385	0.565	(0.033)**
Household size	4.948	4.974	(0.915)	4.867	4.913	(0.873)
Firm characteristics						
Pre-investment	0.637	0.592	(0.521)	0.459	0.543	(0.326)
Retail/trade	0.407	0.461	(0.456)	0.333	0.413	(0.331)
Firm age	10.17	9.17	(0.469)	10.17	8.97	(0.506)
Real profit	4,523	4,262	(0.632)	2,813	3,001	(0.726)
Real sale	14,036	13,617	(0.862)	8,802	9,534	(0.714)
Invested capital without land	32,472	31,138	(0.752)	21,524	25,402	(0.351)
Total number of workers	1.356	1.461	(0.232)	1.407	1.478	(0.495)
Interest payment	50.000	288.684	(0.014)**	136.874	61.957	(0.507)
Observations	135	76		135	46	

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2A.6: Treatment Effect on Firms With Business Asset Damage Caused by the Tsunami

	Dependent variable is real profit	
	Female-owned firms	Male-owned firms
Treatment	2142.4**	2947.0*
	(1015.4)	(1641.9)
Firm FE	✓	✓
Wave FE	✓	✓
Observations	1054	936
Number of clusters	115	106
R^2	0.036	0.042

Standard errors, clustered at the enterprise level, are shown in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2A.7: Weekly Working Hours in the Male Sub-sample by Two Levels of the Treatment Amount

	Dependent variable is weekly working hours	
	(1)	(2)
Treatment 10000	6.785**	
	(3.186)	
Treatment 20000		-0.494
		(3.709)
Firm FE	✓	✓
Wave FE	✓	✓
Observations	1774	1587
Number of clusters	189	168
R^2	0.010	0.011

Standard errors clustered at owner level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2A.8: Survival Analysis Result When the Hazard Rate is Allowed to Change Over Time (Weibull Distribution)

	Dependent variable is time	
	(1)	(2)
Female	-0.459	-0.435
	(0.341)	(0.342)
Ever Treatment 10000	-0.497	
	(0.359)	
Ever Treatment 10000 × Female	1.245***	
	(0.475)	
Ever Treatment 20000		-0.560
		(0.402)
Ever Treatment 20000 × Female		0.841
		(0.583)
Controls	✓	✓
Ln(p)	-0.131	-0.216*
	(0.0940)	(0.120)
Observations	470	376

Note: Robust standard errors in parentheses. The parameter p is the shape parameter (define the shape of Weibull distribution). In column (1), the estimate for ln(p) is -0.131 and not statistically significant, which means that the Weibull model is not a better "fit" than the exponential model. This is why the coefficient of Ever Treatment 10000 × Female is very similar to Table 2.9. In column (2), the estimate for ln(p) is -0.216 and statistically significant, which means that the hazards are decreasing monotonically over time. However, the estimated coefficients of the variables of interests are not significant as in Table 2.9. *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table 2A.9: Difference in Initial Business Closures Between Female and Male Owners (Whole Sample)

	Logit	**LPM**	**Survival analysis**
	Close	Close	Time
	(1)	(2)	(3)
Female	-0.446	-0.0542	-0.457
	(0.361)	(0.0439)	(0.343)
Ever Treatment	-0.435	-0.0568	-0.521*
	(0.329)	(0.0433)	(0.312)
Ever Treatment × Female	1.166**	0.154**	1.158***
	(0.468)	(0.0604)	(0.434)
Controls	✓	✓	✓
Observations	590	590	589

Notes: Robust standard errors are shown in parentheses. Ever Treatment equals 1 if the owner ever received the grant from the experiment, and 0 otherwise. In the survival analysis, the result indicates that the treatment has a positive impact on the survival of male-owned firms. The negative coefficient of *Ever Treatment* implies that treated male owners have lower hazard than control male owners to close their firms. *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

3 Are Female-dominated Cancers Underfunded?[1]

Keywords: Cancer Research; Funding; Gender Bias

JEL Codes: I10; I14; I19

3.1 Introduction

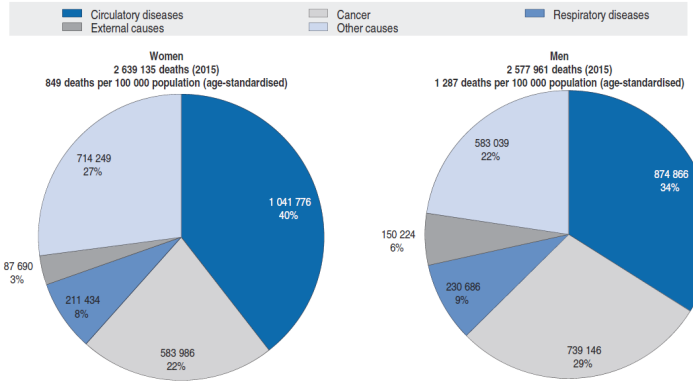
Cancer is one of the most serious health problems around the world. According to the World Health Organization, cancer is a leading cause of death worldwide with approximately 10 million deaths in 2020 (World Health Organization, 2021). Due to its relevance, in the last few decades, cancer research has received increased attention from both national and international funding bodies. Many leading funding bodies have increased the number and size of cancer research projects granted over time. Schmutz et al. (2019) report that cancer research funding is distributed across 107 countries with 44% in the United States, 21% in Europe and 16% in Asia, and the total number of funding sources has more than doubled since 2008.

However, the literature on cancer research funding reports the existence of a mismatch between the societal burden of cancer types and the distribution of research funding to specific projects. For instance, Begum et al. (2018) document a sizeable mismatch between funding levels and the societal and economic burdens of cancer types in Europe. Using data from Web of Science (WoS) during the period of 2002-2013, they show that some cancer types are over-funded, such as breast cancer and blood cancer, while others, including pancreatic and oesophageal cancers, appear to be underfunded. Evidence of funding discrepancies is also found in other parts of the world; for example, Carter and Nguyen (2012) present findings from the United States, and Coronado et al. (2018) discuss similar issues in Canada.

[1]This chapter was co-authored with Judit Vall Castello from the University of Barcelona and Lidia Farre from the Institut d'Anàlisi Econòmica. We would like to acknowledge the valuable contributions of seminar participants at the American-European Health Economics Study Group (VI Edition), the Midwest Health Economics Conference 2022, the Applied Young Economists Webinar 2022, the SAEe 2022, and the 3rd ECO-SOS Workshop on Economics and Sustainability. Their comments and suggestions greatly enriched the content of this chapter.

Furthermore, the literature has paid little attention to the allocation of cancer research resources through the lens of sex-dominance in cancer types. To the extent of our knowledge, there are only two articles that report funding disparities against female cancers. Begum et al. (2018) show that several female-specific cancers, including ovarian, cervical, uterine, and vulvar cancers, are underfunded and under-researched relative to their disease burden in Europe. Additionally, Spencer et al. (2019) document that funding disparities exist in the allocation of resources, particularly in funding for lethality scores for gynecologic cancers, which are significantly lower than for other cancer types in the United States. In this chapter, we aim to fill that gap in the related literature by investigating whether projects focusing on female-dominated cancers receive less funding than those focusing on male-dominated cancers in Europe.[2, 3]

Figure 3.1: Main Causes of Mortality Among Women And Men in EU Countries, 2015



Note: External causes of death include accidents, suicides, homicides and other causes.
Source: Eurostat Database.

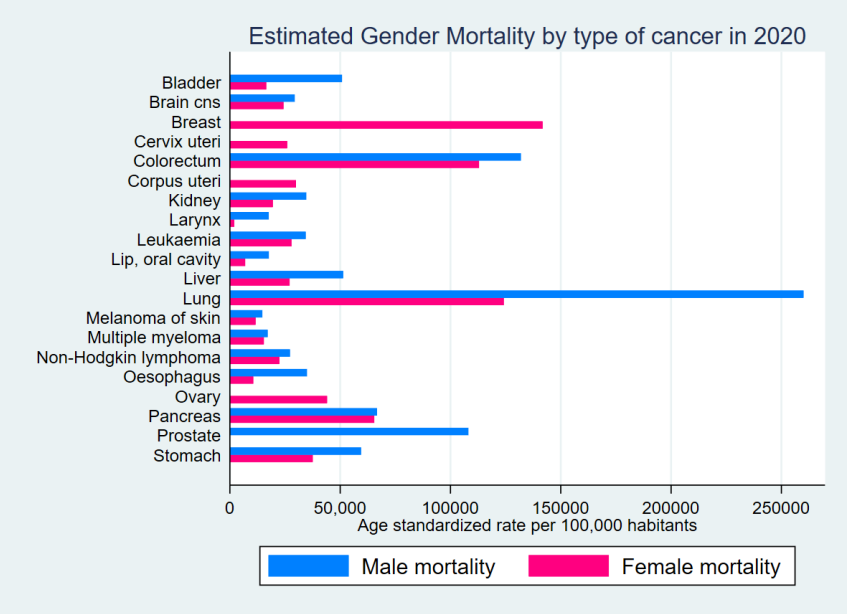
We select Europe as the focus of our study because, despite comprising only 9% of the global population, it bears a significant burden of cancer, accounting for one-fourth of global cases (Ferlay et al., 2018). Cancer is a major health concern on the continent, ranking as the second leading cause of death and morbidity after cardiovascular diseases (Joint Research Centre, ECIS – European Cancer Information System, 2020). Figure 3.1 illustrates the leading causes of mortality among men and women in Europe in 2015, with cancer contributing to 29% of male deaths and 22% of female deaths. Specifically, cancer ranks as the second leading cause of death among men and the third among women. Figure 3.2 depicts gender disparities in cancer mortality rates across different cancer types in Europe. These variations in

[2]Female-dominated cancer are cancer types that their number of male deaths is less than or equivalent to that of female deaths.

[3]Male-dominated cancers are cancer types that their number of male deaths is more than that of female deaths.

mortality rates by gender provide an opportunity to explore the allocation of cancer research funding through the lens of gender-dominated cancer types.

Figure 3.2: Estimated Mortality by Cancer in 2020 - Comparison by Sex



Source: European Cancer Information System

To address our research question, we use two novel owned-collected datasets comprised of projects related to cancer research and innovation. These datasets include projects awarded by the European Research Council (ERC) from 2007 to 2020, and those awarded by the European Commission under the Seventh Framework Programme (FP7) from 2007 to 2013, as well as the Horizon 2020 (H2020) Framework Programme from 2014 to 2020, excluding ERC's projects.[4] Our analysis reveals that a 10 percentage point increase in male relative mortality is statistically significant, associated with approximately a 0.3% increase in the awarded research fund in the ERC dataset, and a 0.8% increase in the awarded research fund in the FP7 & H2020 dataset. This presents a 4,420 euro increase over the ERC sample mean and a 12,402 euro increase over the FP7 & H2020 sample mean.[5]

Furthermore, we offer potential explanations for the unequal distribution of funding. Firstly, the over-representation of male researchers, who are less likely to engage in research on female-dominated cancers, may result in fewer scholars working on projects related to these cancers, thereby leading to reduced funding allocation

[4]We choose the European Commission as the funding body because the European Commission provides grants to projects through open and competitive calls for proposals.

[5]Male relative mortality is measured by the ratio between male mortality and total mortality of each cancer type.

for them. Secondly, gender bias against women in fund allocation, as they are more inclined to conduct research on female-dominated cancers, likely contributes to the inadequate funding for these types of cancers. Notably, our analysis reveals suggestive evidence of funding bias in the FP7 & H2020 sample, wherein all-female research teams receive, on average, approximately 12% less funding than their male counterparts.

Thirdly, the gender composition of evaluation panels plays a crucial role in the allocation of grants for both female-dominated and male-dominated cancer projects. We find that a higher representation of male members on evaluation panels favors male-dominated cancer projects in the ERC sample. Lastly, disparities in mortality rates between female-dominated and male-dominated cancers may influence funding allocations. Our findings indicate that male-dominated cancers exhibit higher mortality rates than female-dominated cancers in Europe, potentially leading to a larger allocation of resources towards male-dominated cancers.

Our findings contribute to several strands of the research literature. First and foremost, we highlight the unequal distribution of cancer research funding through the perspective of sex-dominance in cancer types. While previous studies such as those by Begum et al. (2018) and Spencer et al. (2019), have addressed the under-funding of female-specific cancers, our study stands out as the first attempt to examine the relationship between competitive research funding and the male relative mortality of cancer types using novel and unique datasets.

Our second contribution is providing descriptive evidence of the glass ceiling faced by female researchers in science, particularly in health research. While existing literature has documented the under-representation of women in fields like radiation oncology (Jagsi and Tarbell, 2006) and academic surgery (Zhuge et al., 2011), limited evidence exists regarding gender inequality in cancer research. Our study reveals that male researchers are disproportionately represented in cancer research, particularly in top-ranking positions.

Furthermore, we contribute to the literature on gender disparities in grant and personnel award funding rates by examining gender differences in research fund allocation within a broader context. While most studies focus on the national level, we provide evidence at the regional level. Our findings align with those of several articles, including Raj et al. (2016), Zhou et al. (2018), Burns et al. (2019) and Oliveira et al. (2019).

Lastly, we present a novel finding concerning the decision-making process of evaluation panels regarding the gender aspect of cancer types. Existing literature has documented evidence indicating that the gender composition of scientific committees can influence their decision-making processes (Bagues et al., 2017; Hospido and Sanz, 2021). However, most studies have focused on decisions related to female

and male candidates. To the best of our knowledge, our study provides the first evidence demonstrating that a higher representation of male members on evaluation panels favors projects focusing on male-dominated cancers.

The remainder of the chapter proceeds as follows. Section 3.2 provides a summary of data and method. We then present our empirical result in Section 3.3 and potential mechanisms in Section 3.4. Finally, Section 3.5 discusses and concludes.

3.2 Data and Method

3.2.1 Sample and Data Collection

We employ a purposive method to identify cancer-related projects funded by the European Research Council (ERC), the European Commission within the Seventh Framework Programme (FP7), and within the Horizon 2020 (H2020) Framework Programme. First, we conduct keyword searches for *cancer* on the official ERC website and within the Community Research and Development Information Service (CORDIS) database, encompassing all research projects funded under FP7 and H2020.[6] The search yields 1,231 projects from the ERC and 2,831 projects from FP7 and H2020 (excluding ERC projects) containing the term *cancer* in their abstracts. Subsequently, we screen the abstracts of these projects, selectively including only those with a primary focus on cancer research in our samples.[7]

Our ERC sample comprises 263 projects detailing cancer types, grant types, start and end dates, maximum funding, principal investigators, and their affiliated institutions. In comparison, the FP7 & H2020 sample consists of 714 projects providing information on cancer types, funding types, start and end dates, maximum European Commission (EC) contributions, and awarded institutions. To identify researchers (scientific coordinators or research fellows) in the FP7 & H2020 sample, we extract data from the acknowledgment sections of published journal articles associated with grant-funded projects. Researchers' gender in both samples is gathered from their personal webpages and other social media platforms such as LinkedIn and Twitter. Additionally, we collect data on researchers' quality, measured by the cumulative number of citations up to the year of the funding call, from the Scopus database. Our datasets cover the period from 2007 to 2020, with the year of each project identified as the year of its corresponding funding call.

We access mortality data related to cancer through the official web-page of the European Cancer Information System (ECIS). This web-page compiles incidence

[6]CORDIS database. https://erc.europa.eu/projects-figures/project-database

[7]The European Research Council operates within both the Seventh Framework Programme and the Horizon 2020 Framework Programme.

and mortality data categorized by cancer type, gender, and age group from approximately 200 population-based cancer registries across most European countries, as well as data from the European Statistical Office (EUROSTAT) and the World Health Organization (WHO). It is important to note that ECIS provides historical data up to 2012 and estimates for 2020. For mortality data spanning from 2013 to 2019, we utilize the WHO mortality database.[8] Additionally, we collect information on evaluation panels for all projects in the ERC sample from the ERC website, where this data is publicly available. Subsequently, we identify the gender of evaluators through Google searches, their curriculum vitae, and personal web-pages.

3.2.2 Descriptive Statistics

In this study, we categorize the topics of granted projects into 11 cancer types, including blood cancer, brain cancer, pancreatic cancer, colorectal cancer, melanoma-skin cancer, lung cancer, liver and intrahepatic bile duct cancer, female breast cancer, prostate cancer, other and primary site unknown cancers, and mixed cancers, where the project focuses on more than one cancer type. Within the ERC sample, grants are divided into five types: Starting Grants, Advanced Grants, Consolidator Grants, Proof of Concept, and Synergy Grants. In contrast, the FP7 & H2020 sample includes eight main funding types: Small and medium collaborative projects (FP7 only), Research and Innovation (H2020 only), other collaborative projects (FP7 and H2020), Standard Marie Curie Postdoc (FP7 and H2020), Marie Curie-International dimension (FP7 and H2020), Marie Curie Reintegration or Career Restart (FP7 and H2020), SME Instrument 1 (H2020 only), and other SME funding (FP7 and H2020).[9] More details about grant types and action types are provided in Appendix 3A. The key distinction between ERC Grant Types and FP7 & H2020 Funding Types is that ERC Grant Types specify maximum funding values and project durations for each grant type, while FP7 & H2020 funding types do not have such requirements. This dissimilarity prompts separate analysis of the two samples.

Tables 3.1 and 3.2 display descriptive statistics derived from our datasets. Notably, significant disparities in research funding are evident across grant and funding types in both samples. The average project duration in the FP7 & H2020 sample is approximately half that of the ERC sample (2.75 versus 4.09 years), while the average male relative mortality is comparable between the two samples. Further-

[8]The WHO mortality database, https://platform.who.int/mortality

[9]The Horizon 2020 Framework Programme only retained four funding schemes from the Seventh Framework Programme including Future and Emerging Technologies (FET), European Research Council (ERC), Marie Curie and Infrastructures. Moreover, the European Commission imposed several modifications or changes of retained funding schemes.

more, the average research quality of scholars, which is measured by the number of citations up to the year that researchers applied for the grants over 100,000, in the ERC sample markedly exceeds that of the H2020 sample (0.09 versus 0.02, respectively). This discrepancy can be attributed to the ERC's focus on supporting innovative, bottom-up research endeavors, solely evaluated based on the scientific excellence of the researchers and their proposals. Consequently, ERC recipients are typically esteemed researchers with outstanding research quality. Regarding gender diversity among researchers, the proportion of female researchers is relatively small in the ERC sample (0.22), similar to that observed in collaborative projects (Columns 2 to 4 in Table 3.2), but lower than that in Marie Curie funding schemes (Columns 5 to 7 in Table 3.2).

Table 3.1: Descriptive Statistics in the ERC Sample

	(1) Total Sample	(2) Starting Grant	(3) Advanced Grant	(4) Consolidator Grant	(5) Proof of Concept	(6) Synergy Grants
Research fund	1473.13	1508.11	2395.44	2024.50	149.42	9153.89
	(1128.3)	(294.1)	(316.9)	(183.4)	(2.010)	(1160.4)
Log (research fund)	6.82	7.30	7.77	7.61	5.01	9.12
	(1.183)	(0.159)	(0.150)	(0.0816)	(0.0138)	(0.127)
Project duration	4.09	5.16	5.10	5.13	1.49	5.50
	(1.692)	(0.424)	(0.403)	(0.306)	(0.223)	(0.707)
Female PI	0.22	0.23	0.18	0.24	0.24	0.38
	(0.416)	(0.426)	(0.385)	(0.431)	(0.428)	(0.530)
Male relative mortality (M=1)	0.48	0.51	0.45	0.43	0.49	0.55
	(0.287)	(0.273)	(0.282)	(0.328)	(0.284)	(0.00594)
Male relative mortality 2007 (M=1)	0.47	0.51	0.45	0.42	0.49	0.53
	(0.286)	(0.270)	(0.285)	(0.324)	(0.283)	(0.0240)
Cancer burden	5.51	5.24	6.46	4.82	5.44	4.58
	(4.606)	(4.189)	(5.358)	(2.909)	(5.164)	(2.617)
Citation	0.09	0.02	0.18	0.04	0.10	0.12
	(0.121)	(0.0142)	(0.137)	(0.0349)	(0.143)	(0.147)
Female share	0.34	0.32	0.29	0.30	0.42	0.29
	(0.0862)	(0.0771)	(0.0841)	(0.0648)	(0.0418)	(0.0240)
N	263	77	62	46	76	2

Note: The mean coefficients are presented with their standard deviation in parentheses. Research fund is the maximum ERC funding in thousands of euros. Female PI is the ratio of female principal investigators to the total number of principal investigators in a project. Male relative mortality is the ratio between male deaths and total deaths caused by a cancer type in a given year. Male relative mortality 2007 is the ratio between male deaths and total deaths caused by a cancer type in 2007. Cancer burden is the ratio between potential years of life lost due to cancer types in 2006 and 100,000. Citation denotes the number of citations accrued up to the year researchers applied for the grants, scaled by 100,000. Table 3B.1 in Appendix 3A provides more details of variables in this study.

Table 3.2: Descriptive Statistics in the FP7 & H2020 Sample

	(1) Total Sample	(2) S&M CPs	(3) R&I	(4) Other CPs	(5) Std. MC	(6) MC Int. Dim.	(7) MC RI/CAR	(8) SME Inst. 1	(9) Other SME funds
Research fund	1550.25	4311.16	5591.24	4817.21	185.70	1256.68	124.53	50.00	2297.29
	(2451.7)	(1428.7)	(2301.8)	(4172.8)	(26.35)	(1514.0)	(54.66)	(0)	(839.6)
Log (research fund)	6.00	8.31	8.56	7.88	5.21	6.36	4.73	3.91	7.67
	(1.674)	(0.348)	(0.364)	(1.405)	(0.141)	(1.238)	(0.450)	(0)	(0.389)
Project duration	2.75	4.17	4.57	3.47	2.07	3.34	3.24	0.45	2.77
	(1.415)	(1.153)	(1.012)	(1.267)	(0.300)	(0.937)	(0.971)	(0.121)	(0.742)
Female PI	0.40	0.28	0.22	0.21	0.47	0.32	0.47	0.50	0.50
	(0.433)	(0.447)	(0.399)	(0.335)	(0.501)	(0.470)	(0.501)	(0)	(0)
Male relative mortality (M=1)	0.46	0.46	0.38	0.46	0.44	0.48	0.51	0.48	0.43
	(0.307)	(0.282)	(0.315)	(0.263)	(0.309)	(0.329)	(0.304)	(0.308)	(0.306)
Male relative mortality 2007 (M=1)	0.45	0.47	0.36	0.46	0.43	0.48	0.51	0.47	0.43
	(0.308)	(0.277)	(0.312)	(0.262)	(0.309)	(0.334)	(0.306)	(0.309)	(0.311)
Cancer burden	5.86	5.35	5.26	6.07	6.08	4.72	6.22	5.82	7.71
	(4.998)	(4.909)	(3.931)	(4.531)	(4.962)	(4.136)	(5.792)	(4.991)	(6.184)
Citation	0.02	0.05	0.06	0.05	0.00	0.02	0.01		
	(0.0487)	(0.0646)	(0.0735)	(0.0849)	(0.00369)	(0.0262)	(0.0186)		
N	714	63	68	41	218	85	113	86	40

Note: The mean coefficients are presented with their standard deviation in parentheses. Research fund is the European Commission maximum contribution in thousands of euros. Female PI is the ratio of female scientific coordinators, or fellows to the total number of scientific coordinators, or fellows in a project. Male relative mortality is the ratio between male deaths and total deaths caused by a cancer type in a given year. Male relative mortality 2007 is the ratio between male deaths and total deaths caused by a cancer type in 2007.Cancer burden is the ratio between potential years of life lost due to cancer types in 2006 and 100,000. Citation denotes the number of citations accrued up to the year researchers applied for the grants, scaled by 100,000. Table 3B.1 in 3.5 provides more details of variables in this study.

3.3 Empirical Model and Results

3.3.1 Empirical Model

Our objective is to examine the relationship between the maximum awarded research fund and male relative mortality, quantified by the ratio of male mortality to total mortality for a given cancer type. We employ a linear regression model incorporating fixed effects for grant type or funding type and a period dummy variable that takes the value of 1 if the project was granted after 2013, and 0 otherwise.[10] The descriptive statistics presented in Tables 3.1 and 3.2 reveal significant disparities in research funding across various grant and funding types. To achieve a more precise analysis, we define our outcome variable as the logarithm of the awarded research fund for each project. Our estimating equation is formulated as follows:

$$\begin{aligned} Y_{ict} = \alpha + \beta \times \text{Male relative mortality}_{ict} + \gamma \times X_{ict} \\ + \mu_i + \mathbb{1}_{\text{t} \geq 2014} + \mu_i \times \mathbb{1}_{\text{t} \geq 2014} + \varepsilon_{ict} \end{aligned} \tag{3.1}$$

where Y_{ict} represents the logarithm of the research fund (in thousand euros) for project i awarded in year t that focuses on cancer type c. Male relative mortality$_{ict}$ is the male relative mortality of the cancer type c in project i in year t, which is a

[10]Note that the Horizon 2020 funding programme commenced in 2014, while the Seventh Framework Programme concluded in 2013. Therefore, we choose 2013 as the threshold year to distinguish between projects granted under the H2020 programme (coded as 1) and those granted under the FP7 framework (coded as 0) in the period dummy variable.

continuous variable with the value ranging between 0 and 1. X_{ict} includes control variables: duration of project i awarded in year t with cancer type c; burden of cancer type c in project i in 2006, measured by potential years of life lost due to cancer.

μ_i represents the fixed effects of grant type or funding type for project i. We include grant type or funding type fixed effects to control for characteristics specific to ERC grant types or FP7 and H2020 funding types that may influence the awarded research fund. It is important to note that, in the ERC sample, projects from Synergy Grants are not included due to the limited number of observations, with only two projects identified. $\mathbb{1}_{t \geq 2014}$ is the period dummy that equals to 1 if the project was granted after 2013, and 0 otherwise. This indicator variable allows us to control for any differences that may influence the awarded research fund between the Seventh Framework Programme and the H2020 Framework Programme.[11]

Moreover, we include the interaction term between grant type or funding type fixed effects and the period dummy, which allows for the impact of grant type fixed effects or funding type fixed effects on the outcome variable to change over period. Finally, ε_{ict} is the error term, which we allow to be heteroscedastic and correlated across cancer types. In practice, we cluster the standard errors at the cancer type level. The coefficient β captures the association between maximum research fund and male relative mortality.

3.3.2 Main Results

Table 3.3 presents estimated results from equation 3.1 in the two samples. Panel A displays the findings for the ERC sample, while Panel B presents the results for the FP7 & H2020 sample. In column (1) of Panel A, the coefficient $\hat{\beta}$, which represents the percent change in the awarded research fund when male relative mortality increases by one unit, is positive but not statistically significant. However, after including the control variable *Cancer burden* in column (2), which measures the severity of cancer types, the estimated coefficient becomes positive and statistically significant at the 5% level (0.031). Columns (3) to (4) of Panel A replicate the regression analysis with *Male relative mortality 2007* as the variable of interest, yielding consistent results with the previous columns. The result indicates that 10 percentage point increase in male relative mortality is associated with approximately 0.3% increase in the awarded research fund, holding all other independent

[11] There are significant differences between the Seventh Framework Programme and the H2020 Framework Programme. H2020 introduced streamlined procedures for participation, evaluation, proposal, and project management compared to FP7. Furthermore, H2020 underwent significant restructuring, with parts of the former Cooperation Programme from FP7 now categorized under Industrial Leadership and Societal Challenges.

variables constant. This represents a 4,420 euro increase over the sample mean.

In column (1) of Panel B, the estimated coefficient $\hat{\beta}$ is positive and statistically significant at the 1% level (0.109) when considering only the variable of interest and funding type fixed effects. Adding more control variables in column (2) does not alter the sign or significance level of the estimated coefficient. Notably, most FP7 & H2020 funding types do not specifically impose a maximum project duration, as discussed in Subsection 3.2.2, hence we include the control variable *Project duration* in this column.

The result suggests that a 10 percentage point increase in male relative mortality is associated with approximately a 0.8% increase in the awarded research fund, holding all other independent variables constant. This represents a substantial increase of 12,402 euros over the sample mean. Furthermore, the result remains consistent when using *Male relative mortality 2007* as the variable of interest in columns (3) and (4).

