The Competitive Woman

Evolutionary Insights and Cross-Cultural Evidence into Finding the *Femina Economica*

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Abstract

We propose to explain the gender gap in competitiveness often found in economic experiments with a theoretical framework rooted in evolutionary psychology: Women evolved adaptations to trade off the motivation to acquire resources in competitive environments for effort dedicated to invest directly into offspring, to attract and retain mates, and to not alienate potential allies. Such a tradeoff does not appear binding with the same intensity for men. We offer some initial tests of this idea by conducting a series of experiments using cash and vouchers (in-kind payments dedicated to either children's needs, gender specific interests or gender neutral interests) to reward subjects at different life stages (parents and non-parents) from countries differing in economic development and culture (China, Togo, Sierra Leone, Bosnia and Colombia). Our main hypothesis is that the type of reward used in the experiment matters, as different types (cash or voucher) may induce specific frames which activate the motivation to compete in different domains of interest, with behavioral predictions that depend on an individual's sex and life stage (parent and non-parent). Consistent with this view, our results on parents from China, Togo, and Sierra Leone show that, once the incentives are switched from cash to child-benefitting, sex differences in competitiveness disappear. Data on non-parents from Bosnia show that, once cash is substituted by gender stereotypical vouchers (e.g. beauty supplies or sporting goods), gender differences substantially decrease. Importantly, economic and cultural elements matter, as not all societies exhibit a gender gap to start with (Colombia and Nana Benz of Togo).

These findings indicate that competitiveness in females can be just as intense as in males, once we include in the games what matters to women, with important implications for policies designed to promote gender equality based on the adoption of labor market incentives aligned with women' goals and respectful of the differential constraints that nature and societies put on the individual.

Keywords: Competitiveness; female competition; gender gap; evolutionary psychology; natural and sexual selection; policies to close the gap.

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1. Introduction

We propose a theoretical framework rooted in evolutionary psychology to explain the occurrence of the gender gap in competitiveness frequently found in economic experiments (Niederle and Vesterlund, 2011). Then, we offer an initial test of this idea through a series of experiments with women and men under different rewards (cash and vouchers) intended to induce motivation to compete in different spheres of interest during different life stages (parents and non-parents), from societies spanning a range of socio-economic and cultural backgrounds (China, Togo, Sierra Leone, Bosnia, and Colombia).

Our work builds upon evolutionary psychology cost-benefit analysis of different competitive strategies, as they contribute to individuals' success in reproduction (Cosmides and Tooby, 1997). This approach highlights how each individual, in order to have offspring who successfully reach maturity and are themselves successful at reproduction, has to compete for both resources (somatic effort), for features that appeal to the other sex (reproductive effort towards mating) and elements that directly benefit the offspring (reproductive effort towards parental investment) (Clutton-Brock, 1991; Trivers, 1972; Hrdy, 1992; Del Giudice, Gangestad, and Kaplan, 2015). Here, we advance the hypothesis that for men these three spheres of competition are well aligned, as accumulating resources appear to help men in all three domains: personal wellbeing, attracting women and providing resources for children. On the contrary, for women, going directly after resources and gain status appear to come with costs on the reproduction front: success in the economic and political arenas seems to alienate mates (Buss, 1989; Fisher, 2013; Brown & Lewis, 2004; Fisman et al., 2006; Folke & Rickne, 2016); distance women allies (Benenson, 2013); and although any economic resources acquired will benefit their offspring, the benefit is indirect, and at the expense of direct maternal investment of time and energy (Bertrand et al., 2015; Murray-Close and Heggeness, 2018; for extensive literature see Cassar and Rigdon, 2021).

With this perspective in mind, we propose that the use of cash in experiments eliciting competitiveness may activate a frame that is ideally suited to register that trait as it is expressed by men, but not necessarily by women. Specifically, the use of cash as experimental reward is not neutral, but suggestive of a frame characterized by anonymous market transactions. For many societies, market transactions may be culturally perceived as the principal domain of male-male competition, hence using cash as experimental reward may elicit behavior more indicative

of male norms than true competitiveness per se. Although this method may be well suited to register the trait as it is expressed by men, it has the potential to bias downward the way competitiveness is expressed by women in certain cultures (as not all cultures have the same norms or gender gap to begin with). For women, other incentives, more aligned to each individual's reproductive stage and to the culturally accepted gender roles in her environment, would be better suited to elicit the trait of competitiveness.

To investigate this idea, we test whether different incentives designed to activate the motivation to compete in different domains would result in predictable patterns of gender gaps in competitiveness. Specifically, we conducted a series of experiments in which we used both cash and vouchers intended to benefit a subject's children (e.g. vouchers for school supplies or clothes) or to allow subjects to conform to societal norms about femininity/masculinity (e.g. vouchers for makeup stores or soccer gear). Our findings support our main hypotheses and indicate that the gender gap in competitiveness critically depend on how we elicit such preferences. We found that a gender gap was not always present to start with, yet, when an initial gap could be found using cash (as in China, Togo, Sierra Leone and Bosnia), framing the game as either benefitting the children or as in line with societal norms of femininity eliminated the gender gap or greatly reduced it. This suggests that the most salient difference in competitiveness between men and women may not be in intensity, but in the way in which it is aroused and expressed.

Our empirical results are consistent with the interpretation that, relative to men, women's motivations to compete are more sensitive to both motivations "to get something" and to motivations "to be someone": a negotiation of material interests and of a feminine image that, on the surface, appear to interfere with the desire to win in economic competitions. Depending on an individual's stage in life (parent or not) and culture, motivations to conform to an identity perceived as successful (to benefit offspring, to keep mates, and to nurture allies) may induce women to trade off motivation to compete for resources against effort dedicated to direct investment in children or geared towards attracting and maintaining mates or to not alienate potential allies. Such tradeoff does not appear to be as binding for men, for whom acquiring resources also helps with securing good mates and with the provisioning of offspring.

Our work contributes a novel argument to the much-debated topic of how to close the gender gap in earnings and power. Our research shows that, for women, the elicited

competitiveness using cash is not necessarily indicative of general competitiveness, which suggests that a change in the incentives scheme in labor markets, e.g. by including things that matter to women (from flexible work schedule to school vouchers, from childcare subsidies to dependents' benefits and paid family leave, and so forth) may be a promising strategy to close the gap. Lastly, when placed within the vast theoretical and empirical literature on gender differences, our work suggests that the dichotomy between nature