Comparing the estimated coefficient in the FP7 & H2020 sample to that in the ERC sample, the magnitude in the FP7 & H2020 sample is larger. However, both estimates are positive and statistically significant, supporting the hypothesis that higher male relative mortality is associated with higher grant amounts, or conversely, that female-dominated cancers are underfunded.[12]

3.3.3 Robustness

In this subsection, we conduct several robustness checks. Table 3.4 includes an additional control variable, *Incidence 2007*, in the regression to address potential concerns that *Cancer burden* may not fully capture the severity of all cancer types. *Incidence 2007* refers to the count of newly diagnosed cases (in hundred thousands) categorized by cancer type in the year 2007.[13] Panel A presents results for the ERC sample, while Panel B shows findings for the H2020 sample.

In columns (1) and (2) of Panel A, the magnitudes of the estimated coefficients (0.033 and 0.038) are very similar to those in Panel A of Table 3.3. Similarly, when considering the FP7 & H2020 sample in Panel B, we obtain results consistent with the positive association between male mortality rate and awarded research fund observed in Panel B of Table 3.3.

In Table 3.5, we employ a different dependent variable, *Project cost*, to assess the robustness of the main results in the FP7 & H2020 sample. It is important to note

[12]The result remains when we exclude the interaction term between grant type/funding type fixed effects and period dummy.

[13]The selection of the incidence data from 2007 corresponds to the commencement of the coverage period in both samples.

Table 3.3: Result of the Linear Regression Model in the ERC and the FP7 & H2020 Samples

	Dependent variable is Log(research fund)			
	(1)	(2)	(3)	(4)
Panel A: ERC sample				
Male relative mortality (M=1)	0.027	0.031**		
	(0.015)	(0.013)		
	[0.050]	[0.035]		
Male relative mortality 2007 (M=1)			0.032	0.036*
			(0.020)	(0.018)
			[0.047]	[0.031]
Cancer burden		0.001		0.001
		(0.001)		(0.001)
Grant type FE	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Grant type FE × Period dummy	No	Yes	No	Yes
Mean Dep. Var.	*1473.13*	*1473.13*	*1473.13*	*1473.13*
Observations	261	261	261	261
Adjusted R^2	0.990	0.990	0.990	0.990
Panel B: FP7 & H2020 sample				
Male relative mortality (M=1)	0.109***	0.077***		
	(0.030)	(0.020)		
	[0.028]	[0.000]		
Male relative mortality 2007 (M=1)			0.125***	0.086***
			(0.038)	(0.021)
			[0.004]	[0.002]
Project duration		0.398***		0.397***
		(0.036)		(0.036)
Cancer burden		-0.002		-0.002
		(0.002)		(0.002)
Funding type FE	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Funding type FE × Period dummy	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1550.25*	*1550.25*	*1550.25*	*1550.25*
Observations	714	711	714	711
Adjusted R^2	0.900	0.928	0.901	0.928

Notes: Standard errors, clustered at the cancer type level, are shown in parentheses. Research fund is the maximum awarded grant in the ERC sample and the maximum contribution of the European Commision in the FP7 & H2020 sample (in thousand euros). Male relative mortality is the ratio between the number of male deaths and the total deaths caused by a cancer type in a given year (range between 0 and 1). Male relative mortality 2007 is the ratio between the number of male deaths and the total deaths caused by a cancer type in 2007 (range between 0 and 1). Cancer burden is the number of potential years of life lost caused by a cancer type in 2006 (divided by 100,000). Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

that *Project cost* includes contributions from both the European Commission and other funding bodies.

Table 3.4: Robustness Check in the ERC and the FP7 & H2020 Samples

	Dependent variable is Log(research fund)	
	(1)	(2)
Panel A: ERC sample		
Male relative mortality (M=1)	0.033**	
	(0.012)	
	[0.034]	
Male relative mortality 2007 (M=1)		0.038**
		(0.017)
		[0.024]
Cancer burden	0.001	0.000
	(0.001)	(0.001)
Incidence 2007	0.004	0.005
	(0.004)	(0.004)
Grant type FE	Yes	Yes
Period dummy	Yes	Yes
Grant type FE × Period dummy	Yes	Yes
Mean Dep. Var.	*1473.13*	*1473.13*
Observations	261	261
Adjusted R^2	0.990	0.990
Panel B: FP7 & H2020 sample		
Male relative mortality (M=1)	0.068***	
	(0.008)	
	[0.002]	
Male relative mortality 2007 (M=1)		0.078***
		(0.010)
		[0.000]
Project duration	0.398***	0.397***
	(0.036)	(0.036)
Cancer burden	-0.000	-0.000
	(0.003)	(0.003)
Incidence 2007	-0.019	-0.018
	(0.020)	(0.020)
Funding type FE	Yes	Yes
Period dummy	Yes	Yes
Funding type FE × Period dummy	Yes	Yes
Mean Dep. Var.	*1550.25*	*1550.25*
Observations	711	711
Adjusted R^2	0.928	0.928

Notes: Standard errors, clustered at the cancer type level are shown in parentheses. Research fund is the maximum awarded grant in the ERC sample and the maximum contribution of the European Commission in the FP7 & H2020 sample (in thousand euros). Male relative mortality is the ratio between the number of male deaths and the total deaths caused by a cancer type in a given year (range between 0 and 1). Male relative mortality 2007 is the ratio between the number of male deaths and the total deaths caused by a cancer type in 2007 (range between 0 and 1). Cancer burden is the number of potential years of life lost caused by a cancer type in 2006 (divided by 100,000). Incidence 2007 is the number of new cases by cancer type in 2007 (in hundred thousands). Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Columns (1) to (3) in Table 3.5 show that when our variable of interest is *Male relative mortality*, the results indicate a positive correlation between male relative mortality and project cost. On average, a 10 percentage point increase in male relative mortality is associated with approximately a 1% increase in project cost, representing an 18,498 euro increase over the sample mean. This finding remains consistent when using *Male relative mortality 2007* as the variable of interest in columns (4) to (6).

Table 3.5: Result of the Linear Regression Model with Another Dependent Variable - Log(project cost)

	Dependent variable is Log(project cost)					
	(1)	(2)	(3)	(4)	(5)	(6)
Male relative mortality (M=1)	0.131***	0.097***	0.092***			
	(0.032)	(0.017)	(0.015)			
	[0.055]	[0.009]	[0.032]			
Male relative mortality 2007 (M=1)				0.147***	0.107***	0.102***
				(0.037)	(0.018)	(0.015)
				[0.033]	[0.001]	[0.019]
Project duration		0.393***	0.393***		0.392***	0.392***
		(0.035)	(0.035)		(0.035)	(0.035)
Cancer burden		-0.002	-0.001		-0.002	-0.001
		(0.002)	(0.003)		(0.002)	(0.003)
Incidence 2007			-0.012			-0.011
			(0.019)			(0.019)
Funding type FE	Yes	Yes	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes	Yes	Yes
Funding type FE × Period dummy	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1849.82*	*1849.82*	*1849.82*	*1849.82*	*1849.82*	*1849.82*
Observations	706	703	703	706	703	703
Adjusted R^2	0.903	0.929	0.929	0.903	0.929	0.929

Notes: Standard errors, clustered at the cancer type level, are shown in parentheses. Project cost contains both fund contribution from the European Commission and from other funding agencies (in thousand euros). Male relative mortality is the ratio between the number of male deaths and the total deaths caused by a cancer type in a given year (range between 0 and 1). Male relative mortality 2007 is the ratio between the number of male deaths and the total deaths caused by a cancer type in 2007 (range between 0 and 1). Cancer burden is the number of potential years of life lost caused by a cancer type in 2006 (divided by 100,000). Incidence 2007 is the number of new cases by cancer type in 2007 (in hundred thousands). Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.6 displays the results of the linear regression model when we integrate both samples. In column (1), when we include only funding type or grant type fixed effects, period dummy, and their interaction terms, the estimated coefficient $\hat{\beta}$ is positive and statistically significant at the 1% level (0.089). Upon including additional control variables in column (2), the magnitude of the estimated coefficient

for *Male relative mortality* changes, but maintains its positive sign and significance level (0.053). The result remains stable when we use *Male relative mortality 2007* as the variable of interest in columns (3) and (4). Further robustness checks with time trend (Table 3B.3) and Tobit model with the ERC sample (Table 3B.4) in Appendix 3B yield consistent findings, affirming the positive association between awarded research fund and male relative mortality.

Table 3.6: Results of Linear Regression Model with the Integrated Sample

	Dependent variable is Log(research fund)			
	(1)	(2)	(3)	(4)
Male relative mortality (M=1)	0.089***	0.053***		
	(0.022)	(0.008)		
	[0.016]	[0.008]		
Male relative mortality 2007 (M=1)			0.103***	0.062***
			(0.031)	(0.016)
			[0.000]	[0.010]
Cancer burden		0.000		0.000
		(0.002)		(0.002)
Project duration		0.368***		0.368***
		(0.036)		(0.036)
Incidence 2007		-0.011		-0.010
		(0.015)		(0.015)
Funding/Grant type FE	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Funding/Grant type FE × Period dummy	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1529.48*	*1529.48*	*1529.48*	*1529.48*
Observations	975	972	975	972
Adjusted R^2	0.918	0.939	0.918	0.939

Notes: Standard errors, clustered at the cancer type level, are shown in parentheses. Research fund is the maximum awarded grant in the ERC sample and the maximum contribution of the European Commission in the FP7 & H2020 sample (in thousand euros). Male relative mortality is the ratio between the number of male deaths and the total deaths caused by a cancer type in a given year (range between 0 and 1). Male relative mortality 2007 is the ratio between the number of male deaths and the total deaths caused by a cancer type in 2007 (range between 0 and 1). Cancer burden is the number of potential years of life lost caused by a cancer type in 2006 (divided by 100,000). Incidence 2007 is the number of new cases by cancer type in 2007 (in hundred thousands). Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.4 Mechanisms

The results presented in this chapter are consistent with the hypothesis that female-dominated cancers are underfunded in Europe. In this section, we provide some potential explanations for the unequal distribution of funding.

3.4.1 Over-representation of Men in Cancer Research in Europe

Our analysis of two samples reveals that 27.6% of male researchers work on female-dominated cancer projects, while 72.4% of them focus on male-dominated cancer projects. This indicates a tendency for male researchers to prioritize cancer types associated with their gender. Therefore, if men are over-represented in cancer research, there may be fewer researchers dedicated to female-dominated cancers compared to male-dominated cancers. This imbalance could potentially result in fewer projects and less funding allocated to female-dominated cancers.

To test this hypothesis, we compile a list of cancer research scholars, who have registered on the online platform Publons, from 27 European Union (EU) countries up to November 2021, as well as from the United Kingdom, Switzerland, Norway, and several other nations.[14] We include some countries outside the European Union since EU grants are open to researchers in the host institution not only from an EU Member State, but also from associated countries. Publons provides us with the names of researchers and their affiliations. We then gather information on their gender, citation count, h-index (or Hirsch index), and research fields through Google search, Scopus, and their peer-reviewed publications.[15] Our final list comprises 927 cancer researchers, with 559 male scholars and 368 female scholars, resulting in an overall male percentage of 60.3%.

Figure 3.3 presents the structure of the list of cancer researchers in Europe. Out of 927 researchers, there are 251 researchers (equivalent to 27% of total cancer researchers) that do not work on any specific cancer type. Those researchers mainly focus on cell biology, deoxyribonucleic acid (DNA) repairs and general cancer treatment, such as chemotherapy, radiation or immunotherapy. Out of 676 researchers (equivalent to 73% of total cancer researchers) that work on specific cancer types, there are 267 female researchers (39.5%) and 409 male researchers (60.5%).

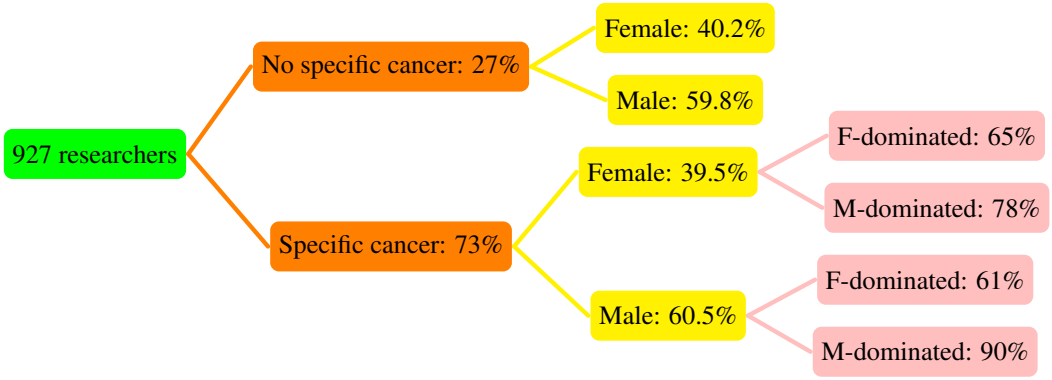
[14] Publons, owned by Clarivate, is a platform that enables researchers to track, verify, and showcase their peer review and editorial contributions for academic journals. With a user base exceeding 3,000,000 researchers across various fields of research, the platform serves as a valuable resource for scholarly communication.

[15] The h-index or Hirsch index is the highest number of publications of a researcher that received h or more citations each while the other publications have not more than h citations each.This metric represents both the productivity and the impact of a researcher.

Female-dominated Cancers

In terms of their research interest on female- or male-dominated cancers, 65% of female and 61% of male researchers focus on female-dominated cancers, while 78% of female and 90% of male researchers study male-dominated cancers. The list shows that male researchers predominantly focus on male-dominated cancers and more so than their female counterparts. Interestingly, female researchers are inclined to study male-dominated cancers, but are more likely than their male colleagues to work on female-dominated cancers.

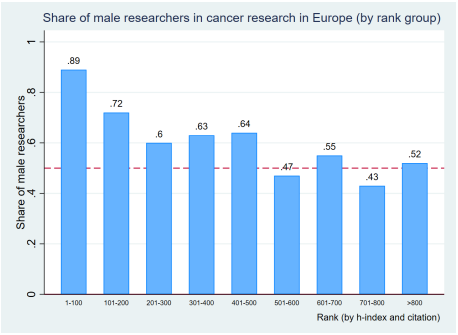
Figure 3.3: Structure of the List of Cancer Researchers in Europe



Next, we show that male researchers are over-represented in cancer research in Europe, especially in the top ranks. From the list of scholars that we gather from Publons, we rank researchers by their h-index, and if several scholars have the same h-index, we use the number of their citations as the second criterion.

Figure 3.4: Share of Male Researchers in Cancer Research in Europe

(a) Share of male researchers in all cancer research



(b) Share of male researchers in specific cancer type research

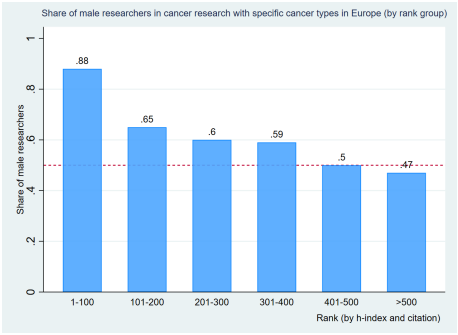


Figure 3.4 illustrates the prevalence of male researchers across various rank groups in European cancer research. In Panel (a), encompassing all cancer research, it is evident that in the top 100 researchers, 89% are male. This over-representation

persists in subsequent rank groups, with 72%, 60%, 63%, and 64% of researchers in the 101st to 200th, 201st to 300th, 301st to 400th, and 401st to 500th positions being male, respectively. Panel (b) focuses specifically on the 676 researchers conducting research in particular cancer types, revealing a consistent pattern similar to Panel (a). Male researchers continue to dominate in numbers among the top 100 researchers and remain over-represented even up to the 301st to 400th rank group.

3.4.2 Funding Bias against Female Researchers

In this subsection, we explore the next potential explanation that might be behind the main results. Our hypothesis is that female-dominated cancers are underfunded due to funding bias against female researchers. Subsection 3.4.1 presents suggestive evidence indicating that female researchers are more inclined to focus on female-dominated cancers compared to their male counterparts. This tendency may contribute to their higher likelihood of leading projects related to female-dominated cancers. Our data also supports this argument since in the two samples, there is 35.6% of female researchers and 27.6% of male researchers that lead female-dominated cancer projects.

Moreover, the related literature reports evidence of gender gaps in grant and personnel award funding rates, such as: Raj et al. (2016), Zhou et al. (2018), Burns et al. (2019) and Oliveira et al. (2019). Therefore, if female researchers receive less funding than their male counterparts, there will be less granted money for female-dominated cancers. We then test our hypothesis in both samples by adding the variable *Female* PI_i, which represents the ratio of female investigators to the total number of investigators in project i, to equation 3.1.

Table 3.7 presents the findings from our two samples. In Panel A, columns (1) and (3) display the results from the ERC sample. The coefficients associated with *Female* PI_i are negative in these columns, but they are not statistically significant when we use both *Male relative mortality* and *Male relative mortality 2007*. We then introduce *Citation* in columns (2) and (4) because, in addition to gender, female and male researchers might differ in research quality. However, the results remain unchanged.

In principle, we find no evidence of funding bias against female researchers in the ERC sample, as the estimated coefficients $\hat{\beta}$ remain very stable across all specifications, approximately around 0.03 as the baseline result. The lack of evidence regarding the gender gap in granting may be explained by the fact that in the ERC sample, we can only observe granted projects, and the maximum awarded fund is very similar across projects within the same grant type.

Table 3.7: Do Female Researchers Receive Less Funding?

	Dependent variable is Log(research fund)			
	(1)	(2)	(3)	(4)
Panel A: ERC sample				
Male relative mortality (M=1)	0.033**	0.032**		
	(0.012)	(0.015)		
	[0.031]	[0.074]		
Male relative mortality 2007 (M=1)			0.038*	0.037*
			(0.017)	(0.020)
			[0.039]	[0.078]
Female PI	-0.005	-0.006	-0.005	-0.005
	(0.015)	(0.016)	(0.015)	(0.016)
	[0.698]	[0.699]	[0.700]	[0.707]
Citation		-0.009		-0.007
		(0.069)		(0.070)
Other controls	Yes	Yes	Yes	Yes
Grant type FE	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Grant type FE × Period dummy	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1473.13*	*1473.13*	*1473.13*	*1473.13*
Observations	261	261	261	261
Adjusted R^2	0.990	0.990	0.990	0.990
Panel B: FP7 & H2020 sample				
Male relative mortality (M=1)	0.043***			
	(0.007)			
	[0.000]			
Male relative mortality 2007 (M=1)		0.053**		
		(0.017)		
		[0.000]		
Female PI	-0.122***	-0.121***		
	(0.037)	(0.037)		
	[0.007]	[0.005]		
Other controls	Yes	Yes		
Funding type FE	Yes	Yes		
Period dummy	Yes	Yes		
Funding type FE × Period dummy	Yes	Yes		
Mean Dep. Var.	*1550.25*	*1550.25*		
Observations	669	669		
Adjusted R^2	0.930	0.930		

Notes: Standard errors clustered at the cancer type level in parentheses. Female PI is the ratio between the number of female principal investigators/scientific coordinators/fellows and the total number of principal investigators/scientific coordinators/fellows in one project. Citation is the ratio between the researcher's cumulative citations (until the year that they applied for the grant) and 100,000. The definition of other variables is as in previous tables. Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In Panel B of Table 3.7, we present the regression results for the FP7 & H2020 sample. In columns (1) and (2), the coefficients of *Female PI*$_i$ are negative, significant at the 1% level, and similar in magnitude. This result indicates that, on average, all-female research teams receive approximately 12% less research funding than their male counterparts. We do not include the control variable *Citation* in this Panel since the FP7 & H2020 sample contains not only individual investigators but also enterprises.

3.4.3 Impact of the Evaluation Panel's Gender Composition on Awarding Grants

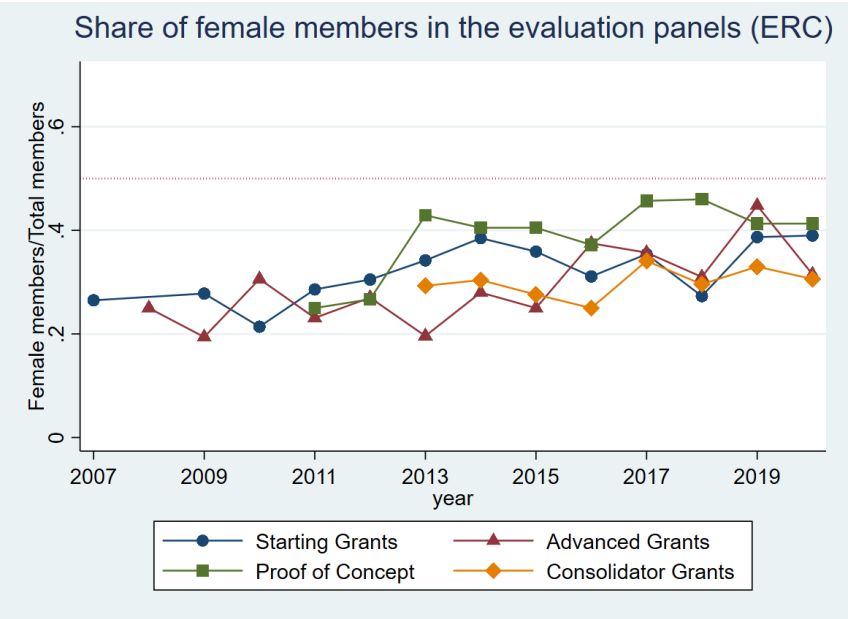
This subsection investigates the impact of the gender composition of evaluation panels on the awarding of grants for female-dominated and male-dominated cancers. The related literature documents evidence that the gender composition of scientific committees can influence committee decision-making (Bagues et al., 2017; Hospido and Sanz, 2021). However, most studies focus on decisions regarding female and male candidates. We contribute to the existing literature by examining evaluation panels' decisions regarding the gender aspect of research topics. We gather information on scientific committees in the ERC sample due to data availability.

Figure 3.5 illustrates the share of female evaluators in committees across four ERC grant types since 2007. This ratio is calculated based on the composition of evaluation panels corresponding to granted projects in our ERC sample. In general, there is an upward trend in the share of female members in evaluation panels across all grant types, although the female share has never exceeded 50%. The increase in the female share of evaluation panels over the years can be attributed to the integrated approach to research and innovation in the Horizon 2020 Framework Programme. Specifically, between 2014 and 2020, the European Union's strategy on gender equality aimed to ensure gender balance in decision-making, with a target of 40% representation of the under-represented sex in panels.

Next, we merge the data on the share of female members in the evaluation panels into the ERC sample. To facilitate interpretation of the results, we introduce two new variables of interest: *Dummy male relative mortality* and *Dummy male relative mortality 2007* ($D_{ict/2007}$). These dummy variables are defined as follows:

$$D_{ict/2007} = \begin{cases} 1 & \text{if male relative mortality of cancer type } c \\ & \text{in project } i \text{ in year } t \text{ or year } 2007 > 0.5 \\ 0 & \text{otherwise} \end{cases}$$

Figure 3.5: Gender Composition in the Evaluation Panels (ERC)



In Table 3.8, we present the results of regressing our dependent variable on several variables of interest, including *Male relative mortality*, *Male relative mortality 2007*, *Dummy male relative mortality* and *Dummy male relative mortality 2007*. We also include *Female share*$_i$, which is the share of female members on the evaluation panel for examining project i, correspondent interaction terms, some control variables, and grant type fixed effects.

Columns (1) and (2) present results when we use *Dummy male relative mortality* and *Dummy male relative mortality 2007* as the variables of interest. Row (1) of column (1) and and row (2) of column (2) indicate that male-dominated cancers receive around 13% more funding than female-dominated cancers when there is no female evaluator in the panel, holding other variables constant. Row (5) of the corresponding columns shows that when the project focuses only on female-dominated cancers, there is a positive association between the share of female evaluators and awarded research funding, albeit not significant.

Furthermore, the negative and significant estimated coefficients in row (6) of column (1) (-0.333) and row (7) of column (2) (-0.352) imply that when the female share in the evaluation panel increases, the funding bias toward male-dominated cancers reduces. The result remains unchanged in columns (3) and (4) when we use the continuous variable *Male relative mortality*, *Male relative mortality 2007* as the variables of interest. In principle, the result suggests that when there are more female evaluators in the evaluation panel, there is less funding bias toward male-dominated cancer projects.

Table 3.8: Does Gender Composition of the Evaluation Panels Matter?

	Dependent variable is Log (research fund)			
	(1)	(2)	(3)	(4)
Dummy male relative mortality (M=1)	0.131*			
	(0.063)			
	[0.041]			
Dummy male relative mortality 2007 (M=1)		0.145*		
		(0.073)		
		[0.042]		
Male relative mortality (M=1)			0.182*	
			(0.090)	
			[0.055]	
Male relative mortality 2007 (M=1)				0.203*
				(0.111)
				[0.042]
Female share	0.221	0.236	0.206	0.235
	(0.229)	(0.244)	(0.236)	(0.264)
Dummy male relative mortality × Female share	-0.333*			
	(0.164)			
	[0.025]			
Dummy male relative mortality 2007 × Female share		-0.352*		
		(0.181)		
		[0.025]		
Male relative mortality × Female share			-0.451*	
			(0.222)	
			[0.065]	
Male relative mortality 2007 × Female share				-0.500*
				(0.267)
				[0.056]
Controls	Yes	Yes	Yes	Yes
Grant type FE	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Grant type FE × Period dummy	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1550.25*	*1550.25*	*1550.25*	*1550.25*
Observations	261	261	261	261
Adjusted R^2	0.990	0.990	0.990	0.990

Notes: Standard errors clustered at the cancer type level in parentheses. Dummy male relative mortality equals 1 if the cancer is male-dominated, and 0 otherwise. Dummy male relative mortality 2007 equals 1 if the cancer is male-dominated in 2007, and 0 otherwise. The definition of other variables is as in previous tables. Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

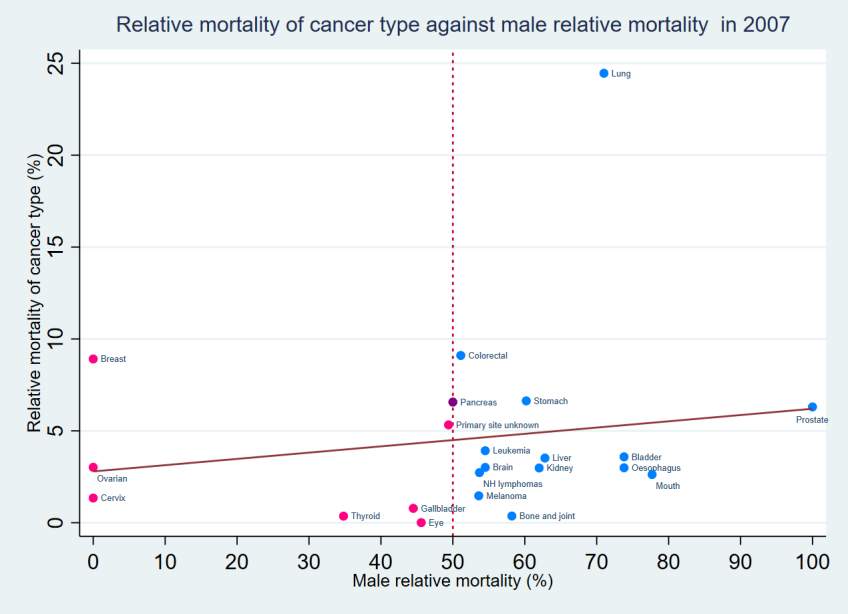
3.4.4 Differences in Mortality between Female-dominated Cancers and Male-dominated Cancers

One important feature of cancer is its differential impact on men and women due to biological differences, such as sex hormones (Folkerd and Dowsett, 2010), and behavioral factors (Dong et al., 2020). Additionally, Dong et al. (2020) report that males generally exhibit lower overall survival rates than females. This evidence

suggests a potential explanation for our study. We hypothesize that male-dominated cancers have higher mortality rates compared to female-dominated cancers, leading to a larger allocation of resources. To test this hypothesis, we analyze mortality data by cancer type and gender in 2007.

Figure 3.6 depicts the relative mortality of each cancer type against male relative mortality. The relative mortality of each cancer type on the vertical axis represents its contribution to overall cancer-related deaths, measured in percentage. Female-dominated cancers are represented by pink dots, male-dominated cancers by blue dots, and gender-balanced cancers by purple dots. It is important to note that this graph only includes cancers from our ERC and H2020 samples.

Figure 3.6: Relative Mortality of Cancer Type against Male Relative Mortality in 2007



All female-dominated cancers, except female breast cancer, account for less than or equal to 5% of total deaths, while four male-dominated cancers (lung cancer, colorectal cancer, stomach cancer, and prostate cancer) each contribute to more than 5% of total deaths. Notably, lung cancer alone causes approximately 25% of total deaths, followed by colorectal cancer (9.1%), stomach cancer (6.6%), and prostate cancer (6.3%). The fitted regression line demonstrates a positive relationship between male relative mortality and the relative mortality of each cancer type, indicating that cancers with higher male relative mortality contribute more to total deaths caused by all cancers. These statistics confirm our hypothesis regarding differences in mortality between male-dominated and female-dominated cancers, which may consequently affect the allocation of funding.

3.5 Discussion and Conclusion

In this chapter, we have presented novel evidence on the underfunded situation of female-dominated cancers in Europe. The data used in this chapter are collected from the European Research Council and two European Framework Programmes for Research and Innovation. The utilization of granted projects through open and competitive calls for proposals provides a powerful tool to reduce selection bias in the samples.

The main finding of this study is as follows. First, we document that female-dominated cancers are underfunded in Europe. Our analysis reveals that a 10 percentage point increase in male relative mortality is statistically significant, associated with approximately a 0.3% increase in awarded research funding in the ERC dataset and a 0.8% increase in the FP7 & H2020 dataset. This corresponds to a 4,420 euro increase over the ERC sample mean and a 12,402 euro increase over the FP7 & H2020 sample mean.

Second, we provide four potential mechanisms behind the main results. Initially, by constructing a list of cancer researchers in Europe, we demonstrate that male scholars are over-represented, especially in the top ranks. This over-representation implies fewer researchers conducting research in female-dominated cancers compared to male-dominated cancers, potentially resulting in fewer projects and less funding for female-dominated cancers. The next explanation is funding bias against female researchers, as they are more likely to work on female-dominated cancers. In the FP7 & H2020 sample, we find that, on average, all-female research teams receive approximately 12% less research funding than their male counterparts, contributing to the lack of funding for female-dominated cancers. The third mechanism involves the impact of the gender composition of evaluation panels. We show that in the ERC sample, a higher share of male panel members favors male-dominated cancer projects. The fourth and final explanation is that male-dominated cancers have higher mortality rates than female-dominated cancers, leading to a larger allocation of resources.

In conclusion, the insights provided by this study into the unequal distribution of cancer research funding based on sex-dominance in cancer types hold significant implications for policymakers in Europe. The mechanisms of over-representation of male scholars in cancer research and the impact of gender composition in evaluation panels highlight the need for targeted interventions to address the underfunding of female-dominated cancers. Specific strategies, such as providing incentives to support female cancer researchers and promoting gender diversity in evaluation panels, are crucial steps towards achieving equitable funding allocation. As cancer remains a significant global health concern impacting individuals of all ages and regions,

ensuring equitable distribution of resources towards sex-dominated cancers is of paramount importance. By prioritizing this objective, policymakers can enhance outcomes for those affected by cancer and contribute to collective efforts aimed at fighting against this disease.

Appendix 3A: Description of Grants

European Research Council (ERC) grant types:[16]

1. **Starting grants**: Researchers of any nationality with 2-7 years of experience since completion of PhD. Starting Grants may be awarded up to **€1.5 million** for a period of 5 years (pro rata for projects of shorter duration). However, an additional **€1 million** can be made available to cover eligible "start-up" costs for researchers moving from a third country to the EU or an associated country and/or the purchase of major equipment and/or access to large facilities and/or other major experimental and field work costs.

2. **Advanced Grants**: Applicants for the ERC Advanced Grants - called Principal Investigators (PI) - are expected to be active researchers who have a track-record of significant research achievements in the last 10 years. The Principal Investigators should be exceptional leaders in terms of originality and significance of their research contributions. No specific eligibility criteria with respect to the academic requirements are foreseen. Advanced Grants may be awarded up to **€2.5 million** for a period of 5 years (pro rata for projects of shorter duration). However, an additional **€1 million** can be made available to cover eligible "start-up" costs for researchers moving from a third country to the EU or an associated country and/or the purchase of major equipment and/or access to large facilities and/or other major experimental and field work costs.

3. **Consolidator Grants**: Researchers of any nationality with 7-12 years of experience since completion of PhD. Consolidator Grants may be awarded up to **€2 million** for a period of 5 years (pro rata for projects of shorter duration). However, an additional **€1 million** can be made available to cover eligible "start-up" costs for researchers moving from a third country to the EU or an associated country and/or the purchase of major equipment and/or access to large facilities and/or other major experimental and field work costs.

4. **Proof of concept**: All Principal Investigators in an ERC frontier research project, that is either on going or has ended less than 12 months before 1 January 2020, are eligible to participate and apply for an ERC Proof of Concept Grant. The Principal Investigator must be able to demonstrate the relation between the idea to be taken to proof of concept and the ERC frontier research

[16]European Research Council, "Homepage," European Research Council, accessed March 21, 2021, https://erc.europa.eu/

project (Starting, Consolidator, Advanced or Synergy) in question. Work Programme 2020 will continue to pilot the award of Proof of Concept grants on the basis of a lump sum of **€150 000**. The ERC has started piloting the use of Lump Sums for the ERC-2019-PoC call, as a simplified funding mode for PoC. This will test efficiency and viability of such funding method compared to the current funding mode which is based on the declaration of actual costs.: The financial contribution will be awarded as a lump sum of **€150 000** for a period of 18 months.

5. **Synergy Grants**: A group of two to maximum four Principal Investigators (PIs) – of which one will be designated as the correspondent PI (cPI) – working together and bringing different skills and resources to tackle ambitious research problems. No specific eligibility criteria regarding the academic training are foreseen for ERC Synergy Grants. PIs must present an early achievement track-record or a ten-year track-record, whichever is most appropriate.Synergy Grants can be up to a maximum of **€10 million** for a period of 6 years (pro rata for projects of shorter duration). However an addition **€4 million** can be requested in the proposal in total to cover: i) eligible 'start-up' costs for Principal Investigators moving to the EU or an Associated Country from elsewhere as a consequence of receiving an ERC grant and/or; (ii) the purchase of major equipment and/or; (iii) access to large facilities.

The different funding types funded under the FP7 and Horizon 2020 framework programs: [17, 18]

1. **Collaborative projects (FP7)**: support should be provided for transnational cooperation at an appropriate scale across the Union and beyond, in a number of thematic areas correspondent to major fields of the progress of knowledge and technology, where research should be supported and strengthened to address European social, economic, environmental, public health and industrial challenges, serve the public and support developing countries. The maximum rates of the financial contribution of the European Union: 75% for reach and technological development activities, 50% for demonstration activities, and 100% for other activities.

2. **Marie Curie actions (FP7)**: individuals should be stimulated to enter the research profession, European researchers should be encouraged to stay in

[17] European Commission, "CORDIS - Community Research and Development Information Service," accessed June 20, 2021, http://cordis.europa.eu/fp7/dc/index.cfm.

[18] European Commission, "Horizon 2020 Online Manual," accessed July 21, 2021, https://ec.europa.eu/research/participants/docs/h2020-funding-guide.

Europe, researchers from the entire world should be attracted to Europe, and Europe should be made more attractive to the best researchers. The European Union covers up to 100% of the budget of the action.

3. **The Capacities programme (FP7)**: support the use and development of research infrastructures; innovative capacities of SMEs and their ability to benefit from research; the development of regional research-driven clusters; the research potential in the Union's convergence and outermost regions; bringing science and society together in European society; the coherent development of research policies at national and Community level; horizontal actions and measures in support of international cooperation.

4. **Research and innovation actions - RIA (H2020)**: Funding for research projects tackling clearly defined challenges, which can lead to the development of new knowledge or a new technology. This action is for consortia of partners from different countries, industry and academia. Funding rate: 100% of eligible costs.

5. **Innovation actions - IA (H2020)**: Funding is more focused on closer-to-the-market activities. For example, prototyping, testing, demonstrating, piloting, scaling-up etc. if they aim at producing new or improved products or services. These actions are for consortia of partners from different countries, industry and academia. Funding rate: 70% of eligible costs (except for non-profit legale entities, where a rate of 100% applies)

6. **Coordination and support actions - CSA (H2020)**: Funding covers the coordination and networking of research and innovation projects, programmes and policies. Funding for research and innovation per se is covered elsewhere. These actions if for single entities or consortia of partners from different countries, industry and academia. Funding rate: 100% of eligible costs

7. **Marie Sklodowska-Curie actions - MSCA**: Funding for international research fellowships in the public or private sector, research training, staff exchanges. These actions are for early stage researchers or experienced researchers (of any nationality), technical staff, national/regional research mobility programmes.

8. **SME Instrument - SME (H2020)**: This instrument is aimed at highly innovative SMEs with the ambition to develop their growth potential. It offers lump sums for feasibility studies, grants for an innovation project's main phase (demonstration, prototyping, testing, application development...); lastly,

the commercialisation phase is supported indirectly through facilitated access to debt and equity financial instruments. This action is for only SMEs can participate. Either a single SME or a consortium of SMEs established in an EU or Associated Country.

Appendix 3B: Additional Tables

Table 3B.1: Description of Variables Used in The Study

Variable	Definition
Cancer types	1 = Blood cancer; 2 = Brain cancer; 3 = Pancreatic cancer; 4 = Colo-rectal cancer; 5 = Melanoma - skin cancer; 6 = Lung cancer; 7 = Liver and intraheptic bile duct cancer; 8 = Female breast cancer; 9 = Prostate cancer; 10 = Other and primary site unknown cancers; 11 = Mixed (when the project focuses on more than 1 cancer type)
Research fund	Maximum ERC funding (ERC projects) or EC maximum contribution (FP7 & H2020 projects), in thousands of Euros
Female PI	The ratio of female principal investigators, scientific coordinators, or fellows to the total number of principal investigators, scientific coordinators, or fellows in a project (Male=0, Female=1, SME=0.5)
Duration	Duration of the project, measured in years, calculated from the start date to the end date.
Grant type	1 = Starting Grant; 2 = Advanced Grant; 3 =Consolidator Grant; 4 = Proof of concept; 5 = Synergy Grants (ERC)
Funding type	1= Small and medium collaborative projects (only in FP7); 2=Research and innovation (only in H2020); 3= Other collaborative projects (both in FP7 and H2020); 4 = Standard Marie Curie Postdoc (both in FP7 and H2020); 5= Marie Curie-International dimension (both in FP7 and H2020); 6 = Marie Curie Reintegration or Career Restart (both FP7 and H2020); 7 = SME instrument 1 (only in H2020); 8 = Other SME funding (both in FP7 and H2020)
Cancer burden	Potential Years of Life Lost (PYLL) is calculated by summing the deaths occurring at each age and multiplying this figure by the number of remaining years of life up to a selected age limit. This age limit corresponds to the life expectancy of men and women in Europe in 2006. The cancer burden is then determined by dividing the PYLL by 100,000.

Male relative mortality	The ratio of male deaths to total deaths for each cancer type in the year when the project was granted, represented as a continuous variable with values ranging from 0 to 1
Male relative mortality 2007	The ratio of male deaths to total deaths in 2007 for each cancer type, represented as a continuous variable with values ranging from 0 to 1
Incidence 2007	Number of incidences for each cancer type per hundred thousand
Citation	The ratio of PI's cumulative citations (until the year that they applied for the grant) over 100,000
Female share	The ratio of female evaluators to the total number of evaluators on the panel that evaluated their project proposal

Table 3B.2: Summary Statistics in the ERC and the FP7 & H2020 Samples

	Sum	Mean	SD	Min	Max	Observations
Panel A: ERC sample						
Research fund	387,432.8	1,473.13	1128.29	139.1	9,974.45	263
Log (research fund)	1,793.1	6.82	1.18	4.94	9.21	263
Project duration	1,074.4	4.09	1.69	1	6.5	263
Female PI	58.75	0.22	0.42	0	1	263
Male relative mortality	125.42	0.47	0.29	0	1	263
Male relative mortality 2007	124.57	0.47	0.29	0	1	263
Cancer burden	1449	5.5	4.6	0	20.36	263
Citation	22.84	0.09	0.12	0.00041	0.71	263
Female share	89	0.34	0.09	0.07	0.55	263
Panel B: FP7 & H2020 sample						
Research fund	1,106,878	1,550.25	2,451.66	30	14,999.33	714
Log (research fund)	4284.07	6.00	1.67	3.4	9.62	714
Project duration	1958.1	2.75	1.41	0.17	8.5	711
Female PI	267	0.40	0.433	0	1	669
Male relative mortality	326.27	0.46	0.31	0	1	714
Male relative mortality 2007	323.04	0.45	0.308	0	1	714
Cancer burden	4182.1	5.86	4.99	0.0011	20.36	714
Citation	11.17	0.022	0.049	0	0.38	511

Table 3B.3: Robustness Check with Time Trend

	Dependent variable is Log(research fund)							
	ERC				FP7 & H2020			
Male relative mortality (M=1)	0.022	0.032***			0.067**	0.040*		
	(0.016)	(0.010)			(0.027)	(0.018)		
	[0.159]	[0.027]			[0.071]	[0.047]		
Male relative mortality 2007			0.029	0.037**			0.080**	0.047**
			(0.021)	(0.016)			(0.030)	(0.020)
			[0.120]	[0.041]			[0.043]	[0.022]
Time trend	0.009**	0.009**	0.009**	0.009**	0.018	0.038***	0.018	0.037***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.010)	(0.009)	(0.010)	(0.009)
Other controls	No	Yes	No	Yes	No	Yes	No	Yes
Grant/Funding type FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1473.13*	*1473.13*	*1473.13*	*1473.13*	*1550.25*	*1550.25*	*1550.25*	*1550.25*
Observations	261	261	261	261	714	711	714	711
Adjusted R^2	0.990	0.990	0.990	0.990	0.871	0.896	0.871	0.896

Notes: Standard errors, clustered at the cancer type level, are shown in parentheses. Research fund is the maximum awarded grant in the ERC sample and the maximum contribution of the European Commission in the FP7 & H2020 sample (in thousand euros). Male relative mortality is the ratio between the number of male deaths and the total deaths caused by a cancer type in a given year (range between 0 and 1). Male relative mortality 2007 is the ratio between the number of male deaths and the total deaths caused by a cancer type in 2007 (range between 0 and 1). Cancer burden is the number of potential years of life lost caused by a cancer type in 2006 (divided by 100,000). Incidence 2007 is the number of new cases by cancer type in 2007 (in hundred thousands). Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3B.4: Robustness Check with Tobit Model in the ERC Sample

	Dependent variable is Log(research fund)			
	(1)	(2)	(3)	(4)
Male relative mortality (M=1)	0.028*	0.036***		
	(0.016)	(0.012)		
	[0.020]	[0.015]		
Male relative mortality 2007 (M=1)			0.034	0.041**
			(0.021)	(0.017)
			[0.014]	[0.020]
Cancer burden		0.001*		0.001*
		(0.001)		(0.001)
Incidence 2007		0.003		0.004
		(0.003)		(0.004)
Grant type FE	Yes	Yes	Yes	Yes
Period dummy	Yes	Yes	Yes	Yes
Grant type FE × Period dummy	Yes	Yes	Yes	Yes
Mean Dep. Var.	*1473.13*	*1473.13*	*1473.13*	*1473.13*
Observations	261	261	261	261
Pseudo R^2	1.451	1.452	1.452	1.453

Notes: Standard errors, clustered at the cancer type level, are shown in parentheses. Research fund is the maximum awarded grant in the ERC sample and the maximum contribution of the European Commission in the FP7 & H2020 sample (in thousand euros). Male relative mortality is the ratio between the number of male deaths and the total deaths caused by a cancer type in a given year (range between 0 and 1). Male relative mortality 2007 is the ratio between the number of male deaths and the total deaths caused by a cancer type in 2007 (range between 0 and 1). Cancer burden is the number of potential years of life lost caused by a cancer type in 2006 (divided by 100,000). Incidence 2007 is the number of new cases by cancer type in 2007 (in hundred thousands). Inference is also conducted using a cluster robust wild bootstrap procedure that follows Davidson and Flachaire (2008), and the corresponding p-values are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4 Unintended Consequences of CCT Programs on Gender Role Attitudes[1]

Keywords: Cash Transfer; Gender Role Attitudes; Parental Role Model; Regression Discontinuity

JEL Codes: J16; J22; I38

4.1 Introduction

Gender norms, which refers to beliefs about roles and behaviors for men and women, pose significant challenges to gender equality (Bursztyn et al., 2023).[2,3] These norms have been shown to be persistent and resistant to change (Fernández et al., 2004; Alesina et al., 2013; Farré and Vella, 2013). Therefore, understanding the factors that contribute to the formation and evolution of gender norms is of paramount importance. In recent years, a growing body of literature has emerged to explore how policies, especially those with the potential to alter gender specialization patterns within households, can influence gender norms. Policies such as tax reforms and paternity leave initiatives have demonstrated their capacity to reshape

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[2]For more details about the concept of gender norms, see Akerlof and Kranton (2000), Pearse and Connell (2016).

[3]The related literature documents adverse effects of gender norms on female employment rate, gender pay gaps and other aspects of women's lives (Fernández et al., 2004; Fortin, 2005; Bertrand et al., 2015).

gender norms in developed contexts, as exemplified by the 1975 Earned Income Tax Credit in the United States (Bastian, 2020) and paternity leave in Spain (Farré et al., 2022). However, little attention is devoted to the connection between policies and gender norms in developing countries, where these norms continue to be among the most significant drivers of gender inequality (Jayachandran, 2015).

This study aims to bridge this gap by providing novel evidence that policy can influence gender norms within a developing context. To this end, I focus on the impacts of conditional cash transfer (CCT) programs on gender role attitudes of beneficiary children. Starting in the late 1990s, CCT programs in Latin America aim to reduce poverty by making the transfer to poor households conditional upon meeting conditions. The common conditions include school enrollment and attendance, regular health check-ups of children and their vaccinations. These programs often designate mothers as the cash recipients (Fiszbein et al., 2009), and in response, mothers bear the responsibility for meeting these program requirements. The act of targeting mothers can have dual effects on their roles and behaviors, either enhancing their participation in decision-making or reinforcing traditional gender roles through added responsibilities.[4] Moreover, previous research consistently demonstrates that maternal roles and behaviors play a pivotal role in shaping their children's gender role attitudes.[5] Therefore, in this chapter, I argue that CCT programs may influence children's gender role attitudes by triggering changes in the roles and behaviors of their mothers.

To establish *causality*, I study the effects of the largest-scale CCT program in Peru, *Juntos*, which has been in operation since 2005. Peru serves as an interesting context for the study for several reasons. First, despite some progress in economic development in recent decades, gender inequality poses a significant concern in Peru. On average, Peruvian women devote 24 more hours weekly to unpaid tasks than men, while men allocate 21 extra hours per week to paid work compared to women (OECD, 2022). Moreover, approximately 60% of Peruvian women report lifetime experiences of intimate partner violence.[6] Second, initially serving with only 70 districts, Juntos gradually expanded to cover more than 700,000 families in 1,305 districts as of 2017.[7] As per the Government of Peru's records in 2023, 96.1%

[4]CCT programs can impact women's decision-making in contraception, household spending on children's health and education (Attanasio and Lechene, 2002; de Brauw et al., 2014; Bergolo and Galván, 2018), but may also reinforce traditional gender roles by imposing time and resource demands on female recipients to fulfill program conditions (Cookson, 2018; Margolies et al., 2023).

[5]See Serbin et al. (1993), Cunningham (2001), Halpern and Perry-Jenkins (2016).

[6]Instituto Nacional de Estadística e Informática. *Perú: Encuesta Demográfica y de Salud Familiar 2019 - Nacional y Departamental* [website]. https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Endes2019/

[7]Out of a total of 1,943 districts in Peru, Juntos has covered almost 70% of them.

of the program recipients were mothers. Third, within the cultural context of Peru, parents have a profound influence on their offspring. Generally, Peruvian children are brought up to be respectful of their parents, obedient, and firmly committed to their parents' decisions (Ember and Ember, 2001).

The study utilizes the Young Lives panel data, which tracks the lives of approximately 2,000 Peruvian children over a span of 15 years. This dataset provides rich information on children's demographics, education, attitudes toward gender roles, and household data, including participation in Juntos, household composition, and housing characteristics.[8] My identification strategy relies on the Juntos eligibility rules, in which a household is *eligible* if (i) it resides in an eligible district, (ii) it includes pregnant women or children up to 19 years old, and (iii) it has a poverty score exceeding a predetermined threshold. This eligibility framework enables a comparison between children in households that were *barely eligible* and those who were *barely ineligible*. Specifically, I employ a non-parametric fuzzy regression discontinuity (RD) design to exploit the institutional rules.

My results fall into four categories. The first set of results focuses on Juntos' impact on the gender role attitudes of children in beneficiary households.[9] I measure these attitudes using a composite index, where a score of 0 signifies a non-traditional attitude, and 1 represents an extremely traditional attitude. The findings indicate that the program leads to more traditional gender role attitudes in children. Juntos children exhibit a 27.7 percentage point increase in agreement with traditional attitudes, representing more than 85% over the comparison group's mean. I further analyze the gender attitude index by breaking it down into three thematic sub-indices: power, equality, and behavior dimensions.[10] The results suggest that the effect is most pronounced in the power dimension, which captures the relative power of girls and women compared to boys and men.

The second set of results reveals heterogeneous treatment effects of Juntos. Concerning child gender, taken at face value, the point estimates suggest that boys exhibit a larger effect compared to girls, indicating a more pronounced impact on boys. However, the estimate within the female subsample is only statistically significant at the 10 percent level, whereas the estimate within the male subsample lacks sta-

[8]The outcome variable of interest is gender role attitudes, which was measured when the Young Lives children reached approximately 15 years old. This aspect is particularly significant because at this age, children have achieved a notable level of maturity, enabling them to engage in reflection and contemplation on complex moral questions.

[9]Gender role attitudes encompass perceptions regarding the desirability or undesirability of behaviors, abilities, and interactions among boys and girls.

[10]Following Jaruseviciene et al. (2014), the power dimension assesses the relative power of girls and women compared to boys and men, the equality dimension measures the aspiration for increased gender equality, and the behavior dimension evaluates social expectations regarding the conduct of boys and girls.

tistical significance. In relation to maternal educational level, I present supporting evidence that Juntos significantly affects children whose mothers have an educational level below secondary school. Furthermore, concerning regional disparities, my findings demonstrate a statistically significant impact of Juntos on children residing in mountainous areas.

The third set of results documents the impact of Juntos on children's behaviors and test scores. An important consideration in this study is the potential for social desirability bias in measuring gender role attitudes through sensitive questions. To tackle this issue, I examine whether the impact on gender role attitudes is in line with children's actual behaviors using detailed daily activity data. The results reveal that girls in beneficiary households allocate more time to caregiving and unpaid household labor, aligning with traditional views, especially related to the power dimension. I further investigate the impact of the Juntos program on children's performance in reading comprehension and mathematics achievement tests. My findings show that beneficiary girls perform significantly less accurately than non-beneficiary girls in both tests, while no statistically significant effects are observed in boys. This suggests that behaviors aligned with traditional gender role attitudes appear to be in line with lower academic performance among girls.

Finally, I show that my estimates of the impact of Juntos remain stable to a broad set of robustness checks. These checks encompass different selections of local polynomial degree, kernel, and bandwidths in the non-parametric method, estimations from a parametric model and wild cluster bootstrap, and different approaches to measure the main outcome variable. Additionally, I provide the findings derived from a placebo cutoff exercise to validate the fuzzy RD design. Lastly, I estimate the treatment effect with an expanded sample size, and find qualitatively similar evidence, reinforcing the reliability of the main findings.

Moving on to the mechanism behind the main results, I analyze the information regarding mothers' three most significant jobs or occupations in terms of time spent during the 12 months leading up to the fourth round of the Young Lives survey. This allows me to assess *Juntos'* impact on mothers' time priority and working behaviors. I find that beneficiary mothers are more likely to prioritize their time on home production over regular or stable income-generating work. To gain further insight into mothers' working behaviors, I examine the extensive margin as it is possible for a mother to choose household chores or being a housewife as their most important job in terms of time spent, while still engaging in work. The results suggest that there is no significant effect on mothers' labor supply. While Juntos does not appear to directly alter mothers' employment status, the noteworthy shift towards traditional gender roles in terms of time priority offers a plausible explanation for the emergence of traditional gender role attitudes in children.

This study contributes to several strands of literature. First and foremost, it builds on the nascent literature concerning the relationship between policies and cultural practices and/or attitudes. One pioneering research in this field is Beaman et al. (2009), which show that female leadership quotas alter voter perceptions of female leaders in India. In a more recent work, Bau (2021) provides evidence that government pension plans reduce matrilocal and patrilocal practices in Ghana and Indonesia.[11]

In the realm of gender norms, there are only two noteworthy papers that examine the effects of public policies, exclusively within developed contexts. Bastian (2020) shows that the introduction of the Earned Income Tax Credit (EITC) in the United States contributes to a rise in working mothers, fostering greater acceptance and support for women in the workforce within the same generation. Farré et al. (2022), the closest paper to this chapter, investigate the impact of paternity leave in Spain on inter-generational gender role attitudes, demonstrating that children of eligible fathers adopt more progressive views. On the contrary, my study focuses on a child-targeted social program in a developing country, with mothers serving as the channel for implementation. Moreover, while the aforementioned studies offer evidence of reshaping gender norms and promoting gender equality, my research reveals a contrasting result in the Peruvian context. These distinctions highlight the unique dynamics at play in a developing country setting. Therefore, this chapter advances our comprehension of the complex interplay between policies and gender norms, which are intrinsic components of broader cultural norms.

Second, this chapter adds to the extensive literature on CCT programs and their effects on beneficiary children in Latin America. While numerous studies in this field predominantly focus on the direct effects of such programs on child health (Gertler, 2004; Barber and Gertler, 2008; Reis, 2010; Amarante et al., 2016), child education (Paul Schultz, 2004; Attanasio et al., 2010; Baird et al., 2013) and child labor (Edmonds and Schady, 2012; Del Carpio et al., 2016), my research goes beyond the conventional scope. Specifically, I shed light on an often-overlooked and indirect aspect: the impact of CCT programs on gender role attitudes of beneficiary children. This analysis is grounded in the prevalent practice of CCT programs designating mothers as the recipients of cash transfers. By doing so, I contribute to this body of literature by presenting novel evidence of unintended consequences that can arise from CCT programs.

Third, this chapter speaks to the literature concerning the responses of adult labor supply to CCT programs, which has yielded mixed evidence. For instance, Banerjee et al. (2017) reanalyze data from seven cash transfer programs in developing

[11] Bau (2021) defines that matrilocal refers to daughters living with their parents after marriage and supporting them in their old age, while patrilocal pertains to sons in a similar living arrangement.

countries. The authors report that these programs had no impact on female and male labor supply, both in terms of the extensive margin (employment) and the intensive margin (working hours). Similar findings are observed in other studies such as Rubio-Codina (2010) in Mexico and Bosch and Schady (2019) in Ecuador.[12]

On the other hand, contrasting results are found by Fernández and Saldarriaga (2014), who document that cash recipients from the *Juntos* program in Peru reduced their working hours by approximately 6 to 10 hours in the week following the payment date. Similarly, De Brauw et al. (2015) show that Brazilian rural women receiving transfers from *Bolsa Família* experience a reduction in their labor supply. This chapter contributes to the existing research by examining a new outcome variable related to the intensive labor supply margin, which represents the most important job or occupation based on time spent. The findings suggest that CCT programs impact mothers' time priority, reducing their likelihood of dedicating time to stable income-earning activities.

Finally, this chapter contributes to the literature that explores parental influences, particularly maternal influences, on their children's gender role attitudes. Previous research mainly focuses on mothers' behaviors and gender role attitudes in developed countries, such as: Serbin et al. (1993) in Canada, Cunningham (2001) in the United States or Cano and Hofmeister (2023) in Australia. In contrast, the developing world remains relatively understudied. Only two papers investigate the inter-generational transmission of gender role attitudes in India (Dhar et al., 2019) and Ethiopia (Leight, 2021). This chapter complements the existing literature by providing evidence that when mothers prioritize their time for activities associated with traditional gender roles, their children exhibit more traditional attitudes in a Latin American setting.

The remainder of the chapter proceeds as follows. Section 4.2 provides the conceptual framework that guides the study. Section 4.3 offers the institutional context. Section 4.4 presents the data source and measurement of the main outcome variable. Section 4.5 introduces the empirical approach. Section 4.6 provides the empirical results, followed by the mechanism behind the main findings in Section 4.7. Finally, Section 4.8 concludes the chapter.

[12] Rubio-Codina (2010) finds limited effects of *Oportunidades* on adult time allocation in Mexico, with adult women substituting for children in non-remunerated activities. Bosch and Schady (2019) provide evidence that the *Bono de Desarrollo Humano* program does not reduce adult labor supply over 4 or 5 years in Ecuador.

4.2 Conceptual Framework

In this section, I construct the conceptual framework that guides this study, drawing upon several key theoretical perspectives and empirical evidence regarding how CCT programs may influence gender role attitudes of children within beneficiary households. The principal avenue for this effect involves the intermediary mechanism of altering maternal roles. Firstly, my analysis focuses on the impact of CCT programs on women's empowerment in decision-making within households, alongside potential additional burdens imposed on mothers. Secondly, I delve into gender socialization theory and the influence of mothers' gendered behaviors on their children's gender role attitudes.

Women's Empowerment in Decision-Making. CCT programs predominantly target women with the explicit goal of empowering them and improving outcomes for children. By providing income support to women, they may increase their involvement in household decisions through a better control over the allocation of funds. The related empirical literature documents the positive effect of CCT programs on the standing of women within households. For instance, by examining the *Progresa* program in Mexico, Attanasio and Lechene (2002) reveals a noteworthy shift in household decision-making dynamics. The program's implementation leads to a transformation from traditional male-dominated decision-making to a more equitable structure. In this new framework, decisions are jointly made by both men and women across various domains, including household expenditures, children's health, and education.

Similarly, in the context of the Brazil's *Bolsa Família* program, de Brauw et al. (2014) find that beneficiary women experience increased decision-making power concerning contraceptive use. Furthermore, particularly in urban areas, the program empowers women by augmenting their influence over children's school attendance, health expenses, and household durable goods purchases. In line with aforementioned studies, Bergolo and Galván (2018) provide suggestive evidence that the cash transfer program *Asignaciones Familiares-Plan de Equidad (AFAM-PE)* in Uruguay leads to increased female (perceived) involvement in making decisions related to specific aspects of household expenditures. Moreover, by employing the collective household model and constructing a new measure of women's empowerment, Almås et al. (2018) show that the cash transfer program in Macedonia improves women's household-decision making power.[13] Overall, CCT programs have been

[13] Almås et al. (2018) introduce a new measure of women's empowerment, which is the amount of money that a women is willing to pay to obtain control over an amount that would otherwise be given to her husband. Within the framework of intra-household allocation models, the authors prove that this measure is responsive to shifts in women's bargaining power, and targeted transfers

shown to have a positive contribution in empowering women and promoting more gender-equitable decision-making within households across different countries.

Additional Burdens and Impacts on Mothers' Labor Supply. Despite showing a positive effect on women's control within households, CCT programs have been criticized on putting additional burdens on mothers. This arises from the prerequisite for mothers to fulfill conditions to receive the transfers. Drawing from a qualitative analysis, Nagels (2016) shows that CCT programs in Bolivia and Peru contribute to the reinforcement of maternalistic and coercive practices. In line with this finding, Cookson (2018) argues that the CCT program in Peru can lead to additional burdens on female recipients in time and resource investments, thereby exacerbating existing gender inequalities.

Building upon this body of literature, by combining both quantitative and qualitative methods, Margolies et al. (2023) report that engagement in a nutrition-based CCT program in Malawi leads to a significant increase in caregiving time for participating women, particularly during the lean season. In terms of labor force participation, empirical evidence suggests that CCT programs can reduce maternal working hours (Fernández and Saldarriaga, 2014) and employment (De Brauw et al., 2015; El-Enbaby et al., 2019). Taken together, these studies demonstrate one significant concern of potential adverse effects of CCT programs on women that can actually perpetuate traditional gender roles.

Gender-socialization Theory and Maternal Influences on Children's Gender Role Attitudes. The parental influences on children's gender role attitudes can be explained through various approaches, with the most influential theory in the literature being the gender socialization theory (Perales et al., 2021). According to this theory, children acquire knowledge about gender roles from an early age by observing their parents' actions and behaviors (Martin et al., 2002). This phenomenon is referred to as the process of role modeling. In this process, children absorb the rules and underlying structure behind their parents' gendered activities to form their gendered beliefs and specific patterns of gendered behaviors that align with structural properties (Bussey and Bandura, 1999).

Aligning with the gender-socialization theory, empirical literature documents that mothers' behaviors have a pronounced impact on shaping gender role attitudes of their children. For instance, Serbin et al. (1993) report that children whose mothers engage in more traditionally male household chores have less traditional ideas about gender roles. Similarly, Cunningham (2001) finds that daughters whose mothers dedicated more time to paid employment during their first years of life are less likely to engage in traditionally feminine household chores as adults. Fernández et al.

to women enhance their bargaining power within the couple.

(2004) show that men whose mothers worked have wives with a significant higher likelihood of being employed. Expanding on the existing body of literature, Halpern and Perry-Jenkins (2016) document that mothers play a crucial role in imparting knowledge about feminine behaviors to girls and masculine behaviors to boys. More recently, Bertrand (2019) confirms that children raised in families where mothers hold greater economic power exhibit more egalitarian attitudes.

Expected Impact. Taken as a whole, CCT programs, which assign mothers as cash recipients and, in response, require them to fulfill specific program requirements, have the potential to alter the roles and status of mothers within households. Consequently, such changes may impact the gender role attitudes of children as they observe and internalize shifts in their mothers' roles and involvement in various aspects of family life. Nonetheless, due to the diverse findings in the empirical literature, where CCT programs can either empower women in decision-making or impose additional burdens and reduce mothers' labor supply, the direction of influence on the gender role attitudes of children remains uncertain.

4.3 Institutional Context

In this section, I briefly provide the background of the Peruvian Juntos program and some features related to its eligibility rules, conditions and responsibilities.

In April 2005, the Peruvian Government created the National Direct Support Program for the Poorest – *Juntos*, which is a conditional cash transfer program focusing on poor households with children or pregnant women. The objectives of the program are to reduce the current poverty, and to break the inter-generational transmission of poverty by human capital investments on education and health. The Juntos program stands as the largest program in the country with a budget of US$308 million for the year 2016, which constitutes 26.1% of the total budget of the Ministry of Development and Social Inclusion (MIDIS) and 0.16% of Peru's gross domestic product (GDP).[14] Prior to 2009, the program provided a monthly payment of 100 soles (roughly 30$ or approximately 10% of poor households' monthly consumption and over 50% per capita households' expenditure). Since 2010, the transfer has been made bimonthly with 200 soles (Sánchez et al., 2020). This change was implemented due to the low rate of transfer withdrawals from bank accounts, attributing to the long distances that beneficiaries must travel to collect their transfer. According to official sources, the program had already supported an estimated 72% of all eligible households by 2015 (MIDIS 2015).[15]

[14]Inter American Development Bank Data 2016. https://www.iadb.org/en/toolkit/conditional-cash-transfer-programs/peru-juntos

[15]Ministerio de Desarrollo e Inclusión Social - MIDIS. 2015. JUNTOS: "Memoria Anual 2014."

In terms of eligibility rules, the Juntos program carried out the selection process in two stages. The first stage was conducted at the district level, where districts were chosen based on five criteria, including exposure to violence, high levels of economic inequality, chronic child malnutrition, high rates of extreme poverty, and a high proportion of the population with unsatisfied basic needs. The second stage involved selecting eligible households within eligible districts. It is crucial to emphasize that the household must have resided in the district for a period exceeding six months before the enrollment date in the program. Since the objective of the program is to support poor groups in the population, household eligibility should be based on the precise documentation of individual or household income. However, such information is typically not available or difficult to obtain in developing countries because a large part of the population works in the informal sector. Household eligibility for the Juntos program was therefore determined by the poverty score, which was formulated using household-level data obtained from a census conducted in each district.

In principle, the poverty score is a linear combination of household characteristics using an official algorithm created by the program's administration. Prior to 2012, the Peruvian government implemented a universal threshold value across all regions. From 2012 and beyond, following the integration of all social protection programs under MIDIS, a new poverty score denoted as the *Indice de Focalizacion de Hogares (IFH)* and 15 regional-specific thresholds were established. Households in eligible districts with pregnant women or children up to 19 years old, whose poverty score exceeds the cutoff value, qualify for the program.[16, 17] Finally, a commission consisting of community members and local and national representatives verified the list of eligible households in the checked stage. In Appendix 4B, I describe the algorithms and variables used to compute the poverty score in two periods.

The program enrolls all eligible members of a household selected as beneficiaries, and a representative, typically the mother, signs an agreement form with the program.[18] Upon enrollment, the mother becomes responsible for fulfilling the program conditions for each and every one of her children (in case of having children up to 19 years old), with no exceptions. There are several conditions that a beneficiary household must meet to receive the transfers. Firstly, children up to 59

Gobierno del Perú.

[16]Before 2014, the age limit of the children was 14.

[17]In the first few years, after the selection of a district, a survey was conducted for each household to assess eligibility. Subsequently, the program administration approached eligible households and extends invitations to join *Juntos*. In the present practice, households are not individually informed; instead, the list of eligible households is posted in the municipality.

[18]For more details of the agreement form, see Appendix 4D.

months old must receive the comprehensive health and nutrition care (including growth monitoring and complete vaccinations). Secondly, pregnant women must receive the comprehensive health care (including monthly pre-birth check-ups from the day that the pregnancy is identified). Thirdly, children aged 6 and above must be enrolled in school and maintain an attendance rate of at least 85% until they reach the age of 19 or complete their education (including allowance for up to three absences per month). Lastly, it is necessary for children to have a national identification number.

Whether or not the households meet conditions of the program relative to health and education services are monitored by local managers and Juntos fieldworkers, who have access to information from schools and health centers. In particular, health visits are verified by attendance (pre-birth checkup) and check-up records (growth and development controls) while the educational condition is verified by school attendance records. Disaffiliation from the program occurs when a household cannot meet conditions frequently or when all household members no longer belong to the targeted population or when the household loses eligibility according to their poverty score. Note that disaffiliation could also be voluntary.[19]

4.4 Data and Measures

In this section, I first describe the data source used in this chapter with descriptive statistics of key variables. I then introduce the approach to measure the main outcome variable - gender attitude index.

4.4.1 Young Lives

The dataset in this chapter comes from the Young Lives panel data led by Oxford University during five rounds in 2002, 2006, 2009, 2013 and 2016. The Young Lives study is a longitudinal research initiative that aims to examine the evolving landscape of childhood poverty. Over a period of 15 years, the study has been employing both qualitative and quantitative research methods to track the development of 12,000 children across four countries: Ethiopia, Peru, India (Andhra Pradesh), and Vietnam. The project has been following two cohorts in each country since 2002. In each country, the younger cohort, comprising approximately 2,000 children, was between 6 and 18 months old in 2002, while the older cohort, consisting of around 1,000 children, was between 7.5 and 8.5 years old in 2002.

In this study, I use data from the younger cohort of the Peruvian Young Lives survey. Focusing on the younger cohort offers several advantages, including: (i)

[19]For detailed explanation, see Huerta and Stampini (2018).

it allows for the examination of the long-term effects of Juntos on children's outcomes, as the younger cohort has been followed from childhood to adolescence, and (ii) it provides a large enough sample size of Juntos recipients to allow for meaningful analysis, as compared to the older cohort which has less than 100 beneficiary children.

The sampling procedure of Young Lives in Peru began with the district level that the sentinel sites were chosen using a multi-stage, cluster-stratified, random sampling approach. Based on the poverty map developed by *Fondo Nacional de Compensación y Desarrollo Social* (FONCODES) in 2000, the Peruvian research team excluded the richest 5% of districts, and subsequently selected surveyed districts from the remaining pool. Once the districts were chosen, households within each district were selected randomly. For the younger cohort, all selected households were visited by a fieldworker to identify eligible households with at least one child aged between 6 and 18 months in 2002.

Young Lives sample in Peru is pro-poor, but comparable to nationally representative samples. Escobal and Flores (2008) compare the Young Lives sample with two nationally representative samples including the Living Standard Measurement Survey 2001 (ENAHO 2001) and the Demographic and Health Survey 2000 (DHS 2000). The authors conclude that Young Lives households are very similar to the average household in Peru, and Young Lives sample captures the full range of diversity in Peruvian children in terms of their varied attributes and experiences. Table 4A.1 in Appendix 4A presents the comparison of some key variables between the Young Lives 2002 and the DHS 2000 adapted from the Appendix 5 in Escobal and Flores (2008). In this comparison, the authors take into consideration the different sample frames. The results reveal that two samples are comparable in several aspects, including household, respondent and child characteristics.

For the research purpose, I mainly use the child survey and the household survey, with a specific focus on households located in eligible districts.[20] The household survey covers a wide range of topics such as participation in Juntos, household composition, housing quality and asset, access to basic services, jobs and education of household members. From the child survey, I obtain rich information on Young Lives children along the following dimensions: demographic characteristics (e.g., gender, age, religion, ethnicity, mother's education), child health (e.g., vaccination, health long term issues), cognitive abilities (e.g., maths test result, reading test results), and attitudes toward women's role.

Given that my primary outcome variable of interest, gender role attitudes, is observed only in the fifth round, I construct a cross-sectional dataset that combines

[20]The information regarding the eligibility period of districts is obtained from the official website of MIDIS. For detailed information, see http://www2.juntos.gob.pe/infojuntos/.

key information from the fifth round with data from previous rounds. This combined dataset is then merged with information regarding household participation in the Juntos program and other relevant data from the household survey. My constructed sample comprises 1,119 children, including 596 beneficiary children and 523 non-beneficiary children. It is important to note that *beneficiary children* in this chapter refers to children who are members of beneficiary households that have ever participated in the program at any point between 2002 and 2016. Table 4.1 summarizes some key variables for the sample.

Table 4.1: Descriptive Statistics of Key Variables

	Mean	Standard Deviation	Min	Max	Count
Juntos (Yes=1)	0.53	0.50	0.00	1.00	1,119
Female (Yes=1)	0.50	0.50	0.00	1.00	1,119
Urban (Yes=1)	0.48	0.50	0.00	1.00	1,119
BMI-for-age z-score	0.70	1.30	-4.91	11.34	1,111
Weight-for-age z-score	-0.47	1.13	-5.54	5.33	1,112
Height-for-age z-score	-1.64	1.29	-9.50	4.79	1,112
Polio vaccination (Yes=1)	0.97	0.16	0.00	1.00	1,113
BCG Vaccination (Yes=1)	0.96	0.19	0.00	1.00	1,113
Measles vaccination (Yes=1)	0.35	0.48	0.00	1.00	1,101
Age of child (months, 2002)	11.68	3.56	5.00	22.00	1,119
Health long term issues (Yes=1, 2002)	0.22	0.41	0.00	1.00	1,119
Catholic (Yes =1)	0.81	0.39	0.00	1.00	1,119
Mestizo (Yes = 1)	0.94	0.24	0.00	1.00	1,119
Mother education (<secondary school = 1)	0.63	0.48	0.00	1.00	1,111
Age of mom (years, 2002)	27.13	6.91	15.00	49.00	1,108
Caregiver's gender preference for the child (Male=1)	0.51	0.44	0.00	1.00	1,110
Household size (members, in 2002)	5.81	2.33	2.00	18.00	1,119
Reading test in 2016 (accuracy rate)	0.60	0.15	0.07	1.00	1,077
Maths test in 2016 (accuracy rate)	0.34	0.15	0.00	0.81	1,119
Male sibling (Yes=1)	0.76	0.43	0.00	1.00	1,119
Female sibling (Yes=1)	0.76	0.43	0.00	1.00	1,119
Coastal area (Yes=1)	0.21	0.41	0.00	1.00	1,119
Mountainous area (Yes=1)	0.61	0.49	0.00	1.00	1,119
Observations	1119				

Note: Descriptive statistics is computed from the estimating sample to examine the effect of Juntos on gender role attitudes. The variables, including *Juntos, Female, Urban, Polio vaccination, BCG vaccination, Measles vaccination, Health long term issues, Catholic, Mestizo, Mother education, Caregiver's gender preference for the child, Male sibling, Female sibling, Coastal area, Mountainous area* are indicators. The z-scores for Weight-for-age, Height-for age and BMI-for-age are calculated based on the World Health Organization (WHO) reference tables and software (Briones, 2018). Note that the body mass index (BMI) is the ratio between a child's weight in kilograms and their height in metres squared. The formula proposed by WHO is *z-score = (X-m)/SD*, where X is the observed value of the child (height, weight or BMI), m and SD are the mean and standard deviation value of the distribution corresponding the reference population. Reading test and maths test in 2016 are measured by the rate of correct answers.

Over the 15-year study period, 596 children, or 53% have ever benefited from the Juntos program. Moreover, the sample is characterized by a balance in terms of child gender, with the majority identifying as Mestizo (94%) and Catholic (81%). At baseline, the average age of mothers was approximately 27 years old, and 63% of them have the education level below secondary school. Additionally, the table reports that the average household size is around six individuals, and most children have female or male siblings. The caregiver gender preferences before the child was

born was equally distributed with the mean of 0.51. This indicates that there should be no overall bias in caregiver gender preference towards male or female offspring in the analysis sample.

4.4.2 Measurement of Gender Role Attitudes

In this study, the main outcome variable of interest is gender role attitudes of children aged 15. To construct an index, I combine 12 gender attitude variables that are exclusively obtained from the fifth round of the survey. These variables are based on the Attitudes toward Women Scale for Adolescents (AWSA), a widely recognized tool for assessing gender role attitudes among adolescents.[21] The 12 variables are gathered by asking children whether they agree with statements about the attributes, expectations, roles and rights acceptable for each gender. Following Dhar et al. (2019), I transform the variables from a 4-Likert scale into binary values. In this case, the corresponding indicator equals 1 if children answer 'Agree' or 'Strongly agree' ('Disagree' or 'Strongly disagree') when the statement is in favour of (opposed to) traditional views. Gender attitude index (unweighted index) is the average of the twelve indicators. In principle, the value of the constructed index ranges from 0 to 1, where a score of 0 signifies an extremely non-traditional attitude, while 1 denotes an extremely traditional attitude.[22,23]

One potential concern pertains to the representativeness of the gender attitude index due to the lack of national representativeness in the Young Lives Sample. In order to address this concern, I present descriptive evidence in Appendix 4A, comparing the responses to gender attitude statements in this survey with those from other surveys in Peru and some other Latin American countries.

Figure 4A.2 compares the average response to the statement *Men make better political leaders than women do* in the World Values Survey in Peru and other Latin American countries with the average response to the statement *Men are better leaders than women* in the Young Lives Survey.[24] Generally, Peru exhibits a more

[21]The Attitudes Toward Women Scale for Adolescents (AWSA) is derived from the short form of the Spence-Helmreich Attitudes Toward Women Scale (Galambos et al., 1985). AWSA has been used widely to capture gender belief in the psychology literature, for instance: Caso et al. (2020), Puzio and Best (2020) and Coyne et al. (2022).

[22]In Figure 4A.1 in Appendix 4A, I present the distribution of the gender attitude index.

[23]The full sentences of all statements are presented in Appendix 4C.

[24]The World Values Survey (`www.worldvaluessurvey.org`) is an international scholarly endeavor aimed at investigating the dynamics of changing values and their influence on social and political realms. Commencing in 1981, the survey employs robust research methodologies tailored to individual countries, encompassing almost 100 nations, which collectively represent nearly 90 percent of the world's population. Employing a standardized questionnaire, this non-commercial, cross-national, longitudinal investigation boasts the participation of nearly 400,000 respondents, making it the most extensive academic study encompassing the entire spectrum of global variations,

progressive stance compared to neighboring countries, with approximately 20% of respondents strongly agreeing/agreeing with the statement. Furthermore, despite the age difference of respondents (ranging from 18 to 88 years old) in the World Values Survey, the mean responses of the Young Lives Survey and the Peruvian World Values Survey are highly similar. Considering gender, the mean responses of female respondents in both surveys are closely aligned, while male respondents in the Young Lives Survey display more regressive views compared to the other survey.

In Figure 4A.3, a comparison between two cohorts in the Young Lives Survey is presented. In Round 5, the older cohort consists of individuals around 22 years old. By employing identical questions for both cohorts, the mean responses on a 1-to-4 scale for all 12 gender attitude items are compared. The results indicate a high degree of similarity in the mean responses of the two cohorts across the 12 items. In conclusion, through comparisons with other surveys and with different cohorts within the same survey, I am able to proceed with confidence that the responses of the younger cohort are reasonably representative of Peru.

Following Jaruseviciene et al. (2014), I then classify gender role attitudes into three dimensions: (i) power dimension: measures the level of power held by girls and women in comparison to boys and men, (ii) equality dimension: captures the desire for greater gender equality, such as expectations around sharing housework or the same freedoms for boys and girls, and (iii) behavior dimension: measures social expectations for the behaviors of boys and girls.[25] The three sub-indices are obtained using the same procedure as the gender attitude index.

Table 4.2 describes the attitudes towards gender roles of children in the sample. I report descriptive statistics of all twelve statements, three sub-indices and the aggregated index. Overall, the attitudes are quite regressive among youth in the behavior dimension and power dimension. For example, 58% believe that swearing is worse for women than men, while 57% support the idea that it is more important for men than women to do well in school. With respect to the equality dimension, there is significantly less support for traditional norms. For instance, only 13% believe that women should not have the same freedom as men.

from impoverished to affluent countries, across all major cultural zones.

[25] Jaruseviciene et al. (2014) conduct a factorial analysis of the AWSA with the same 12 statements as in this chapter. Using a sample of 3,518 adolescents in Bolivia and 2,401 adolescents in Ecuador, the authors provide three distinct dimensions of gender role attitudes, including the power dimension, the equality dimension, and the behavioral dimension.

Table 4.2: Descriptive Statistics of Attitudes towards Gender Roles (Young Lives Round 5, Age 15)

Agree/Strongly Agree with...	Mean	SD	Min	Max
Behavior dimension	**0.51**	**0.28**	**0.00**	**1.00**
Women should not swear	0.58	0.49	0.00	1.00
Men pay for date expenses	0.54	0.50	0.00	1.00
Women cannot ask men out	0.42	0.49	0.00	1.00
Equality dimension	**0.15**	**0.20**	**0.00**	**1.00**
Women are not smart as men	0.18	0.39	0.00	1.00
Women should not play rough sports	0.11	0.32	0.00	1.00
Husband should not share housework duties with wives	0.16	0.37	0.00	1.00
Women should not have the same freedom as men	0.13	0.33	0.00	1.00
Power dimension	**0.34**	**0.29**	**0.00**	**1.00**
Incentivize college attendance more for sons than daughters	0.26	0.44	0.00	1.00
Fathers should have greater authority than mothers in family decisions	0.35	0.48	0.00	1.00
Men's academic success is more significant than women's	0.57	0.50	0.00	1.00
Men are better leaders than women	0.23	0.42	0.00	1.00
Women's priority should be good homemakers and mothers	0.27	0.44	0.00	1.00
Gender attitude index	**0.32**	**0.16**	**0.00**	**0.83**
Observations	1119			

Note: All variables, except Gender attitude index and three sub-indices related to behavior, equality and power dimensions, are indicators taking value 1 if children answer 'Agree' or 'Strongly agree' ('Disagree' or 'Strongly disagree') when the statement is in favour of (opposed to) traditional views. Gender attitude index and three sub-indices (unweighted indices) are as the averages of their respective component indicators.

4.5 Empirical Approach

This section presents the empirical approach. To estimate the causal effect of the Juntos program on gender role attitudes of beneficiary children, I exploit the eligibility rules, which identify that a household is *eligible* if it resides in an eligible district, includes pregnant women or children up to 19 years old, and has a poverty score exceeding a predetermined threshold. In my analysis sample, since all households reside in eligible districts and surveyed children was approximately 15 years old in 2016, therefore, the eligibility of households is identified solely based on their poverty score. First, I introduce the approach for calculating household poverty scores based on surveyed data. Despite that I do not observe the government's eligibility-determining score, I show that measurement error would not pose a concern since there is a clear jump in the share of participating households at the threshold. I then provide the identification strategy - a fuzzy RD design following Battistin et al. (2009). Moreover, I conduct several validation tests to show the robustness of the design.

4.5.1 Household Poverty Score

My identification strategy exploits the assignment rule of the program, whereby households with poverty scores equal to or exceeding the corresponding thresh-

olds are selected as eligible. To implement the identification strategy, I need to observe household poverty scores, which condition eligibility. Utilizing extensive data from the household survey conducted in five rounds, I recompute the poverty scores using the official formulas implemented in the Juntos program. The beneficiary households are defined as households that have received cash transfers at any point in time between 2002 and 2016.

The approach for calculating poverty scores relies on the time that the district, where the household lived in, became eligible for the Juntos program, spanning from 2002 to 2016. As discussed in Section 4.3, the Juntos program updated its poverty score computation approach in 2012. Therefore, I employ the former method, utilizing a universal threshold value, for households in districts that became eligible between 2005 and 2011. For households in districts that became eligible between 2012 and 2016, I apply the current method, which employs the IFH index and regional-specific thresholds.

In principle, the poverty scores are calculated using data from the previous round corresponding to the eligibility time of districts for non-beneficiary households. For Juntos beneficiary households, poverty scores are determined based on data from their previous round corresponding to the time of enrollment, indicating the initial program entry. Given that the poverty scores in the former method are on a scale from 0 to 1, with higher scores indicating greater poverty, and the current method uses a scale from 0 to 100 with higher scores indicating greater wealth, I re-scale the scores obtained from the current method by a factor of 100 and adjust their direction to align with the former method. This transformation is necessary to maintain consistency in the poverty scores across the two methods and ensure that the direction of the scores accurately reflects the level of poverty. Subsequently, the poverty scores are centered with their corresponding eligibility cutoff values, and then the *eligible threshold* is 0 in this setting. A non-negative centered poverty score implies that households are eligible for the program.

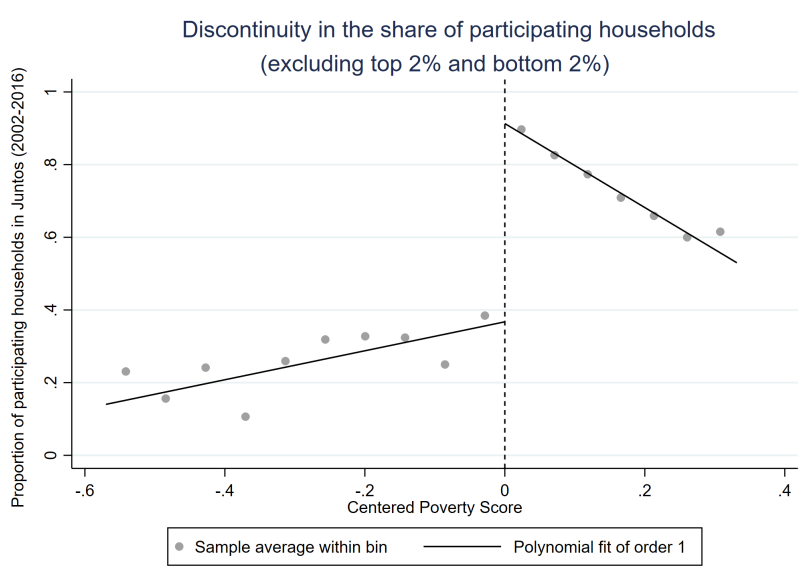
In my identification, an issue may arise due to potential differences between Young Lives Study data and administrative data used for household poverty score calculation, potentially resulting in measurement error. The calculation result indicates that 25% of households have centered poverty scores below 0, but reported receiving the benefit. Moreover, 23.9% of households have centered poverty scores greater than 0, but did not take part in the program, which can be explained because participation in the program is not mandatory.

In general, this evidence is also consistent with measurement error in the reporting of the participating status. However, the inaccuracy in participating status is unlikely to happen. This is because households are asked whether they are beneficiaries of the Juntos program from the third to the fifth round, and there is no

inconsistency in their report during the whole study period. Therefore, I make an assumption that the participating status is not misreported. All inconsistencies in the data between the poverty score and the observed participating status are presumed to come from measurement error in the poverty score.

Measurement error would pose a major issue if it had smoothed out any discontinuity in the share of participating households at the threshold (Davezies and Le Barbanchon, 2017). However, as shown in Figure 4.1, this is not the case. For the sake of brevity, I plot the share of participating households by excluding the top 2% and the bottom 2% of the running variable. The figure shows a clear jump at the threshold. Therefore, following Battistin et al. (2009), I can refer that the measurement error in the eligibility variable arises due to *contaminated data*, in which the observed distribution of poverty scores includes both accurately measured values and those reported with some degree of error.

Figure 4.1: Discontinuity in the Share of Participating Households (Excluding Top 2% and Bottom 2%)



Note: In this graph, the support of the running variable (centered poverty score) is divided into disjoint bins. The observations situated to the right of the vertical line are considered eligible for Juntos.

In this study, a direct assessment of the correlation between my computed household poverty score and the government's eligibility-determining score is not feasible. However, to provide suggestive evidence about the quality of the computed poverty score, Table 4A.2 in Appendix 4A presents a positive correlation between my computed poverty score from Young Lives and the poverty score from

ENAHO.[26,27] It is essential to note that ENAHO's questions provide precise information for identifying the variables used in the algorithms to calculate the poverty score. Additionally, the Peruvian government utilized ENAHO data from 2001 to 2004 to establish coefficients in the algorithm used for the former method and data from ENAHO 2009 to determine the set of variables for the IFH computation.

In Panel A of Table 4A.2, when employing the former method with a universal threshold value, the correlation rate is 0.875. This correlation is derived from the average poverty scores in 14 departments in Young Lives 2002 and ENAHO 2004. In Panel B, the current method is employed to compute the IFH index. Based on the average indices in 13 clusters, a moderate and positive correlation (0.562) is observed between the computed IHF index in Young Lives 2009 and the IFH index in ENAHO 2009. More importantly, the average poverty scores or IHF indices are very similar in several departments and clusters, which supports the claim that the household poverty score is partially observed with errors.

4.5.2 Identification Strategy

In the presence of measurement error due to contaminated data, following Battistin et al. (2009), I employ the fuzzy regression discontinuity design, where the eligibility status is used to solve the endogeneity of the participating status. In the RD design framework, it is assumed that households near the eligibility cutoff on either side share similar characteristics, except for their program eligibility status. The specific estimating equations are as follows:

$$Juntos_{ij} = \alpha + \beta \mathbb{1}_{[X_{ij} \geq 0]} + h(X_{ij}) + \lambda_j + \varepsilon_{ij} \tag{4.1}$$

$$Y_{ij} = \mu + \gamma \mathbb{1}_{[X_{ij} \geq 0]} + h(X_{ij}) + \kappa_j + \upsilon_{ij} \tag{4.2}$$

where $Juntos_{ij}$ is a binary variable that takes the value of one if the household of child i in district j participated in Juntos at any point between 2002 and 2016. The variable Y_{ij} represents my measure of gender role attitudes for child i in district j. X_{ij} is the centered poverty score of the household of child i in district j. $\mathbb{1}_{[X_{ij} \geq 0]}$ is an indicator variable that equals 1 if the centered poverty score is greater than or equal

[26] In order to facilitate an appropriate comparison, two sub-samples are drawn from the ENAHO dataset. Specifically, the ENAHO 2004 dataset is confined to households with children aged between 3 and 4 years, while the ENAHO dataset for the year 2009 includes households with children aged between 7 and 9 years. Notably, the ENAHO surveys lack information on children under three years old, rendering a comparison between ENAHO 2002 and Young Lives 2002 unfeasible. Detailed explanations of the calculation methods can be found in Appendix 4B.

[27] To better illustrate the quality of the computed score, I use the complete sample, encompassing households from both eligible and ineligible districts, resulting in a total of 1,860 observations across 20 districts.

to 0. $h(X_{ij})$ captures the relationship between the outcome variable and running variable X_{ij}. λ_j and κ_j are district fixed effects, which account for time-invariant factors specific to each district. It is important to control for district fixed effects in the first stage due to variations in how household poverty scores are calculated across different districts. Moreover, as described in Appendix 4B, some components of household poverty scores are influenced by district-specific factors, such as household access to water, electricity, and drainage systems. Intuitively, I compare the gender role attitudes of children within the same district in this setting. ε_{ij} and υ_{ij} are error terms. Following Abadie et al. (2022), standard errors are clustered at the district level.

The relevant parameters include $\hat{\beta}$ in Equation 4.1, the intention-to-treat (ITT) estimate $\hat{\gamma}$ from Equation 4.2, and the ratio $\tau_{FRD} = \hat{\gamma}/\hat{\beta}$, which represents the local average treatment effect (LATE) given some additional assumptions.[28] To estimate the causal effect, I employ a non-parametric RD design strategy, focusing solely on observations near the threshold where a discontinuous change in the probability of treatment assignment occurs. This approach does not impose any assumptions regarding the functional form of the running variable. However, as highlighted by Calonico et al. (2014), the traditional bandwidth selecting procedure of the non-parametric method often leads to bias in the distributional approximation of the estimator. To overcome this challenge, I adopt the local polynomial non-parametric RD design with data-driven bandwidth selectors and bias-correction techniques proposed by Calonico et al. (2014) and Calonico et al. (2019).

In this chapter, I primarily use the mean square error (MSE) optimal bandwidth ($\hat{h}_{MSE}$), which optimizes point estimates by minimizing the asymptotic mean square error (Calonico et al., 2020). In my baseline regression specification, I use the MSE optimal bandwidth, triangular weights and linear local polynomial. In all RD specifications, I report the conventional point estimators and the corresponding robust p-values.

4.5.3 Threats to Identification and Assessment of Validity

Within the RD design framework, the assignment of households to the Juntos program can be viewed as locally randomized around the threshold of the centered poverty score, which serves as the running variable. While it is challenging to

[28] According to Hahn et al. (2001), there are three additional assumptions for identification, which allows τ_{FRD} to be interpreted as LATE. The first assumption is monotonicity, that is having a non-negative centered poverty score does not decrease the probability of receiving cash transfer for any household (which seems plausible). The second assumption is the existence of the first stage. The third assumption - local independence - indicates that in a neighborhood around the threshold, household treatment effects and treatment status are jointly independent of the centered poverty score.

directly assess the randomness assumption, there are several methods available to evaluate its validity. This subsection presents the tests for discontinuity in both the running variable and other covariates near the threshold.

4.5.3.1 Testing Discontinuities in the Running Variable Density

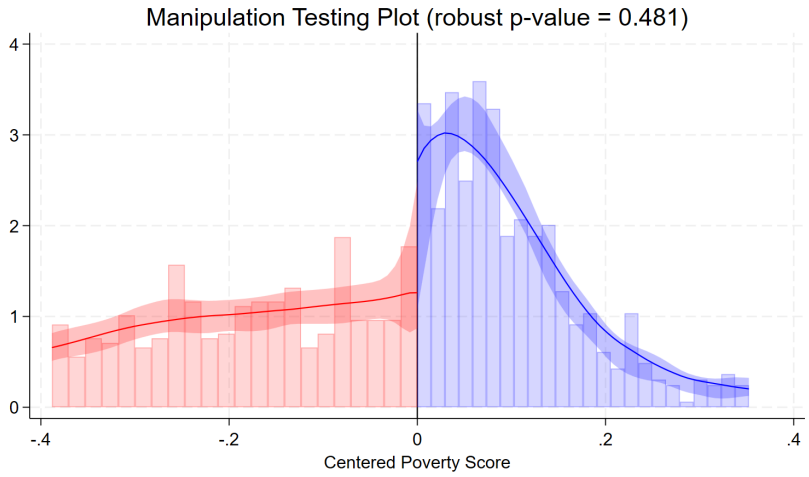
In the Juntos program, manipulation of household poverty scores might occur at different levels, including the household level and district level. Manipulation behaviors often require knowledge of the formulas to calculate poverty scores before applying to the program. At the household level, it is hard to believe that households could precisely manipulate their poverty scores. First, the targeted population of the program is poor households, who are less likely to know the formulas. Second, those formulas are quite complicated with several different variables and their corresponding coefficients. Most of variables are long term and not easy to adjust in response to expectations regarding the program's commencement. Moreover, it is very unlikely that the households know the cutoff value. The households only know the result of the eligibility evaluation, but not the value of their poverty scores.

Another concern related to manipulation is that districts might attempt to *adjust* the poverty scores of their households to maximize the program's benefits. However, the likelihood of such an event is pretty low, given that the Juntos program has implemented a checked stage with a commission consisting of both local and national representatives to verify the list of eligible households.

Taking a statistical perspective, we can assess the potential manipulation by examining the density of the running variable around the eligibility threshold. To do this, I use a manipulation test that involves a local-polynomial density estimator based on the observed sample's cumulative distribution function. This allows me to estimate the probability density function of the centered poverty score, following the approach by Cattaneo et al. (2018). The null hypothesis posits that the density of the centered poverty score variable remains continuous at the zero threshold.

In Figure 4.2, there appears to be a noticeable jump at the threshold upon initial observation. However, the results of the statistical test show that we cannot reject the null hypothesis, indicating no manipulation of density at the threshold. This conclusion is based on a test statistic of 0.7052 and a p-value of 0.481. To explain the observed jump, it is possible that it is influenced by measurement errors, as discussed in Subsection 4.5.1, which affect some of the poverty scores. In principle, there is no statistical evidence to support the manipulation of the running variable's density at the threshold.

Figure 4.2: Manipulation Testing Plot



Note: This graph presents the manipulation test based on density discontinuity following Cattaneo et al. (2018). The observations situated to the right of the vertical line are considered eligible for Juntos.

4.5.3.2 Testing Discontinuities in Covariate Distributions Around the Threshold

To provide additional evidence regarding the exogeneity of the running variable, I examine characteristics of children and their households close to the threshold. The RD design is valid when other factors are smooth through the cutoff value. To test for discontinuity, I run the estimating equations 4.1 and 4.2 with the dependent variable replaced by the characteristics of interest. I focus on two categories of characteristics, including child characteristics (such as: gender, vaccination, health issues in 2002) and household characteristics (such as: baseline household size, age of moms, mother's education).

Table 4.3 presents the estimates of τ_{FRD} when characteristics of interest are outcome variables. The results suggest that there is no significant discontinuity in observable characteristics at the cutoff when all robust p-values are larger than 0.1. Note that in all regressions conducted on equation 4.1, the estimates of β are strongly significant with an approximate magnitude of 0.21.

Table 4.3: Covariate Discontinuity Test Around the Threshold

Variable	MSE-Optimal Bandwidth	RD Estimator	Robust Inference p-value	Robust Inference Conf. Int.	Eff.Number Observations
Child characteristics					
Female	0.128	-0.011	0.981	[-0.545, 0.531]	554
BMI-for-age z-score	0.094	-0.916	0.248	[-2.403, 0.620]	451
Weight-for-age z-score	0.136	-0.511	0.517	[-2.681, 1.349]	580
Height-for-age z-score	0.171	0.414	0.537	[-1.301, 2.496]	685
Age of child (months, 2002)	0.130	-3.134	0.493	[-9.159, 4.411]	557
Polio vaccination (Yes=1)	0.150	0.161	0.284	[-0.171, 0.584]	630
BCG Vaccination	0.126	0.063	0.621	[-0.221, 0.369]	549
Measles vaccination	0.109	0.331	0.263	[-0.425, 1.556]	490
Health long term issues (Yes=1, 2002)	0.129	0.451	0.241	[-0.267, 1.060]	555
Mestizo (Yes = 1)	0.126	0.182	0.439	[-0.293, 0.674]	551
Catholic (Yes =1)	0.131	0.223	0.172	[-0.145, 0.813]	561
Household characteristics					
Age of mom (years, 2002)	0.123	-9.059	0.206	[-24.353, 5.258]	534
Household size (members, in 2002)	0.123	-1.071	0.576	[-6.258, 3.478]	539
Mother education (<secondary school = 1)	0.123	-0.626	0.175	[-2.016, 0.367]	536
Caregiver's gender preference for the child (Male=1)	0.143	0.501	0.155	[-0.210, 1.321]	611

Note: This table presents the LATE estimates when I replace the dependent variable in equation 4.2 by the characteristics of interest. The estimates are obtained by utilizing the MSE optimal bandwidth, triangular weights and linear local polynomial. The p-values and 95% confidence intervals reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

4.6 Results

In this section, I present four key categories of results. First, I document the effects of Juntos on gender role attitudes of beneficiary children and which dimensions of attitudes are particularly affected. Second, I provide evidence on heterogeneous treatment effects of Juntos. Third, I discuss how Juntos influences children's daily activity time use and their achievement test scores. Finally, I show that my estimates of Juntos' effects on gender role attitudes are robust to a rich battery of robustness checks.

4.6.1 Effects on Gender Role Attitudes

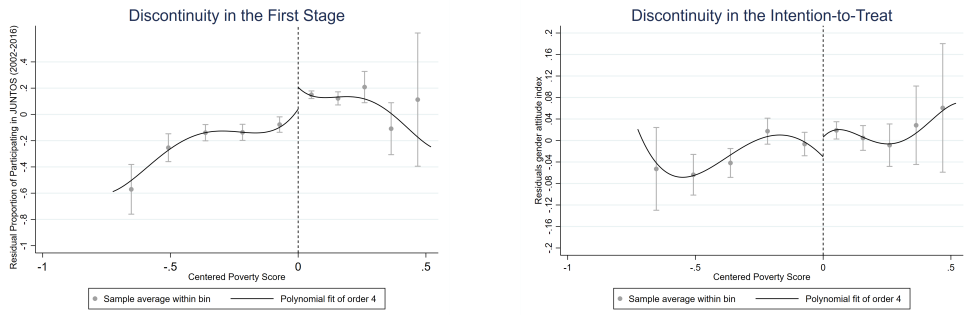
I first present the RD graphical evidence to intuitively illustrate the discontinuous changes at the threshold. Figure 4.3 shows the discontinuities in both the proportion of Juntos participating households and the gender attitude index. In particular, Panel A plots the residual proportion of participating in the Juntos program as a function of the running variable (centered poverty score). Residuals are obtained from a regression of $Juntos_{ij}$ on the district fixed effects. The circles present the sample average within bin over disjoint bins of the running variable. The solid lines represent separate fourth-order global polynomial fits on each side of the threshold, while the error bars indicate the 95 percent confidence intervals for the local means. The figure reveals a jump in the proportion of participating in the Juntos program at the threshold level. Transitioning from barely below to barely above the threshold level results in an approximate 0.2 increase in the proportion of households receiv-

ing the cash transfer.

Analogously, Panel B plots the residual gender attitude index, which is obtained by regressing gender attitude index on the district fixed effects, as a function of the running variable. The figure shows a clear jump at the threshold level, in which the gender attitude index of beneficiary children is roughly 0.05 points higher than non-beneficiary children.

Figure 4.3: First Stage and Intention-to-Treat

(a) Panel A: First Stage **(b) Panel B: Intention-to-Treat**



Note: Each graph plots the outcome as a function of the running variable (centered poverty score). In both graphs, the support of centered poverty score is divided into disjoint bins. The circles illustrate the outcome's local mean at the midpoint of individual bins. The solid lines depict distinct fourth-order global polynomial fits on either side of the threshold. The error bars are the 95 percent confidence intervals for the local means. The observations situated to the right of the vertical dashed line are considered eligible for Juntos.

Next, I provide the results of my main regression using the local polynomial approach. Table 4.4 presents the results of estimating the coefficients β and τ_{FRD} from equations 4.1 and 4.2 using nonparametric local polynomial methods proposed by Calonico et al. (2014) and Calonico et al. (2019).

The estimates in row (1) confirm my observation in Figure 4.3 that I have a significant first stage when all estimates of the coefficient β are statistically significant at the 5% level. Regarding the estimates of τ_{FRD}, the results suggest that the Juntos program leads to more traditional gender role attitudes among children in beneficiary households. In terms of the effect size, when quantifying gender role attitudes as an unweighted index, beneficiary children exhibit a 27.7 percentage point increase in favor of traditional attitudes compared to those in non-beneficiary households (robust p-value <0.05), as reported in column (2). The magnitude of the effect is substantial, representing an 85% increase over the control group's mean within the optimal bandwidth.

Table 4.4: Effects on Gender Role Attitudes

	Gender Attitude Index		Power Dimension		Equality Dimension		Behavior Dimension	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. First stage (β)	0.209	0.201	0.209	0.201	0.209	0.201	0.209	0.201
	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)
Robust p-value	0.007	0.010	0.007	0.010	0.007	0.010	0.007	0.010
Panel B. LATE (τ_{FRD})	0.278	0.277	0.457	0.454	0.233	0.225	0.077	0.086
	(0.110)	(0.110)	(0.179)	(0.184)	(0.154)	(0.147)	(0.164)	(0.174)
Robust p-value	0.033	0.030	0.027	0.029	0.157	0.160	0.973	0.920
District FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Control Group Mean (optimal BW)	0.323	0.323	0.329	0.329	0.174	0.174	0.548	0.548
Observations	527	522	527	522	527	522	527	522

Note: Panel A presents estimates of equation 4.1, where the dependent variable is participation in the Juntos program. Panel B report the LATE estimate of participation in Juntos on gender role attitudes, computed as the ratio of the ITT estimate to the first-stage coefficient. The optimal bandwidth is 0.120. Several control variables are included in the analysis, such as the age of mothers (years) in 2002, dummy variables for gender of the child, mother education, location (urban), and child's religion. In columns (2), (4), (6) and (8), to include control variables in the non-parametric estimation, I employ a two-stage approach following Lee and Lemieux (2010). Initially, the outcome variable is residualized by absorbing control variables through the Ordinary Least Squares (OLS) method. Subsequently, the local linear RD approach is applied to the residualized outcome. The estimates are obtained by utilizing the MSE optimal bandwidth, triangular weights and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at the district level are shown in parentheses.

Building upon the main result, I further investigate which dimensions of gender role attitudes are particularly affected. To do so, I decompose the gender attitudes index into thematic sub-indices, including the power dimension, equality dimension, and behavior dimension, as outlined in Section 4.4.2. I present the results from estimating equations 4.1 and 4.2 when the dependent variables are three sub-indices in columns (3) to (8) of Table 4.4. The findings suggest that Juntos has a significant impact on the power dimension, reflecting the extent of power women hold in comparison to men. However, no significant effects are observed in the domains of equality and behavior. It is important to note that when considering the coefficient values at face value, the influence on the equality dimension closely mirrors the estimated effect on the gender attitude index.[29]

In brief, the results suggest that the Juntos program leads to more traditional gender role attitudes in beneficiary children. Based on the discussion of gender-socialization theory and maternal influences on children's gender role attitudes in Section 4.2, this finding can be explained by the program's potential impact on mothers that reinforces their traditional roles. I will delve deeper into this hypothesis in Section 4.7.

[29]In figures 4A.4 and 4A.5 in Appendix 4A, I present the RD graphical evidence of the first stage, along with the intention-to-treat estimates, utilizing the optimal bandwidth for the gender attitude index and three sub-indices, including: power dimension, equality dimension and behavior dimension.

4.6.2 Heterogeneous Effects by Child Gender, Maternal Educational Level and Region

In this subsection, I explore whether the impact of the Juntos program on gender role attitudes varies along three dimensions: child gender, maternal education, and region.

First, I conduct a separate analysis to examine the impact of the Juntos program on boys and girls in columns (1) and (2) of Table 4.5. Taking the point estimates at face value, I find that the impact on females is smaller than the effect on males, with values of 0.233 and 0.280, respectively. However, the estimated coefficient of τ_{FRD} demonstrates weak statistical significance in the female sub-sample, with a robust p-value just below 0.1. In contrast, the estimated coefficient in the male sub-sample is statistically indistinguishable from zero. These inconclusive results could be attributed to the relatively small number of observations in both sub-samples near the threshold.

Table 4.5: Heterogeneous Effects by Child Gender, Maternal Education and Region

	Gender Attitude Index					
	Child Gender		*Mother's Educational Level*		*Region*	
	Female	Male	$<$ secondary school	$\geq$ secondary school	Mountain	Jungle & Coast
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. First stage (β)	0.250	0.185	0.237	0.290	0.233	0.132
	(0.086)	(0.077)	(0.063)	(0.120)	(0.075)	(0.094)
Robust p-value	0.020	0.062	0.001	0.018	0.015	0.284
Panel B. LATE (τ_{FRD})	0.233	0.280	0.188	0.332	0.341	0.187
	(0.129)	(0.206)	(0.072)	(0.184)	(0.132)	(0.158)
Robust p-value	0.098	0.236	0.022	0.148	0.011	0.442
District FEs	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.316	0.326	0.350	0.301	0.337	0.334
Observations	237	301	318	164	441	253

Note: Panel A presents estimates of equation 4.1, where the dependent variable is participation in the Juntos program. Panel B report the LATE estimate of participation in Juntos on gender role attitudes, computed as the ratio of the ITT estimate to the first-stage coefficient. Several control variables are included in the analysis, such as the age of mothers (years) in 2002, dummy variables for location (urban) and child's religion. In all columns, I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at the district level are shown in parentheses.

Next, I investigate whether the impact of Juntos on children's gender role attitudes varies across different levels of maternal education. I conduct a separate analysis, distinguishing between children whose mothers have an educational level below secondary school and those with at least a secondary school education. This analysis is presented in columns (3) and (4) of Table 4.5. In column (3), I examine the impact of the Juntos program on the gender role attitudes of children whose mothers have an educational level below secondary school. The point estimate of τ_{FRD} (0.188) is positive and statistically significant at a robust p-value level of 0.05. Shifting focus to column (4), I turn to children whose mothers have at least

a secondary school education. The estimated coefficient of τ_{FRD} is positive but insignificant, indicating no clear evidence of the program's effect in this sub-sample. However, it is essential to interpret this result cautiously due to the small number of observations (164) in this particular sub-sample.

The ultimate facet of heterogeneity under consideration lies at the regional level. Peru is renowned for its abundant diversity, characterized by three distinct natural regions: the coastal areas, mountainous areas, and the jungle. Throughout Peruvian history, women residing in mountainous regions have consistently occupied a subordinate status compared to men, a circumstance attributed to deeply ingrained patriarchal systems and practices (Babb, 2018). To delve into the nuanced impact, I present a separate analysis of children residing in the highlands and in coastal and jungle areas in the last columns of Table 4.5.

Column (5) reveals a large and statistically significant effect of Juntos (0.341) on the gender role attitudes of children in the highlands (robust p-value < 0.05), whereas no significant effect is observed in other areas in Column (6). However, it is important to interpret the result of Column (6) with caution since the estimator of β in Panel A is indistinguishable from zero, possibly due to the limited number of observations. It is noteworthy to bear in mind that between 2005 and 2017, only 28% of eligible districts belong to the jungle and coastal regions, as reported by Carpio et al. (2019).

4.6.3 Effects on Time Use and Test Scores

One crucial focal point within this investigation revolves around the measurement of the gender attitude index through sensitive questions, thus giving rise to the predicament of social desirability bias (Yan, 2021). That is, societal expectations dictate certain behaviors and attitudes as socially desirable while designating others as socially undesirable. Therefore, children might exhibit a bias towards responding in a socially desirable manner. In other words, children might not actually change their views towards gender role attitudes. To surmount this concern, I test whether the main results are aligned with children's actual behaviors.

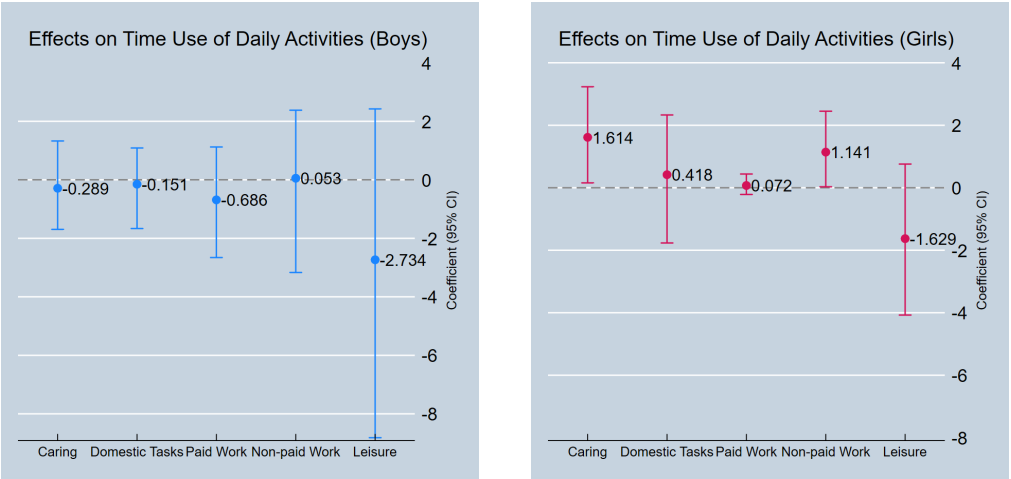
Relying on detailed information on the time use in daily activities during a typical day in Round 5, I examine the effect of the Juntos program on time use across five key categories: caring for others, domestic tasks and chores, paid work, non-paid work (labor force work for the household), and leisure.[30]

Figure 4.4 presents the results for male and female sub-samples. The results in the right sub-graph indicate that beneficiary girls significantly allocate more time to

[30]It is noteworthy that a "typical day" in this context refers specifically to weekdays, excluding weekends, holidays, and national holidays.

care-giving and unpaid labor (1.614 and 1.141 hours, respectively, robust p-value <0.05). Moreover, beneficiary girls also spend more time on domestic tasks (0.418 hours) and less time on leisure activities (-1.628), though these estimates are statistically insignificant. In the left sub-graph, there is no statistically significant impact of the Juntos program on boys' time allocation. However, taking the coefficients at face value, it appears that beneficiary boys spend less time on activities traditionally associated with femininity, such as caregiving (-0.289) and domestic tasks (-0.151).[31]

Figure 4.4: Effects on Time Use in Daily Activities



Note: This graph presents the effects of Juntos on children's time use in daily activities. The point estimates are obtained from replicating the specification in Table 4.4's Column (2) by replacing the dependent variable by variables representing time use in daily activities in Round 5. Time use is measured in hours during a typical day (not weekends, holidays or national holidays). *Caring* (time) indicates time that children spend on caring for others (younger siblings, ill household members). *Domestic tasks* (time) denote time that children spend on domestic tasks and chores (fetching water, firewood, cleaning, cooking, washing, shopping, etc.). *Paid work* (time) indicates time that children spend on activities for pay/sale outside of household or for someone not in the household. *Non-paid work* (time) denotes time that children spend on tasks on family farm, cattle herding, other family business, shepherding, piecework or handicrafts done at home. *Leisure* (time) indicates time that children spend on playing or general leisure (including time taken to eating, drinking and bathing).

The increase in time devoted on caring and non-paid work among female children seems to align with some traditional views, particularly in the power dimension. These views are characterized by two statements: (i) women's priority should be good homemakers and mothers, and (ii) men's academic success is more significant than women.[32] It is essential to interpret the magnitude of estimated coefficients

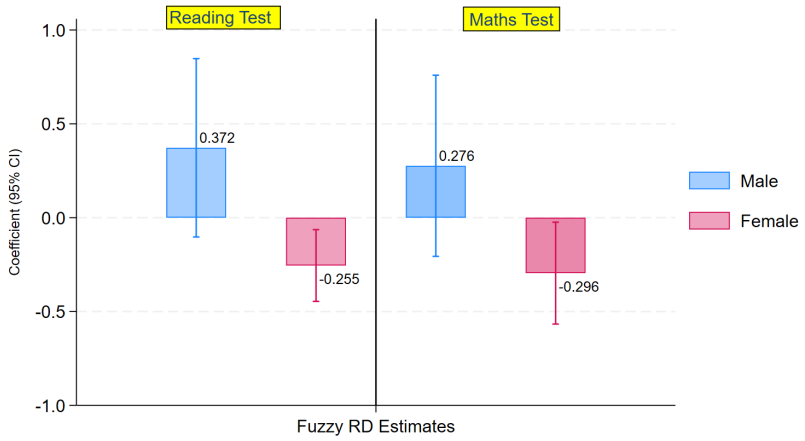
[31] Detailed results of the effects on children's time use in daily activities are presented in Table 4A.3 in Appendix 4A.

[32] Power dimension of gender attitude index measures the level of power held by girls and women in comparison to boys and men.

cautiously since the recorded hours are rounded to the nearest integer.[33] In summary, the findings indicate that the traditional attitudes among children are in line with their gendered behaviors, especially among girls.[34]

Next, I examine the impact of Juntos on children's performance in reading comprehension and mathematics achievement tests. Having been administered since the second round, these tests were designed by the Young Lives team to evaluate children's intellectual and cognitive abilities. During the fifth round, the mathematics test consisted of 31 questions. Some questions were drawn from the Programme for International Student Assessment (PISA) tests. Students were given 50 minutes to complete the mathematics test. The reading comprehension test comprised 27 questions, and students had 30 minutes to complete it. Figure 4.5 illustrates the estimation results of Juntos' impact on children's accuracy in reading and mathematics tests.

Figure 4.5: Effects on Test Scores



Note: This graph the effects of Juntos on children's test scores. The point estimates are obtained from replicating the specification in Table 4.4's Column (2) by replacing the dependent variable by reading test scores and maths test scores.

The findings reveal that beneficiary girls exhibit a significant decrease in accuracy, scoring 25.5% lower in reading and 29.6% lower in math compared to non-beneficiary girls. In contrast, there are no statistically significant effects for boys in

[33]The number of hours is recorded in the following way: if the time is less than 30 minutes, enter *0*; and if it is 30 minutes or more, enter *1* (1 hour).

[34]In Table 4A.4 in Appendix 4A, I present the results of of Juntos' impacts on other daily activities, including study time, school time, and sleep duration. Although the statistical significance of these results is lacking, when considering the estimated values at face value, it becomes apparent that male beneficiaries allocate less time to caregiving, domestic chores, and leisure pursuits. Conversely, they spend more time on after-school studies, particularly at home or through extra tuition.

either reading or math tests. Notably, the decline in achievement test scores among girls aligns with a substantial increase in time spent on caregiving and non-paid work, suggesting a potential negative association between engagement in gendered behaviors and academic performance.[35]

4.6.4 Robustness Checks

In this subsection, I show that my estimates of Juntos' effects on gender role attitudes are robust to a rich battery of robustness checks.

Different Selections of Local Polynomial Degree, Kernel, or Bandwidth. In Table 4.6, I show that the main results are not sensitive to the selection of local polynomial degree, kernel, or bandwidth. Following Gelman and Imbens (2019), in column (1), I present the result when replacing the local linear polynomial by a quadratic polynomial, but selecting a different optimal bandwidth $\hat{h}_{MSE}$. The result indicates that the point estimate of the RD LATE is very similar with those estimated with the linear specification in Table 4.4. Importantly, the point estimate remains consistent in both direction and statistical significance at the 5 percent level. Shifting the focus to columns (2) and (3), I use the uniform and epanechnikov kernels. In column (4), I use the coverage error rate (CER) bandwidth ($\hat{h}_{CER}$), which optimizes confidence intervals by minimizing the asymptotic coverage error rate (Calonico et al., 2020).[36] In column (5), I follow the common practice in the RD design by employing the $\hat{h}_{MSE}$ for the ITT only. Moving to columns (6) and (7), I allow for different bandwidths on each side of the zero threshold when recalculating h_{MSE} and h_{CER}. In general, the estimates from columns (2) to (7) remain statistically significant at the 1 percent level or the 5 percent level. Moreover, the estimating results consistently align with the baseline results in both sign and magnitude.

Parametric Model and Wild Cluster Bootstrap. Table 4.7 presents the parametric fuzzy RD results using the two-stage least squares (2SLS) technique. In all columns, the optimal bandwidths are obtained through the methodology proposed by Imbens and Kalyanaraman (2011). One concern in this study is the relatively small number of clusters (12 districts), which may violate the asymptotic assumption of an infinite number of clusters. To address this challenge, I employ the cluster-robust wild bootstrap procedure following Cameron et al. (2008) and

[35]Table 4A.5 in Appendix 4A presents detailed results of the effects on children's test scores. Moreover, to provide a robustness check for the effects of Juntos on test scores, Table 4A.6 in Appendix 4A presents the estimated results on test scores in Round 4. Overall, beneficiary girls show a significant decrease in accuracy in both reading and mathematics, while no significant effect is observed among beneficiary boys.

[36]Calonico et al. (2020) show that $\hat{h}_{MSE}$, which minimizes the asymptotic mean square error, is optimal for point estimates, while $\hat{h}_{CER}$, which minimizes the asymptotic coverage error rate, is optimal for inference in confidence intervals.

report the corresponding p-values in all specifications. Overall, the results suggest positive and statistically significant estimated treatment effects, which are consistent with the findings obtained from the nonparametric fuzzy RD technique.

Table 4.6: Effects on Gender Role Attitudes, Robustness

	Local Polynomial Degree	**Kernel**		**Alternative bandwidths**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. First stage (β)	0.211	0.194	0.201	0.202	0.208	0.225	0.215
	(0.082)	(0.070)	(0.068)	(0.066)	(0.055)	(0.055)	(0.058)
Robust p-value	0.018	0.015	0.015	0.009	0.013	0.001	0.001
Panel B. LATE (τ_{FRD})	0.280	0.274	0.286	0.275	0.272	0.254	0.287
	(0.129)	(0.122)	(0.115)	(0.113)	(0.089)	(0.088)	(0.093)
Robust p-value	0.049	0.039	0.035	0.034	0.020	0.007	0.004
Bandwidth selection	$\hat{h}_{MSE}$	$\hat{h}_{MSE}$	$\hat{h}_{MSE}$	$\hat{h}_{CER}$	ITT $\hat{h}_{MSE}$	$\hat{h}_{MSE2}$	$\hat{h}_{CER2}$
Local Polynomial Degree	2	1	1	1	1	1	1
Observations	679	499	542	505	709	584	516

Note: The dependent variable is the gender attitude index as defined in Table 4.4's columns (1) and (2). In each column, the specific local polynomial degree and the algorithm for optimal bandwidth selection are indicated. The $\hat{h}_{MSE}$ bandwidth selection algorithm is optimal for point estimation; the $\hat{h}_{CER}$ selection algorithm is optimal for inference of confidence intervals. The use of subscript 2 in the description of the bandwidth selection algorithm indicates that distinct bandwidth lengths have been chosen on each side of the threshold. Several control variables are included in the analysis, such as the age of mothers (years) in 2002, dummy variables for gender of the child, mother education, location (urban), and child's religion. The p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Estimation through An Expanded Sample Size. One concern in this study is the relatively small sample size around the eligibility threshold, which could affect the precision of my estimates. To address this concern, I take the approach of incorporating household data from ineligible districts into my analysis sample to estimate the impact of the Juntos program on children's gender role attitudes.[37] This approach assumes that households near the eligibility threshold, whether in eligible or ineligible districts, are comparable, with the exception of their eligibility status. It is important to acknowledge that this assumption is strong. However, my primary objective in including households from ineligible districts is to bolster the sample size and enhance the robustness of my main findings.[38]

Given that all households in ineligible districts do not receive the cash transfer, including district fixed effects in regression specifications might not be suitable. To address this, I choose to control for the district poverty index from the year 2000, a comprehensive index developed by FONCODES. This index covers various

[37] In ineligible districts, I apply the current method, which will be used once they become eligible after 2016, to calculate household poverty scores. For these calculations, I primarily use data from rounds 4 and 5.

[38] In Table 4A.7 and Figure 4A.6 in Appendix 4A, I present the results of the manipulation test and covariate discontinuity test conducted on the expanded sample around the threshold. The findings indicate that we cannot reject the null hypothesis, suggesting no evidence of manipulation of density at the threshold. Additionally, there is no significant observed discontinuity in characteristics at the threshold.

factors related to access to essential services, such as health facilities, classrooms, availability of piped water, sanitation facilities, and electricity. It also considers factors like road accessibility, school attendance, and child malnutrition.

Table 4.7: Effects on Gender Role Attitudes (Parametric Method and Wild Cluster Bootstrap), Robustness

	Gender attitude index			
2SLS	**(1)**	**(2)**	**(3)**	**(4)**
LATE (τ_{FRD})	0.206***	0.184**	0.206***	0.181***
	(0.067)	(0.078)	(0.064)	(0.069)
	[0.016]	[0.014]	[0.016]	[0.016]
Controls	No	Yes	No	Yes
First stage				
Z	0.253***	0.251***	0.216**	0.223**
	(0.071)	(0.071)	(0.088)	(0.086)
X	0.436*	0.451	1.909	1.730
	(0.227)	(0.252)	(1.076)	(1.026)
Z × X	-0.754*	-0.753*	-3.039**	-2.872**
	(0.349)	(0.349)	(1.319)	(1.250)
X^2			5.327	4.525
			(3.476)	(3.351)
Z × X^2			-1.805	-0.919
			(5.146)	(5.044)
District FEs	Yes	Yes	Yes	Yes
1st stage F	11.33	10.60	12.63	12.07
1st stage R^2	0.51	0.52	0.51	0.52
Regression type	Linear	Linear	Quadratic	Quadratic
Observations	885	882	885	882

Note: The dependent variable is the gender attitude index as defined in Table 4.4's columns (1) and (2). In all columns, the optimal bandwidths are selected following the methodology of Imbens and Kalyanaraman (2011). Standard errors, shown in parentheses, are clustered at the district level. Inference is also conducted using a cluster robust wild bootstrap procedure following Cameron et al. (2008), and the corresponding p-values are reported in brackets. Asterisks denote significance: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Additionally, I incorporate department fixed effects into the model to account for time-invariant characteristics specific to each department. While the eligibility criteria are determined at the district level, it is crucial to recognize the significant role that departments play in designating eligible districts. Carpio et al. (2019) highlight that logistical and budgetary constraints can lead the Juntos program to exclude very poor districts in remote and isolated regions or departments with only

a few poor districts. The specific estimating equations are as follows:

$$Juntos_{ijd} = \alpha_1 + \beta_1 \mathbb{1}_{[X_{ijd} \geq 0]} + h(X_{ijd}) + \delta District\ poverty\ index_j + \eta_d + \zeta_{ijd} \quad (4.3)$$

$$Y_{ijd} = \mu_1 + \gamma_1 \mathbb{1}_{[X_{ijd} \geq 0]} + h(X_{ijd}) + \theta District\ poverty\ index_j + \iota_d + \nu_{ijd} \quad (4.4)$$

where $Juntos_{ijd}$ is a binary variable that takes the value of one if the household of child i in district j of department d participated in Juntos at any point between 2002 and 2016. The variable Y_{ijd} represents my measure of gender role attitudes for child i in district j of department d. X_{ijd} is the centered poverty score of the household of child i in district j in department d. $h(X_{ijd})$ captures the relationship between the outcome variable and running variable X_{ijd}. $District\ poverty\ index_j$ is the poverty index of district j in 2000 from FONCODES. η_d and ι_d are department fixed effects. ζ_{ijd} and ν_{ijd} are error terms. Standard errors are clustered at the district level.

Table 4.8 displays the estimation results. When comparing these results to those in Table 4.4, the LATE estimates show similar signs and statistical significance across two dependent variables: the gender attitude index and power dimension. In terms of magnitude, the estimated coefficients are closely aligned between the child sample in eligible districts and the child sample from both eligible and ineligible districts. Specifically, for the gender attitude index, the coefficients are 0.278 and 0.238, for the power dimension, they are 0.457 and 0.394, and for the equality dimension, they are 0.233 and 0.213, respectively. Despite the imperfections in the replication, the comparison of results suggests that the main findings of the study remain robust as the sample size increases.

In addition, I present the estimation results for sub-samples of females and males with expanded dataset sizes, as detailed in Table 4A.8 and Table 4A.9 in Appendix 4A. In Table 4A.8, taken the estimates at the face value, the results suggest that the impact of the Juntos program is more pronounced for boys, particularly evident in columns (1) and (2). Columns (3) through (6) further reveal that girls who are beneficiaries perform less accurately in reading and math tests, while no significant effects are observed for boys. These results align with those in Table 4A.5. Table 4A.9 displays the findings of the Juntos program on children's daily activities. Notably, beneficiary girls allocate significantly more time to caregiving and unpaid work while spending less time on leisure activities. Conversely, there are no significant effects observed among beneficiary boys. These findings are consistent with those in Table 4A.3.

Table 4.8: Effects on Gender Role Attitudes through An Expanded Sample Size, Robustness

	Gender Attitude Index	Power Dimension	Equality Dimension	Behavior Dimension
	(1)	(2)	(3)	(4)
Panel A. First stage (β_1)	0.257	0.257	0.257	0.257
	(0.060)	(0.060)	(0.060)	(0.061)
Robust p-value	0.000	0.000	0.000	0.000
Panel B. LATE (τ_{FRD})	0.238	0.394	0.213	0.042
	(0.090)	(0.152)	(0.099)	(0.130)
Robust p-value	0.015	0.008	0.064	0.907
District Poverty Index	Yes	Yes	Yes	Yes
Department FEs	Yes	Yes	Yes	Yes
Observations	968	968	968	968

Note: Panel A presents estimates of equation 4.3, where the dependent variable is participation in the Juntos program. Panel B report the LATE estimate of participation in Juntos on gender role attitudes, computed as the ratio of the ITT estimate to the first-stage coefficient. The optimal bandwidth is 0.184. The estimates are obtained by utilizing the MSE optimal bandwidth, triangular weights and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at the district level are shown in parentheses.

Different Approaches to Measure the Outcome Variable. In Table 4A.10 in Appendix 4A, I further show that the estimates are robust when using different approaches to construct the outcome variable. In columns (1) and (2), I construct the weighted gender attitude index following Anderson (2008). The weighted gender attitude index is the average of twelve binary variables, with weights derived in two steps. First, I normalize the binary variables to have the same standard deviation. Then, I calculate weights based on the inverse covariance matrix. In columns (3) and (4), following Kolenikov and Angeles (2009), I conduct the polychoric principle component analysis (PCA) using the twelve Likert scale variables and then use the resulting first component as an index for gender role attitudes.

Furthermore, I normalize these gender attitude indices to be mean zero with standard deviation one for the control group within the optimal bandwidths. Across all specifications, even with a higher level of statistical significance, the RD estimates consistently align with the baseline findings in Table 4.4 in terms of direction. This finding suggests that Juntos program leads to more traditional gender role attitudes among beneficiary children.

Placebo Cutoffs. One useful falsification exercise to validate the fuzzy RD design is to examine the treatment effect at the placebo cutoffs. In this test, the true threshold value is replaced with alternative values at which the treatment status remains unchanged. Estimation and inference are then conducted using those artificial cutoff point. The expected outcome is the absence of significant effects at the placebo cutoff values. I present the results of this falsification test in Table 4A.11 in Appendix 4A, utilizing six artificial cutoffs (-0.15, -0.1, -0.05, 0.05, 0.01, and 0.15). Following Cattaneo et al. (2020), I use only treated observations for artificial cutoffs exceeding the true cutoff, while only control observations are employed for artificial cutoffs falling below the true cutoff. Overall, the results reveal no evidence

of significant treatment effects at the placebo cutoffs. Therefore, I conclude that the poverty score only exhibits a discontinuous change at the zero threshold.

4.7 Mechanisms

So far, it has been shown that the Juntos program leads to more traditional gender role attitudes among children. This section delves into an in-depth exploration of the underlying factors contributing to the main results observed in the study.

As highlighted in Section 4.2, the argued channel for this effect involves the potential intermediary process of changing maternal roles and behaviors.[39] To explore this pathway, I analyze data from Round 4 of the household survey. Specifically, I use the question that captures mothers' primary job or occupation based on the time spent in the 12 months preceding the survey.[40] Initially, I classify jobs into three categories: (i) household chores/housewife, (ii) self-employment in various sectors and regular salaried or wage employment, and (iii) other working activities characterized by nonsalaried, irregular, or unstable income or part-time work, for instance, housemaid. Subsequently, I create three indicators to represent these three aforementioned groups (Household chores/Housewife, Self-employment/Wage employment, and Other working activities). I then estimate equations 4.1 and 4.2 with the dependent variable in the intention-to-treat stage replaced by three dummy variables.

The estimated results in Table 4.9 reveal important insights. Column (1) suggests that beneficiary mothers are 53.2% more likely to prioritize their time on household chores or housewifery compared to non-beneficiary mothers (robust p-value <0.01). This finding aligns with Nagels (2016), who shows that the Juntos program reinforces maternalistic and coercive behaviors. Turning to column (2), the finding indicates that beneficiary mothers have a 46.2% lower likelihood of choosing self-employment or wage employment as their most important activity in terms of time use (robust p-value <0.05). The last two columns show no significant evidence of the program's effect on mothers' time priority of other working activities.[41]

[39] By using the third, forth and fifth rounds of the household survey, I can identify Juntos recipients in beneficiary households, which reveals that approximately 93% of the recipients are mothers.

[40] Survey question: "For each household member 10 years old or above, ask for the 3 most important jobs / occupations (in terms of time) that he/she has done in the last 12 months, including SALARIED and NON-SALARIED jobs, INSIDE and OUTSIDE home. If the household member has had less than 3 occupations or he/she did not work (e.g., too old), enter 88 = N/A."

[41] In Figure 4A.7 in Appendix 4A, I present a discontinuity test of Household chores/Housewife and Self-employment/Wage employment around the threshold in Round 2 in 2006. To ensure robustness, all households that reported receiving the cash transfer before Round 2 were excluded from the analysis. The findings from this analysis indicate that there is insufficient evidence to support the existence of systematic differences between the treatment and control groups near the threshold

Table 4.9: Effects on Maternal Time Priority

	Household chores/ Housewife	**Self-employment/ Wage-employment**	**Other working activities**
	(1)	(2)	(3)
Panel A. First stage (β)	0.285	0.226	0.293
	(0.064)	(0.050)	(0.064)
Robust p-value	0.000	0.000	0.000
Panel B. LATE (τ_{FRD})	0.532	-0.462	-0.277
	(0.185)	(0.273)	(0.292)
Robust p-value	0.004	0.038	0.320
District FEs	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.376	0.278	0.325
Observations	430	581	404

Note: The specifications in all columns replicate the specification Table 4.4's Column (2) by replacing the dependent variable by variables representing jobs/occupations. I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. *Household chores/Housewife* equals 1 if a mother selects household chores or being housewife as the most important job in terms of time spent, and 0 otherwise. *Self-employment/Wage employment* equals 1 if a mother selects self-employment in agriculture, animal husbandry, fishing, forestry, manufacturing, and services, or regular salaried or wage employment as the most important job in terms of time spent, and 0 otherwise. *Other working activities* equals 1 if a mother selects jobs with nonsalaried, irregular, or unstable incomes or part-time work as the most important job in terms of time spent, and 0 otherwise. Controls include the age of mothers, a dummy variable for their education (equals 1 if the level is less than secondary school and 0 otherwise), dummy variables indicating whether they live with a partner, whether they have a health long-term issue, whether they live in urban areas, whether they have a job/occupation related to agriculture, animal husbandry, fishing and forestry in 2006, and household size. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

The results suggesting that mothers tend to prioritize household chores and homemaking over earning a stable income can be interpreted through various channels. First, from the theoretical standpoint, this finding is line with the standard economic model of labor supply, which predicts that individuals should work less when they receive a non-work income, such as: Becker (1965). In these models, individuals determine the amount of work they perform by weighting the benefits of working more hours against the costs. With the additional financial resource, mothers may choose to prioritize their time on activities they find personally fulfilling, such as taking care of their homes and families. This phenomenon reflects the persistence of traditional gender roles, where women are often expected to bear primary responsibility for domestic duties. This observation is particularly relevant within the context of Peru, which is recognized as a patriarchal society (Flake, 2005).

Second, it is essential to consider the implications of women's participation in cash transfer programs, particularly in relation to their role in meeting program conditions. The existing body of literature indicates that when women are specifically targeted as beneficiaries of cash transfers, it reinforces their traditional roles as caretakers and domestic workers (Cookson, 2018). This happens because mothers typically take on responsibilities like ensuring their children to attend health check-ups and school.

Moreover, these additional tasks reduce their available time and opportunities to work. Within the context of Peru, there is also evidence on the impact of Juntos on the time use of female cash recipients. For instance, Fernández and Saldarriaga (2014) show that mothers reduce their hours of labor supply in the week following the pay date of Juntos. Similarly, Cookson (2016) reports that fulfilling the Juntos program conditions adds to the workload of beneficiary women, involving time spent attending services, seeking care, and collecting the cash transfer. The household survey in Round 5 suggests that on average, mothers spend more than 50 minutes and pay 5.3 soles on traveling from their house to the Juntos center to receive the money.

To gain further insight into the extensive margin of mothers' working behaviors, the household survey includes questions that capture the second and third most important jobs or occupations in terms of time spent.[42] This allows an examination of

before the intervention took place.

[42]The survey includes questions about daily hours spent on various activities, where respondents rank their top three activities based on time spent in the last 12 months. Although there is no specific information regarding the time mothers spend on household chores or fulfilling homemaking roles, the data reveals that working mothers, prioritizing *work* as their first activity, allocate an average of 7.12 hours to it. For those who prioritize *work* as their second most important activity, they dedicate an average of 5.39 hours, and for those who rank *work* as their third most important activity, they allocate an average of 5.20 hours.

the extensive margin of mothers' labor supply. A mother may prioritize household chores or being a housewife as their most important job in terms of time spent while still engaging in other work. Table 4.10 presents the estimate results.

Table 4.10: Effects on Maternal Working Behaviors

	Household chores/ Housewife	**Self-employment/ Wage-employment**	**Other working activities**
	(1)	(2)	(3)
Panel A. First stage (β)	0.296	0.306	0.295
	(0.064)	(0.062)	(0.064)
Robust p-value	0.000	0.000	0.000
Panel B. LATE (τ_{FRD})	0.313	0.108	-0.163
	(0.212)	(0.237)	(0.282)
Robust p-value	0.252	0.415	0.492
District FEs	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.242	0.313	0.431
Observations	388	340	394

Note: The specifications in all columns replicate the specification in Table 4.4's Column (2) by replacing the dependent variable by variables representing jobs/occupations. *Household chores/Housewife* equals 1 if a mother selects household chores or being housewife as their job, and 0 otherwise. *Self-employment/Wage employment* equals 1 if a mother selects self-employment in agriculture, animal husbandry, fishing, forestry, manufacturing, and services, or regular salaried or wage employment as their job, and 0 otherwise. *Other working activities* equals 1 if a mother selects jobs with nonsalaried, irregular, or unstable incomes or part-time work as their job, and 0 otherwise. Controls include the age of mothers, a dummy variable for their education (equals 1 if the level is less than secondary school and 0 otherwise), dummy variables indicating whether they live with a partner, whether they have a health long-term issue, whether they live in urban areas, whether they have a job/occupation related to agriculture, animal husbandry, fishing and forestry in 2006, and household size. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Generally, in terms of the extensive margin, there is no significant evidence of Juntos' impacts on unemployment or labor supply of mothers in beneficiary households. This finding is consistent with previous studies on the relationship between cash transfers and labor supply in developing countries, such as: Alzúa et al. (2013), Banerjee et al. (2017), and Bosch and Schady (2019). One possible explanation might be due to the low level of transfer. In Peru, the cash transfer amount per month is 100 soles which accounts for 10% of the minimum wage and less than one third of the national poverty line (352 soles per capita per month).[43]

In summary, while the Juntos program may not directly influence mothers' employment status, it does lead to a shift in their time allocation towards domestic activities at the expense of regular income-generating pursuits. This shift suggests that the program reinforces traditional gender roles among women. This alteration in maternal roles has the potential to impact children's gender role attitudes, as

[43]In Table 4A.12 in Appendix 4A, I investigate the impact of the Juntos program on paternal working behaviors, considering both time prioritization and extensive margin. The findings indicate that the cash transfer program has no significant effect on paternal working behaviors.

mothers play a pivotal role in shaping their children's perceptions of gender. Moreover, a recent study by Díaz and Saldarriaga (2022) reports no evidence on the impact of Juntos on changes in women's empowerment or male partners' responses to women's empowerment.[44] Therefore, children's exposure to their mothers' traditional gender roles may explain the observed traditional gender role attitudes in this study.[45]

4.8 Conclusion

This study examines the influence of CCT programs on the gender role attitudes of children in beneficiary households, focusing on the context of the Juntos program in Peru. To the best of my knowledge, this research represents the first of its kind in this specific avenue of study. The findings presented in this chapter provide valuable insights into the relationship between social protection programs and gender norms, particularly in the developing country setting.

The key takeaway from this study is that the Juntos program leads to the development of more traditional gender role attitudes. When breaking down the gender attitude index into three sub-indices, it becomes evident that the most pronounced effect occurs in the power dimension, which captures the relative power dynamics between girls and women compared to boys and men.

Furthermore, I explore the connection between attitudes and behaviors by utilizing detailed data on children's daily activities. The findings emphasize an alignment between children's attitudes and behaviors, particularly among female beneficiaries. Furthermore, the study examines the impact of the Juntos program on reading and math test scores, revealing that beneficiary girls demonstrate lower accuracy rates in both tests. These results suggest that the decline in achievement test scores among girls is in line with a significant increase in the time they allocate to caregiving and non-paid work.

To elucidate the mechanisms driving these results, I investigate the impact of the Juntos program on mothers' time priority. The findings indicate that beneficiary mothers are more inclined to prioritize their time for household chores and

[44] Using data from the Peruvian DHS from 2000 to 2015, Díaz and Saldarriaga (2022) do not find any statistically significant effects of Juntos on several dimensions of women's empowerment, including: decision-making autonomy, justification of (tolerance to) wife beatings, and working for payment, or their male partners' responses to marital control, and emotional support.

[45] In Table 4A.13 in Appendix 4A, I present a robustness check for the impact of Juntos on maternal time priority and working behaviors. This analysis uses an expanded sample of mothers. The estimates are derived from the regression of equations 4.3 and 4.4 with outcome variables in equation 4.4, including Household chores/Housewife, Self-employment/Wage employment, and Other working activities. Notably, the estimated coefficients maintain their signs and significance levels, consistent with those in Tables 4.9 and 4.10, affirming the reliability of the mechanism results.

traditional homemaking roles, while they are less likely to engage in paid work or self-employment. Furthermore, I delve into the extensive margin of mothers' working behaviors. In particular, I consider the possibility that a mother may prioritize household chores or homemaking as their primary time commitment while still participating in some form of employment. The results reveal no significant effect on mothers' unemployment or labor force participation. While Juntos does not appear to alter mothers' employment status, the shift towards more traditional gender roles in their time allocation could potentially serve as a pathway for reinforcing regressive gender role attitudes among children.

My findings carry significant implications regarding the connection between policies and gender norms in developing countries. Policies, especially those with the potential to alter gender specialization patterns within households, can influence gender norms of the next generation. However, their design plays a pivotal role. The unintended consequences on children's gender role attitudes resulting from shifts in mothers' roles within households challenge the reliance on mothers as tools for enhancing children's human capital. Therefore, policymakers should carefully consider policy design to prevent reinforcing gender stereotypes and promote progressive gender role attitudes among the youth, contributing to a more equitable society.

Appendix 4A: Additional Tables and Figures

Table 4A.1: Comparing Young Lives and DHS 2000: Sample Frame and Wealth Index Groups (using sample frame, wealth index groups (T1-T3), at national level, in %)

	T1 (Poorest)		T2 (Moderately poor)		T3 (Least poor)		Full sample	
Variables	**DHS**	**Young Lives**	**DHS**	**Young Lives**	**DHS**	**Young Lives**	**DHS**	**Young Lives**
Household assets								
Own fridge	0.0	0.4	5.0	5.0	42.0	38.3	15.5	14.5
Own radio	55.3	62.0	88.5	77.7	93.1	84.2	78.0	74.3
Own TV	8.3	14.3	58.0	57.7	94.3	91.9	52.0	53.8
Own car	0.4	0.0	2.5	1.9	14.9	8.6	5.8	3.5
Own phone	0.0	0.0	0.5	0.6	26.4	20.1	8.9	6.9
Type of cooking fuel:								
gas or electricity	1.2	0.4	11.9	16.3	62.6	72.6	24.8	29.5
Wealth index	0.0568	0.1010	0.2451	0.2970	0.6753	0.6753	0.3021	0.3541
Respondent characteristics								
Average age (years old)	27.6	26.6	27.1	27.3	27.9	27.3	27.5	27.1
Level of education								
None	16.8	17.4	6.6	9.7	1.9	0.5	8.8	9.4
Primary school	61.9	61.3	50.1	45.7	16.8	14.6	43.3	40.8
Secondary school	17.8	18.9	36.8	36.4	53.1	52.1	35.3	35.5
Higher	3.5	2.0	6.5	7.1	28.1	32.3	12.6	13.7
Marital status								
Single	5.5	11.4	7.2	7.3	10.2	9.4	7.5	9.5
Married	33.4	39.3	37.6	41.8	37.9	28.6	36.2	36.5
Living together	53.7	45.2	49.8	46.4	46.5	55.4	50.1	49.0
Child characteristics								
Sex - male	52.8	46.4	49.1	52.6	52.7	49.3	51.6	49.3
Average birth weight (gram)	3142.4	3062.1	3122.3	3182.2	3295.9	3273.2	3187.2	3170.3
Stunting	31.4	38.8	25.7	28.7	6.2	11.4	21.3	26.5
Underweight	12.3	17.0	9.4	12.9	2.6	3.5	8.2	11.2

Note: Source: Young Lives and INEI 2001b. This table is adapted from the Appendix 5 of Escobal and Flores (2008). The wealth index is a composite measure evaluating whether households can access to services such as water and sanitation, possess consumer durables like refrigerators, and the quality of materials used for floors, roofs, and walls in their dwelling. The wealth index is characterized by a continuous scale representing household wealth, where higher values indicate greater levels of wealth. To classify the sites into categories of the poorest, moderate poor, and least poor, arbitrary thresholds of 0.2 and 0.4 are implemented on the wealth index. All other variables, except average age and average birth weight, are measured as percentages at the national level.

Table 4A.2: Comparing Poverty Scores/IFH Index: Young Lives vs. ENAHO

Department/Cluster	Young Lives	ENAHO
Panel A: Former method (YL 2002 & ENAHO 2004)	**Poverty score**	**Poverty score**
Tumbes	0.146	0.236
Piura	0.535	0.535
Amazonas	0.688	0.661
San Martin	0.389	0.220
Cajamarca	0.192	0.520
La Libertad	0.148	0.229
Ancash	0.448	0.433
Huanco	0.752	0.687
Lima	0.076	0.148
Junin	0.495	0.470
Ayacucho	0.707	0.636
Apurimac	0.708	0.711
Arequipa	0.238	0.237
Puno	0.119	0.316
Correlation		*0.875*
Panel B: Current method (YL 2009 & ENAHO 2009)	**IFH index**	**IFH index**
2	48.843	38.436
3	43.580	43.774
4	37.100	43.407
5	47.224	41.550
6	63.971	47.218
7	48.173	42.124
8	51.190	57.150
9	62.292	52.540
10	61.840	52.476
11	50.328	46.900
12	33.466	43.847
13	48.030	43.601
15	56.667	56.476
Correlation		*0.562*

Note: The table presents the comparison of the poverty score and IHF index between Young Lives data and ENAHO data. The value range of the poverty score in the former method is between 0 and 1, while the corresponding value of the IFH index is between 0 and 100.

Table 4A.3: Effects on Time Use in Daily Activities

	Caring	**Domestic Tasks**	**Paid work**	**Non-paid work**	**Leisure**
	(1)	(2)	(3)	(4)	(5)
Panel A: Girls					
LATE (τ_{FRD})	1.614	0.418	0.072	1.141	-1.628
	(0.701)	(0.877)	(0.114)	(0.518)	(1.003)
Robust p-value	0.031	0.788	0.500	0.044	0.179
Control Group Mean (optimal BW)	0.738	1.194	0.035	0.169	3.640
Observations	204	290	208	244	234
Panel B: Boys					
LATE (τ_{FRD})	-0.289	-0.151	-0.686	0.053	-2.734
	(0.647)	(0.630)	(0.815)	(1.223)	(2.394)
Robust p-value	0.811	0.681	0.426	0.780	0.265
Control Group Mean (optimal BW)	0.476	1.029	0.317	0.362	3.721
Observations	262	274	277	240	271
District FEs	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Note: All specifications replicate the specification in Table 4.4's Column (2) by replacing the dependent variable by variables representing time use in daily activities in Round 5. Time use is measured in hours during a typical day (not weekends, holidays or national holidays). *Caring* (time) indicates time that children spend on caring for others (younger siblings, ill household members). *Domestic tasks* (time) denote time that children spend on domestic tasks and chores (fetching water, firewood, cleaning, cooking, washing, shopping, etc.). *Paid work* (time) indicates time that children spend on activities for pay/sale outside of household or for someone not in the household. *Non-paid work* (time) denotes time that children spend on tasks on family farm, cattle herding, other family business, shepherding, piecework or handicrafts done at home. *Leisure* (time) indicates time that children spend on playing or general leisure (including time taken to eating, drinking and bathing). Several control variables are included in the analysis, such as dummy variables indicating whether the child is the first-born in the household, the presence of male and female siblings, the presence of younger sibling(s) aged below 6 years and/or the existence of elderly family members or family members with long-term health issues, and the household size. In all columns, I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.4: Effects on Time Use in Daily Activities, other activities

	Study time	**School time**	**Sleeping time**
	(1)	(2)	(3)
Panel A: Girls			
LATE (τ_{FRD})	-1.022	-1.633	0.184
	(0.674)	(1.343)	(1.267)
Robust p-value	0.169	0.210	0.958
Control Group Mean (optimal BW)	2.173	6.808	8.642
Observations	279	237	222
Panel B: Boys			
LATE (τ_{FRD})	1.137	0.139	-0.257
	(0.947)	(3.329)	(1.442)
Robust p-value	0.317	0.957	0.969
Control Group Mean (optimal BW)	1.758	6.747	8.725
Observations	252	245	215
District FEs	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Note: All specifications replicate the specification in Table 4.4's Column (2) by replacing the dependent variable by variables representing time use in daily activities in Round 5. Time use is measured in hours during a typical day (not weekends, holidays or national holidays). *Study time* indicates time that children spend on studying outside of school time (at home, extra tuition). *School time* denote time that children spend at school (including travelling time to school and play time at school). *Sleeping time* indicates time that children spend on sleeping. Several control variables are included in the analysis, such as dummy variables indicating whether the child is the first-born in the household, the presence of male and female siblings, the presence of younger sibling(s) aged below 6 years and/or the existence of elderly family members or family members with long-term health issues, and the household size. In all columns, I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.5: Effects on Test Scores

	Girls		**Boys**	
	Reading Test	**Maths Test**	**Reading Test**	**Maths Test**
	(1)	(2)	(3)	(4)
Panel A. First stage (β)	0.253	0.258	0.193	0.195
	(0.082)	(0.079)	(0.083)	(0.080)
Robust p-value	0.018	0.007	0.066	0.065
Panel B. LATE (τ_{FRD})	-0.255	-0.296	0.372	0.276
	(0.098)	(0.138)	(0.242)	(0.246)
Robust p-value	0.009	0.048	0.127	0.235
District FEs	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.637	0.329	0.625	0.375
Observations	251	208	304	323

Note: All specifications replicate the specification in Table 4.4's Column (2) by replacing the dependent variable by reading test scores and maths test scores. Several control variables are included in the analysis, such as the age of mothers (years) in 2002, dummy variables for mother education, location (urban), and child's religion. In all columns, I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.6: Effects on Test Scores, Round 4 Robustness

	Girls		**Boys**	
	Reading Test	**Maths Test**	**Reading Test**	**Maths Test**
	(1)	(2)	(3)	(4)
Panel A. First stage (β)	0.261	0.260	0.245	0.235
	(0.089)	(0.095)	(0.105)	(0.089)
Robust p-value	0.016	0.013	0.043	0.027
Panel B. LATE (τ_{FRD})	-0.325	-0.368	-0.135	0.155
	(0.157)	(0.206)	(0.128)	(0.224)
Robust p-value	0.068	0.096	0.299	0.544
District FEs	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.553	0.481	0.559	0.503
Observations	229	222	200	255

Note: All specifications replicate the specification in Table 4.4's Column (2) by replacing the dependent variable by reading test scores and maths test scores. Several control variables are included in the analysis, such as the age of mothers (years) in 2002, dummy variables for mother education, location (urban), and child's religion. In all columns, I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.7: Covariate Discontinuity Test Around the Threshold (Expanded Sample)

Variable	MSE-Optimal Bandwidth	RD Estimator	Robust Inference p-value	Robust Inference Conf. Int.	Eff.Number Observations
Child characteristics					
Female	0.160	-0.362	0.106	[-0.929, 0.089]	883
BMI-for-age z-score	0.156	-0.553	0.374	[-2.178, 0.819]	869
Weight-for-age z-score	0.160	-0.879	0.179	[-2.384, 0.444]	881
Height-for-age z-score	0.180	-0.639	0.439	[-2.309, 1.001]	952
Age of child (months, 2002)	0.156	-0.433	0.938	[-4.838, 5.236]	868
Polio vaccination (Yes=1)	0.163	0.087	0.235	[-0.090, 0.367]	892
BCG Vaccination	0.164	0.026	0.651	[-0.131, 0.209]	900
Measles vaccination	0.114	0.229	0.273	[-0.380, 1.346]	668
Health long term issues (Yes=1, 2002)	0.180	0.276	0.170	[-0.142, 0.808]	957
Mestizo (Yes = 1)	0.171	0.137	0.280	[-0.147, 0.506]	934
Catholic (Yes =1)	0.153	-0.028	0.848	[-0.295, 0.359]	861
Household characteristics					
Age of mom (years, 2002)	0.156	-4.982	0.159	[-13.277, 2.166]	862
Household size (members, in 2002)	0.189	-0.073	0.908	[-2.615, 2.323]	991
Mother education (<secondary school = 1)	0.161	0.011	0.728	[-0.808, 0.565]	884
Caregiver's gender preference for the child (Male=1)	0.162	0.406	0.135	[-0.147, 1.088]	887

Note: This table presents the LATE estimates when I replace the dependent variable in equation 4.4 by the characteristics of interest. The estimates are obtained by utilizing the MSE optimal bandwidth, triangular weights and linear local polynomial. The p-values and 95% confidence intervals reported are constructed using robust bias correction and clustering at the district level.

Table 4A.8: Effects on Gender Role Attitudes and Test Scores in Expanded Sub-samples of Boys and Girls, Robustness

	Gender Attitude Index		**Reading Test**		**Maths Test**	
	Girls	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. First stage (β_1)	0.350	0.183	0.338	0.207	0.350	0.202
	(0.070)	(0.074)	(0.076)	(0.070)	(0.071)	(0.069)
Robust p-value	0.000	0.073	0.000	0.021	0.000	0.022
Panel B. LATE (τ_{FRD})	0.150	0.373	-0.146	0.078	-0.133	0.090
	(0.067)	(0.253)	(0.060)	(0.143)	(0.063)	(0.159)
Robust p-value	0.057	0.135	0.028	0.495	0.076	0.481
District Poverty Index	Yes	Yes	Yes	Yes	Yes	Yes
Department FEs	Yes	Yes	Yes	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.285	0.318	0.640	0.637	0.350	0.379
Observations	392	389	371	432	377	443

Note: Panel A presents estimates of equation 4.3, where the dependent variable is participation in the Juntos program. Panel B report the LATE estimate of participation in Juntos on outcome variables of interest, computed as the ratio of the ITT estimate to the first-stage coefficient. The ITT estimate is obtained through equation 4.4, where the dependent variables are gender attitude index in columns (1) and (2); reading test scores in columns (3) and (4), and maths testing scores in columns (5) and (6). The estimates are derived using MSE optimal bandwidths, triangular weights and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at the district level are shown in parentheses.

Table 4A.9: Effects on Time Use in Daily Activities in Expanded Sub-samples of Boys and Girls, Robustness

	Caring	**Domestic Tasks**	**Paid work**	**Non-paid work**	**Leisure**
	(1)	(2)	(3)	(4)	(5)
Panel A: Girls					
LATE (τ_{FRD})	1.745	0.253	0.038	0.755	-2.100
	(0.558)	(0.495)	(0.071)	(0.376)	(0.855)
Robust p-value	0.003	0.621	0.570	0.053	0.021
Control Group Mean (optimal BW)	0.837	1.184	0.013	0.148	3.675
Observations	238	364	312	348	446
Panel B: Boys					
LATE (τ_{FRD})	0.145	0.226	-0.290	0.279	-2.340
	(0.583)	(0.626)	(0.412)	(0.829)	(1.631)
Robust p-value	0.664	0.821	0.446	0.767	0.166
Control Group Mean (optimal BW)	0.500	1.014	0.223	0.419	4.094
Observations	352	464	460	401	395
District Poverty Index	Yes	Yes	Yes	Yes	Yes
Department FEs	Yes	Yes	Yes	Yes	Yes

Note: All specifications replicate the specification in Table 4.8's Column (2) by replacing the dependent variable by variables representing time use in daily activities in Round 5. Time use is measured in hours during a typical day (not weekends, holidays or national holidays). *Caring* (time) indicates time that children spend on caring for others (younger siblings, ill household members). *Domestic tasks* (time) denote time that children spend on domestic tasks and chores (fetching water, firewood, cleaning, cooking, washing, shopping, etc.). *Paid work* (time) indicates time that children spend on activities for pay/sale outside of household or for someone not in the household. *Non-paid work* (time) denotes time that children spend on tasks on family farm, cattle herding, other family business, shepherding, piecework or handicrafts done at home. *Leisure* (time) indicates time that children spend on playing or general leisure (including time taken to eating ,drinking and bathing). Several control variables are included in the analysis, such as dummy variables indicating whether the child is the first-born in the household, the presence of male and female siblings, the presence of younger sibling(s) aged below 6 years and/or the existence of elderly family members or family members with long-term health issues, and the household size. In all columns, I employ a two-stage approach, as detailed in Table 4.4, to include control variables in the non-parametric estimation. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.10: Effects on Gender Role Attitudes (different measures), Robustness

	Weighted Gender attitude index		Polychoric PCA Gender attitude index	
	(1)	(2)	(3)	(4)
Panel A. First stage (β)	0.217	0.209	0.230	0.224
	(0.067)	(0.067)	(0.059)	(0.059)
Robust p-value	0.007	0.001	0.001	0.001
Panel B. LATE (τ_{FRD})	1.263	1.271	1.011	0.966
	(0.586)	(0.578)	(0.466)	(0.464)
Robust p-value	0.076	0.064	0.066	0.054
District FEs	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
Control Group Mean (optimal BW)	0	0	0	0
(SD)	(1)	(1)	(1)	(1)
Observations	525	520	672	646

Note: The dependent variable in columns (1) and (2) is the weighted gender attitude index constructed as in Anderson (2008). In columns (3) and (4), following the method of Kolenikov and Angeles (2009), I conduct the polychoric principle component analysis (PCA) using the twelve Likert rating scale variables and use the resulting first component as an index for gender role attitudes. The estimates are obtained using MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.11: Placebo Cutoffs

Alternative cutoffs (1)	**RD Estimates** (2)	***p*-value** (3)	**CI 95%** (4)	**Bandwidth** (5)	**Obs Left** (6)	**Obs Right** (7)
-0.15	-0.357	0.635	[-1.815, 2.977]	0.064	69	76
-0.10	-0.001	0.977	[-0.818, 0.843]	0.038	42	59
-0.05	-0.635	0.899	[-3.625, 4.129]	0.067	85	69
0	0.278	0.033	[0.022, 0.535]	0.120	155	372
0.05	-1.247	0.690	[-6.327, 4.185]	0.015	49	58
0.10	-1.395	0.479	[-4.387, 2.060]	0.025	77	61
0.15	1.143	0.998	[-7.204, 7.188]	0.033	67	38

Note: The dependent variable is the gender attitude index as defined in Table 4.4's columns (1) and (2). The LATE estimates are calculated at the zero threshold and across different placebo thresholds. For the artificial cutoffs below the true threshold in the first three rows, I use the sample with negative values of the running variable. The sample in the last 3 rows (with artificial cutoffs above the true threshold) is restricted to non-negative values of the running variable. Estimates are obtained through the utilization of a triangular kernel, a local linear polynomial, and a $\hat{h}_{MSE}$ optimal bandwidth. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Table 4A.12: Effects on Paternal Working Behaviors

	Time Priority		**Extensive Margin**	
	Self-employment/ Wage-employment	*Other working activities*	*Self-employment/ Wage-employment*	*Other working activities*
	(1)	(2)	(3)	(4)
Panel A. First stage (β)	0.279	0.279	0.279	0.279
	(0.062)	(0.062)	(0.062)	(0.062)
Robust p-value	0.000	0.000	0.000	0.000
Panel B. LATE (τ_{FRD})	-0.066	0.066	-0.066	0.066
	(0.220)	(0.220)	(0.220)	(0.220)
Robust p-value	0.671	0.671	0.671	0.671
District FEs	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.910	0.090	0.910	0.089
Observations	371	371	371	371

Note: This table presents the impact of the Juntos program on paternal working behaviors, considering both time priority and extensive margin. The specifications in all columns replicate the specification in Table 4.4's Column (2) by replacing the dependent variable by variables representing jobs/occupations. *Self-employment/Wage employment* equals 1 if a father selects self-employment in agriculture, animal husbandry, fishing, forestry, manufacturing, and services, or regular salaried or wage employment as the most important job in terms of time spent or as their job (extensive margin), and 0 otherwise. *Other working activities* equals 1 if a father selects jobs with nonsalaried, irregular, or unstable incomes or part-time work as the most important job in terms of time spent or as their job (extensive margin), and 0 otherwise. Controls include the age of fathers, a dummy variable for their education (equals 1 if the level is less than secondary school and 0 otherwise), dummy variables indicating whether they live with a partner, whether they have a health long-term issue, whether they have a job/occupation related to agriculture, animal husbandry, fishing and forestry in 2006, and household size. Standard errors clustered at district level are shown in parentheses.

Table 4A.13: Effects on Maternal Time Priority and Working Behaviors in the Expanded Sample of Mothers, Robustness

	Time Priority			Extensive Margin		
	Household chores/ Housewife	*Self-employment/ Wage-employment*	*Other working activities*	*Household chores/ Housewife*	*Self-employment/ Wage-employment*	*Other working activities*
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. First stage (β)	0.287	0.289	0.289	0.288	0.289	0.288
	(0.060)	(0.062)	(0.062)	(0.061)	(0.062)	(0.060)
Robust p-value	0.000	0.000	0.000	0.000	0.000	0.000
Panel B. LATE (τ_{FRD})	0.370	-0.343	-0.026	0.150	-0.172	0.117
	(0.150)	(0.177)	(0.166)	(0.148)	(0.171)	(0.125)
Robust p-value	0.006	0.036	0.866	0.234	0.250	0.524
District Poverty Score	Yes	Yes	Yes	Yes	Yes	Yes
Department FEs	Yes	Yes	Yes	Yes	Yes	Yes
Control Group Mean (optimal BW)	0.331	0.312	0.357	0.222	0.357	0.421
Observations	777	669	656	612	655	758

Note: Panel A presents estimates of equation 4.3, where the dependent variable is participation in the Juntos program. Panel B report the LATE estimate of participation in Juntos on outcome variables of interest, computed as the ratio of the ITT estimate to the first-stage coefficient. The ITT estimate is obtained through equation 4.4, where the dependent variables are *Household chores/Housewife* in columns (1) and (4); *Self-employment/Wage employment* in columns (2) and (5), and *Other working activities* in columns (3) and (6). *Household chores/-Housewife* equals 1 if a mother selects household chores or being housewife as the most important job in terms of time spent in column (1)/in terms of employment status in column (4), and 0 otherwise. *Self-employment/Wage employment* equals 1 if a mother selects self-employment in agriculture, animal husbandry, fishing, forestry, manufacturing, and services, or regular salaried or wage employment as the most important job in terms of time spent in column (2)/in terms of employment status in column (5), and 0 otherwise. *Other working activities* equals 1 if a mother selects jobs with nonsalaried, irregular, or unstable incomes or part-time work as the most important job in terms of time spent in column (3)/in terms of employment status in column (6), and 0 otherwise. Controls include the age of mothers, a dummy variable for their education (equals 1 if the level is less than secondary school and 0 otherwise), dummy variables indicating whether they live with a partner, whether they have a health long-term issue, whether they have a job/occupation related to agriculture, animal husbandry, fishing and forestry in 2006, and household size. The estimates are obtained by utilizing MSE optimal bandwidths and linear local polynomial. The robust p-values reported are constructed using robust bias correction. Standard errors clustered at district level are shown in parentheses.

Figure 4A.1: Distribution of Gender Attitude Index

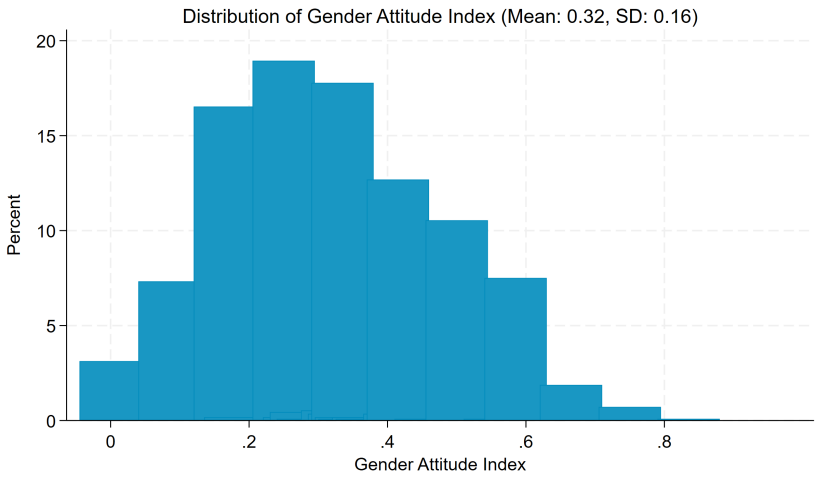


Figure 4A.2: Comparison of Young Lives study's Question with World Value Surveys in Peru and other Latin American Countries

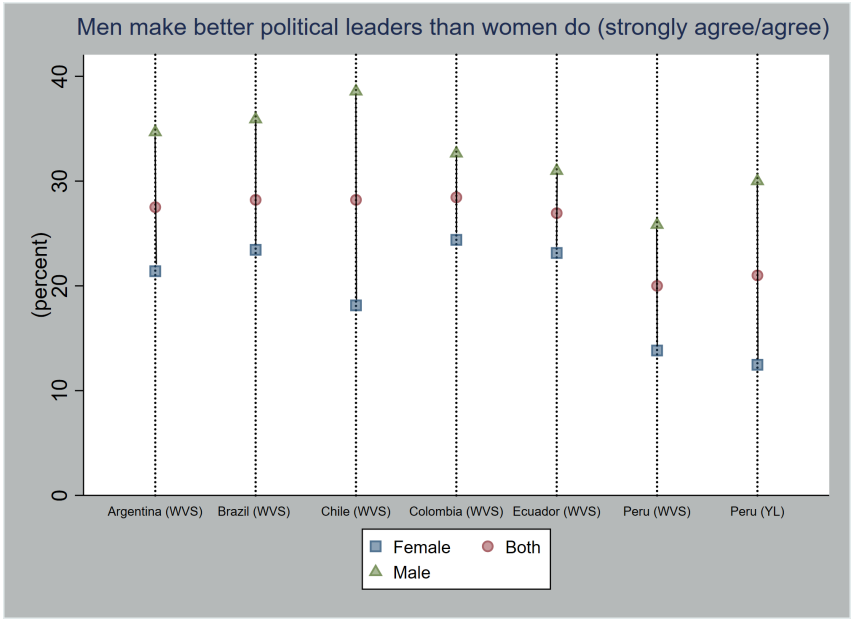
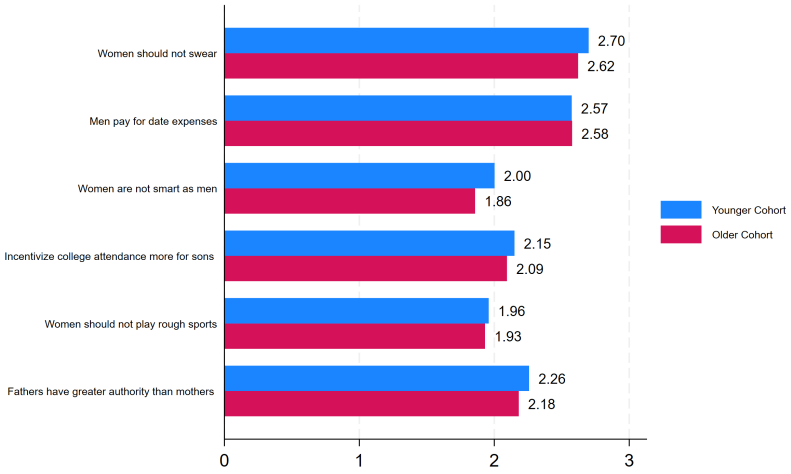


Figure 4A.3: Comparison of Younger Cohort and Older Cohort in Round 5 - Young Lives (1: Strongly Disagree - 4: Strongly Agree)

(a) Item 1 to 6 (mean)



(b) Item 7 to 12 (mean)

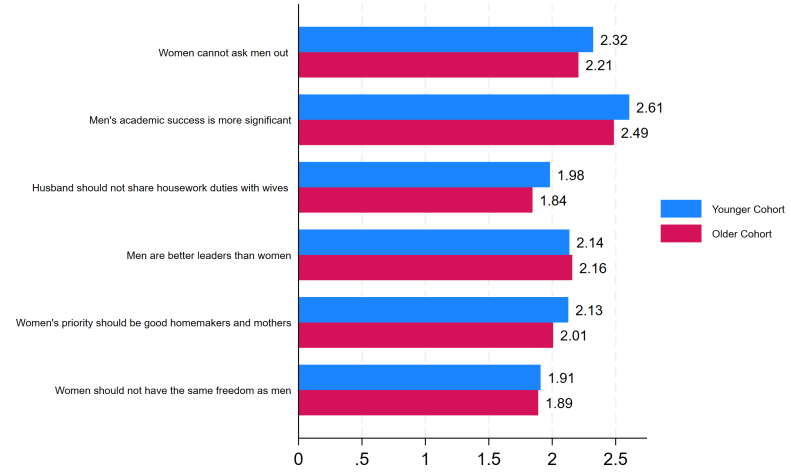
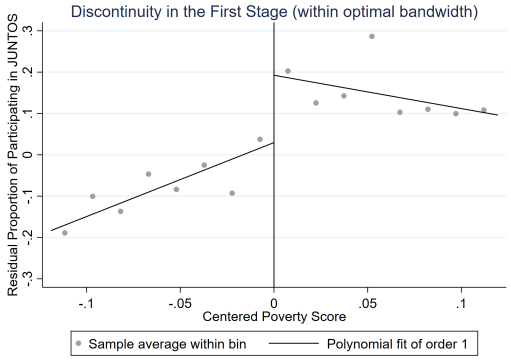


Figure 4A.4: First Stage and Intention-to-Treat of Gender Attitude Index

(a) First Stage



(b) Intention-to-Treat (Gender Attitude Index)

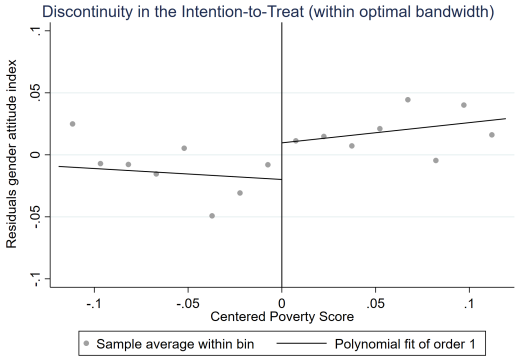
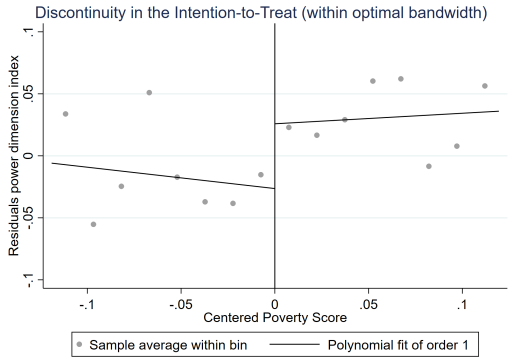
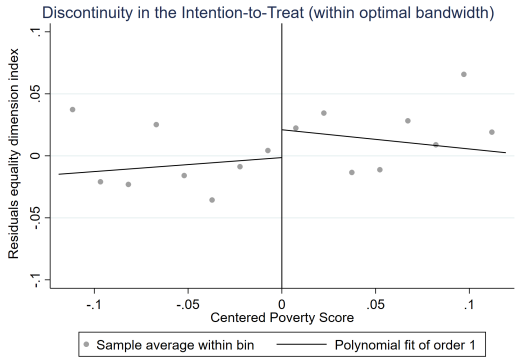


Figure 4A.5: Intention-to-Treat of Power Dimension, Equality Dimension and Behavior Dimension

(a) Intention-to-Treat (Power Dimension)



(b) Intention-to-Treat (Equality Dimension)



(c) Intention-to-Treat (Equality Dimension)

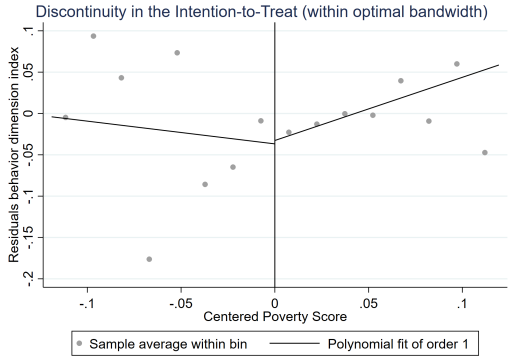
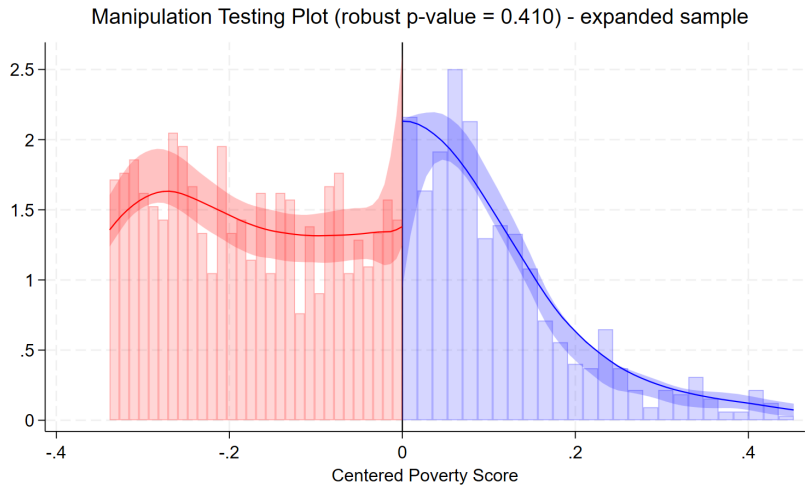


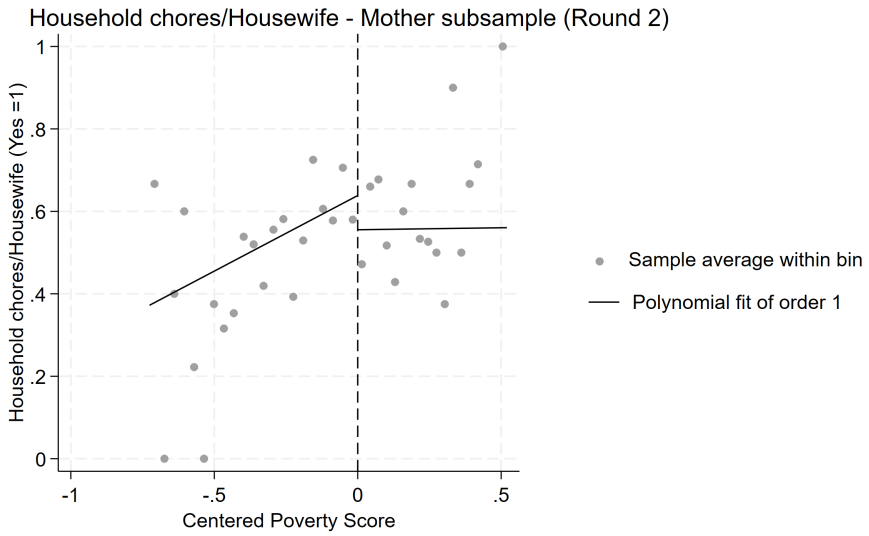
Figure 4A.6: Manipulation Testing Plot (Expanded Sample)



Note: This graph presents the manipulation test based on density discontinuity following Cattaneo et al. (2018). The observations situated to the right of the vertical line are considered eligible for Juntos.

Figure 4A.7: Discontinuity Test of Maternal Time Priority Around the Threshold in Round 2

(a) Household chores/Housewife (Robust p-value: 0.137)



(b) Self-employment/Wage employment (Robust p-value: 0.229)

Appendix 4B: Details on Constructing the Household Poverty Score

Appendix 4B.1: Household Poverty Score (2005-2011)

From 2005 to 2011, the Peruvian government conducted logistic regression analysis using household data sourced from the National Household Survey, specifically covering the period between 2001 and 2004:

$$Y = \alpha + \beta X + \mu \tag{4.5}$$

where $Y = 1$ if the household was consider as poor, and $Y = 0$ if the household was not poor. α is the constant, μ is the error term. X are explanatory variables including: analf_m, edu_men, combust0, no_equip, serv3, tipom2, tipom3, tipom4.

Below is the result of the regression:

Table 4B.1: Result of the Logistic Regression

Variable	Coefficient
analf_m	1.1832 [12.66]***
edu_men	0.2276 [5.13]***
combust0	-0.7624 [12.84]***
no_equip	0.4446 [27.40]***
serv3	-0.3769 [3.23]***
tipom2	-0.2593 [5.55]***
tipom3	-0.8584 [14.86]***
tipom4	-1.3172 [17.53]***
Constant	-1.3461 [12.48]***

The steps involved in producing the household poverty score are as follows:

1. Identifying the variables in the equation:

   The dummy variables tipom2, tipom3, and tipom4 correspond to housing type groups 2, 3, and 4, respectively, which result from distinct combinations of

Table 4B.2: List of Variables Used to Construct Household Poverty Score

Variable	Definition
Total illiterate female adults	The sum of all female adults (over 18 years of age) in the household who do not know how to read and write
Total adults	The sum of all household members aged over 18
Total minors in school	The sum of all minors (below the age of 18) in the household who currently attends a regular educational center or program
Total minors	The sum of all minors (below the age of 18) in the household
analf_m	The ratio between total illiterate female adults and total adults
edu_men	The ratio between total minors in school and total minors
combust0	Equals 1 if the primary fuel used for cooking in the household is of industrial origin (gas, electricity, kerosene), and 0 otherwise.
no_equip	The quantity of equipment unavailable within a household. The value ranges from 1 to 7, corresponding to the following appliances: black and white television, color television, refrigerator, electric iron, gas stove, motorized vehicle, and pedal-powered vehicle
serv3	The value ranges from 1 to 3, depending on whether the household has access to electricity connected to the grid, public network water supply, and sanitary toilet facilities.

wall, roof, and floor materials. From an initial pool of 294 material combinations, 22 selections (91.1%) were chosen and organized into the subsequent variables:

Table 4B.3: Housing Type Groups

Variable	Type	Wall material	Roof material	Floor material
Group 1	102	Adobe	Tiles	Land
	126	Adobe	Straw	Land
	294	Mat	Straw	Land
	210	Stone with mud	Straw	Land
	114	Adobe	Woven cane	Land
	168	Rushes covered with mud	Straw	Land
Group 2	108	Adobe	Calamine	Land
	150	Rushes covered with mud	Calamine	Land
	252	Wood	Straw	Land
	276	Mat	Calamine	Land
	113	Adobe	Woven cane	Concrete
	101	Adobe	Tiles	Concrete
	192	Stone with mud	Calamine	Land
Group 3	234	Wood	Calamine	Land
	107	Adobe	Calamine	Concrete
	250	Wood	Straw	Planks
	106	Adobe	Calamine	Planks
	24	Brick	Calamine	Land
Group 4	232	Wood	Calamine	Planks
	23	Brick	Calamine	Concrete
	5	Brick	Concrete	Concrete
	233	Wood	Calamine	Concrete

2. All the variables previously generated are multiplied by their corresponding coefficients obtained in the regression in Table 4B.1. The result signifies the probability that a household is poor. Considering that poverty in the rural area

stands at 65.9% in the household pool of 2001-2004, the threshold associated with that percentage is 0.7567447.

Appendix 4B.2: Household Poverty Score - IHF Index (2012 on-wards)

As described in Section 4.3, from 2012 and beyond, a new poverty score - *Indice de Focalizacion de Hogare (IFH index)* and 15 regional-specific thresholds were established following the integration of all social protection programs under MIDIS. The IFH index has a scale from 0 to 100, with higher scores indicating greater wealth. Below, I explain how the index is calculated.

Initially, the responsible entity utilized data from ENAHO 2009 to determine the collection of factors involved in the computation. They applied the Sommers test to assess the correlation between potential explanatory variables and a poverty measurement. Subsequently, they chose significant variables and implemented a Principal Component analysis targeting discrete variables. The selected variables, which were statistically significant at the 10% level in the Sommers test, fall into five categories, including: household assets, education, housing characteristics, labor and social security characteristics. Finally, they calculated the weights of each component variable in the equation. The method was applied separately across three geographic zones: the Lima Province, other urban areas, and all rural areas.

The equation to calculate the IFH index is as follows:

$$IFH_{ij} = v_{j1}X_{i1j} + ... + v_{jp}X_{ipj} \tag{4.6}$$

where IFH_{ij} is the poverty score of household i in cluster j, X_{inj} is the nth selected variable in the computation in cluster j, v_{jn} is the corresponding weight of the variable X_{inj} in cluster j.

Table 4B.4 provides the list of selected variables and their corresponding weights in three geographic areas. Using those weights, I can calculate the raw index IFH_{ij} and then I standardize the index to obtain the standardized index. The value range of the standardize index is between 0 and 100 in each cluster. The formula to standardize the raw index is as follows:

$$IFH'_{ij} = 100 * \frac{IFH_{ij} - IFH_j^{\min}}{IFH_j^{\max} - IFH_j^{\min}} \tag{4.7}$$

where IFH'_{ij} is the standardized IFH of household i in cluster j, $IFH_j^{\min}$ and $IFH_j^{\max}$ are the minimum and the maximum values of the raw IFH index in cluster j, respectively.

Table 4B.4: Variables and Weights to Construct IFH Index

Variables	Metropolitan Lima	Remaining urban areas	Rural areas
Fuel used to cook			
Do not cook	-0.49	-0.67	-0.76
Other	-0.40	-0.50	-0.38
Firewood	-0.37	-0.33	0.05
Carbon	-0.33	-0.22	0.36
Kerosine	-0.29	-0.19	0.37
Gas	0.02	0.12	0.52
Electricity	0.43	0.69	0.52
Water supply in the home			
Other	-0.78	-0.58	
River	-0.65	-0.42	
Well	-0.62	-0.37	
Water tanker	-0.51	-0.34	
Pipe	-0.41	-0.32	
Outside	-0.35	-0.25	
Inside	0.10	0.12	
Wall material			
Other	-0.70	-0.80	
Wood or mat	-0.48	-0.55	
Stone with mud	-0.44	-0.46	
Rushes covered with mud	-0.41	-0.43	
Clay	-0.39	-0.38	
Sun-dried brick or adobe	-0.37	-0.20	
Stones, lime or concrete	-0.33	-0.07	
Brick	0.10	0.25	
Type of drainage			
None	-0.89	-0.68	
River	-0.75	-0.49	
Sinkhole	-0.59	-0.40	
Septic tank	-0.46	-0.30	
Drainage system outside the house	-0.39	-0.21	
Drainage system inside the house	0.10	0.20	
Number of members with health insurance			
None	-0.26	-0.25	-0.10
One	-0.04	0.06	0.50

Two	0.06	0.17	0.59
Three	0.14	0.27	0.66
More than three	0.32	0.48	0.86
Goods that identify household wealth			
None	-0.47	-0.35	-0.11
One	-0.17	0.05	0.64
Three	0.15	0.40	0.90
Four	0.25	0.52	1.09
Five	0.47	0.75	1.09
Has fixed phone			
Yes	-0.32		
No	0.20		
Roof material			
Other	-0.86	-0.90	
Straw	-0.74	-0.72	
Mat	-0.67	-0.62	
Woven cane	-0.38	-0.23	
Tiles	-0.23	0.03	
Wood or mat	-0.21	0.07	
Concrete	0.17	0.32	
Education of the Household head			
None	-0.51	-0.57	-0.59
Preschool	-0.43	-0.25	-0.08
Primary	-0.28	0.01	0.35
Secondary	-0.06	0.19	0.59
Vocational education (VET)	0.10	0.33	0.68
Undergraduate	0.22	0.55	0.88
Postgraduate	0.40	0.55	0.88
Floor material			
Other	-0.97	-1.12	
Land	-0.60	-0.47	
Concrete	-0.16	-0.01	
Wood	0.08	0.30	
Tiles	0.16	0.40	
Vinyl sheets	0.28	0.51	
Parquet	0.51	0.71	
Overcrowding			
More than six	-0.68		
Between four and six	-0.51		

Between two and four	-0.31	
Between one and two	-0.07	
Less than one	0.24	
Highest level of education in the house		
None		-0.35
Primary		0.11
Secondary		0.41
Vocational education (VET)		0.62
Undergraduate		0.83
Electricity		
No		-0.29
Yes		0.22
Floor made of earth		
Yes		-0.17
No		0.47

Note: Taken from SISFOH (2010).

To determine whether a household is eligible, there are specific cluster thresholds. The households that have an index below or equal to the threshold are eligible for the Juntos program. Table 4B.5 present the cluster-thresholds. The 15 clusters were obtained by combining areas with similar monetary poverty in 2009. Generally, each of these clusters comprises multiple geographically distinct areas that are not connected to each other.

Table 4B.5: Eligibility Thresholds by Cluster

Cluster	Threshold	Population	Per capita income (soles)	Per capita spending (soles)	Poverty status
1	33	208,101	2,184	1,815	0.5159
2	36	1,907,122	2,116	1,697	0.5994
3	34	2,284,876	2,332	1,937	0.5404
4	38	2,646,680	2,282	1,916	0.5389
5	35	634,472	2,067	1,595	0.6410
6	34	212,723	5,941	4,045	0.2606
7	52	2,544,448	5,141	4,260	0.2565
8	42	2,134,993	5,667	4,428	0.2397
9	44	3,740,611	6,403	5,050	0.1352
10	50	2,229,638	5,997	4,673	0.1620
11	44	490,207	5,498	4,015	0.2725
12	43	101,993	8,632	4,638	0.1645
13	43	1,636,740	5,045	4,024	0.2116
14	33	93,527	8,961	6,178	0.0261
15	55	9,342,700	8,712	6,612	0.1546
Peru	-	30,208,831	5,793	4,501	0.2764

Note: Taken from SISFOH (2010).

Appendix 4C: Variables Description

In this appendix, I provide further details on the list of items used to measure gender role attitudes (taken from Round 5 of the Child Survey).

Gender role attitudes. Indicate whether a child: Strongly disagree, disagree, agree, or strongly agree about each statement.

(i) Swearing is worse for a girl than for a boy.

(ii) On a date, the boy should be expected to pay all expenses.

(iii) On the average, girls are as smart as boys.

(iv) More encouragement in a family should be given to sons than daughters to go to college.

(v) It is all right for a girl to want to play rough sports like football.

(vi) In general, the father should have greater authority than the mother in making family decisions.

(vii) It is all right for a girl to ask a boy out on a date.

(viii) It is more important for boys than girls to do well in school.

(ix) If both husband and wife have jobs, the husband should do a share of the housework such as washing dishes and doing the laundry.

(x) Boys are better leaders than girls.

(xi) Girls should be more concerned with becoming good wives and mothers than desiring a professional or business career.

(xii) Girls should have the same freedoms as boys.

Appendix 4D: Household Agreement with Juntos

Figure 4D.1: Affiliated Household and Juntos Program Agreement Form (Adapted from Appendix E, Pages 77-78, Huerta and Stampini (2018))

Acuerdo de Compromiso

El/La representante del hogar

Señor / Señora

DNI n° N° Celular

Dirección

Comunidad / Centro Poblado

Distrito

Provincia

Departamento

Y el PROGRAMA NACIONAL DE APOYO DIRECTO A LOS MÁS POBRES-JUNTOS, debidamente representado por su Jefe(a) de Unidad Territorial acuerdan asumir lo siguiente:

Representante del Hogar:
- Se compromete a participar en el Programa JUNTOS, y aceptar y cumplir las Condiciones Generales que se explican en este documento.
- Se compromete a asegurar que las gestantes, los niños, niñas y jóvenes de 0 hasta 19 años que integran su hogar, asistan y hagan uso de los servicios de salud y educación, según su edad.
- Se compromete a comunicar al Programa Juntos, cualquier cambio que sucediera en la información de su hogar y sus miembros.

JUNTOS:
- Se compromete a realizar la transferencia del incentivo monetario al hogar que cumpla con sus compromisos en salud y educación, y tenga la información actualizada de su hogar y sus miembros que la componen.

El representante del hogar declara que antes de firmar este Acuerdo de Compromiso, un intérprete o trabajador del Programa JUNTOS le ha explicado las Condiciones Generales en su lengua materna.

Jefe (a) de Unidad Territorial
Programa Nacional de Apoyo Directo
a los más Pobres - JUNTOS

Representante de Hogar

DNI

Fecha / /

Huella Digital

CONDICIONES GENERALES

Conste por el presente documento, el **Acuerdo de Compromiso** entre el Programa Nacional de Apoyo Directo a los Más Pobres-JUNTOS (en adelante Programa JUNTOS); y el representante del hogar elegido (en adelante EL/LA TITULAR), quien manifiesta su decisión de participar de manera voluntaria del programa, contar con DNI y aceptar las condiciones que se detallan a continuación:

Miembro objetivo del hogar:
El hogar debe contar con al menos un miembro objetivo. Los miembros objetivos son:
Gestantes,
Niños, niñas, adolescentes y jóvenes hasta que culminen la educación secundaria o cumplan diecinueve (19) años, lo que ocurra primero.
* El hogar debe informar al programa sobre la presencia de gestante en el hogar así como sobre el nacimiento de una niña, el ingreso o salida de un miembro objetivo del hogar.

Corresponsabilidades:
El / la TITULAR, asume el compromiso de asegurar que todos los miembros objetivos del hogar, asistan obligatoriamente a los servicios de salud y educación:
La gestante, debe asistir a todos los controles pre-natales, según como lo indica las normas del sector salud.
La gestante menor de 19 años, que no haya culminado la educación secundaria o primaria, debe además asistir a una Institución Educativa, para continuar educándose.
Los niños y niñas de 0 a 3 años, deben ser llevados a sus controles de Crecimiento y Desarrollo en el establecimiento de salud.
Los niños y niñas de 3 a 5 años, deben asistir a una institución educativa de nivel inicial o Programa No Escolarizado de Nivel Inicial (PRONOEI).
Los niños y niñas de 6 años hasta los 19 años de edad, deben asistir a una Institución Educativa hasta que culminen la educación secundaria.
El /la TITULAR autoriza al Programa JUNTOS, para efectuar visitas a su hogar y/o solicitar información a las instituciones públicas o privadas, para comprobar la información proporcionada por el hogar.

Transferencia del incentivo monetario
El incentivo monetario es un abono que recibe el /la titular al momento del ingreso al Programa por única vez y luego por cumplir las corresponsabilidades en salud y educación de todos los miembros objetivo del hogar. Este abono es de libre disponibilidad, por lo que no se exigirá a el/la TITULAR dar cuenta de ello.

Cuenta Bancaria para recibir el Incentivo Monetario
El/la TITULAR, autoriza al Programa JUNTOS a abrir una cuenta de ahorros a su nombre en una entidad financiera, para poder depositar el incentivo monetario y mantenerla hasta que el hogar se desafilie y presente saldo cero. **Todo titular tiene la obligación de mantener en reserva la clave secreta de su cuenta personal y no entregar a ninguna persona.** Así mismo, el/la titular autoriza a la entidad financiera a vigilar su cuenta de ahorros y/o revertir a favor del Programa Juntos, aquellas transferencias monetarias que hubiesen sido abonadas a su favor sin que le correspondiera.

Revaluación de la Clasificación Socioeconómica del Hogar
El Programa JUNTOS solicitará a la Unidad de Empadronamiento Local, la actualización o revaluación de la clasificación socioeconómica del Hogar Afiliado para comprobar su condición de pobreza, a fin de determinar su permanencia o articulación con otros programas sociales.
El Programa JUNTOS se reserva el derecho de dar por finalizado el presente acuerdo de compromiso con el/la TITULAR, en caso de que se verifique que el hogar ya no cumple con las condiciones y requisitos establecidos por el Programa.

Actualización de datos de hogar
El/la TITULAR, es responsable de comunicar inmediatamente al Gestor Local del Programa JUNTOS, a la plataforma de atención al usuario o línea 1880, cualquier información del hogar que haya cambiado, respecto de lo informado al momento de su afiliación. Esto incluye: 1. el hogar se trasladó a otro distrito o ya no reside en el mismo, 2. al menos, uno de sus miembros objetivo tiene alguna modificación en sus datos personales y/o cambió el lugar donde cumplirá su corresponsabilidad en salud o educación, 3.el titular del hogar falleció; 4.hubo un nacimiento reciente; 5. Hay una mujer gestante en el hogar; 6. El miembro objetivo deja de residir en el hogar.

Autorización al Programa:
El/la TITULAR, autoriza al Programa JUNTOS para que le envíen mensajes de texto y/o de voz a su celular relacionado a temas de salud, educación, nutrición, identidad, pagos y otros relacionados con el programa.

Servicio de Atención al Usuario:
El/la TITULAR, en caso tuviera alguna duda, consulta o queja sobre el Programa JUNTOS, puede comunicarse por teléfono a la **Línea** gratuita **18 80**. **También puede acudir al gestor Local de JUNTOS de su localidad, o la Unidad Territorial de JUNTOS de su Región o a las oficinas de Orienta MIDIS.**

5 Concluding Remarks

5.1 Summary of Key Findings and Policy Implications

The doctoral thesis investigates gender differences in various economic areas, particularly entrepreneurship, cancer research funding, and the factors shaping gender norms.

In Chapter 2, I report that an experimental business intervention following natural disasters has differential impacts on the performance of micro-enterprises owned by females and males. Despite the provision of equal opportunities and resources, gender gaps persist due to differences in business investment choices, rates of business closure, and household expenditure preferences. Additionally, the chapter provides evidence of the positive effects of business grants on the psychological recovery of entrepreneurs. Furthermore, there is suggestive evidence regarding the external validity of the main results in the context of the Covid-19 pandemic. This chapter holds significant policy implications for post-disaster business support. When gender gaps are reflective of preferences or comparative advantages between men and women, policy intervention may not be necessary as there is no welfare loss associated with these gaps (Shang, 2022). Instead, policymakers should consider interventions with a specific focus on female-owned enterprises to enhance their likelihood of survival.

Chapter 3 presents evidence highlighting the underfunding of female-dominated cancers in Europe. Additionally, we propose four potential mechanisms underlying these findings, including: (i) the overrepresentation of male cancer researchers, (ii) bias in funding allocation against female cancer researchers, (iii) a higher proportion of male evaluators favoring male-dominated cancers, and (iv) the increased prevalence of male-dominated cancers. The first three mechanisms primarily relate to unequal opportunities for female investigators, while the fourth mechanism is linked to inherent physiological disparities between men and women. Based on these findings, we recommend two potential solutions to address the unequal distribution of funding towards sex-dominated cancers. Firstly, there is a need to incentivize the increased representation of female cancer researchers across all levels. Secondly, funding organizations should consider forming evaluation panels with a higher proportion of female evaluators.

In Chapter 4, I investigate the impact of Juntos, the largest CCT program in Peru, on the gender role attitudes of beneficiary children. Employing data from the Young Lives Study and utilizing the fuzzy regression discontinuity design, I

present three key findings. Firstly, Juntos leads to more traditional attitudes among children. Secondly, children's behaviors align with these attitudes, particularly evident among beneficiary girls who allocate more time to caregiving and non-paid work. Thirdly, beneficiary girls exhibit poorer performance in reading and math tests, which is in line with their involvement in gender-specific activities. To examine the mechanisms behind these findings, I analyze how Juntos affects the time priority of beneficiary mothers. I find that they prioritize homemaking over wage labor or self-employment, although the program does not significantly impact their overall employment status. This chapter emphasizes the significant influence of policies on gender role attitudes within households. It also highlights the unintended consequences on the gender attitudes of beneficiary children. These findings question the reliance on mothers both as cash recipients and as household representatives to meet program requirements.

The first two studies of this doctoral thesis add to the existing literature on gender gaps in economic outcomes. Specifically, Chapter 2 expands the literature of gender differences in returns to business interventions by examining their implications in post-disaster contexts. In Chapter 3, to our knowledge, we present the first empirical evidence on the unequal distribution of cancer research funding, focusing on the sex-dominance in mortality of cancer types. The final study of the thesis contributes to the emerging literature on the interplay between policies and gender norms. To the best of my knowledge, this is the first evidence of such a connection in a developing context.

5.2 Future Research Directions

This doctoral thesis enhances our understanding of where gender gaps exist, their underlying mechanisms, and the factors that contribute to the formation of drivers of those gaps. However, as with any research, there remain several potential avenues for future inquiry that can deepen our understanding of gender gaps and their contributing factors.

Gender Differences in the Impact of Business Grants on Post-Disaster Microenterprise Performance: Future research could delve into the underlying reasons why female business owners opt to close their initial ventures subsequent to receiving business grants. Such investigation could yield further insights into the formulation of policies aimed at supporting female-owned enterprises in the aftermath of natural disasters. Additionally, it is imperative to assess the impact of business grants in diverse contexts, encompassing various countries and types of natural disasters, to gain a comprehensive understanding of the persistent gender disparities within these scenarios.

Funding Bias Against Female-dominated Cancers: While Chapter 3 provides valuable insights, it is important to acknowledge a notable limitation stemming from the absence of data regarding project applications. This limitation hinders a comprehensive analysis of the funding landscape related to female-dominated cancers. Efforts are currently underway to address this gap by soliciting relevant data from the European Research Council, aligning with one of our key objectives for future research. Moreover, the main results of the paper are derived from a standard regression model, which may be susceptible to selection bias. Therefore, a potential avenue for further investigation involves exploring the causal effect of male relative mortality on awarded funding. This line of inquiry could provide valuable insights into the underlying dynamics shaping funding allocation in this domain.

Unintended Consequences of CCT Programs on Gender Role Attitudes: Building on main findings from Chapter 4, future research could delve into the mechanisms behind the traditional gender role attitudes of beneficiary children. One promising area is to study the effect of CCT programs on the daily time activities of beneficiary parents. This avenue could provide more insights into how and why CCT programs shift mothers into conventional gender role activities. Moreover, it is also important to explore alternative explanations, such as the effect of teachers on students. Given that, according to program conditions, children spend more time at school, the perception of children regarding gender could potentially be impacted by their teachers' gender attitudes. Another promising area for future research is to study the long-term outcomes of beneficiary girls and boys in terms of university attendance, marriage age, and labor market outcomes as adults.

In conclusion, the field of gender economics has gained significant prominence in recent years, exemplified by Professor Claudia Goldin's Nobel Prize in Economic Sciences in 2023. Her groundbreaking research has provided invaluable insights into gender differences in the job market, highlighting the crucial role of gender economics within the broader field of economics. This doctoral thesis lays the groundwork for my future research endeavors, and I am committed to continuing my work in this field. My goal is to contribute to narrowing gender gaps and addressing gender inequalities, aligning with Goal 5 of the Sustainable Development Goals, which serve as a roadmap for creating a more equitable and sustainable future for everyone.

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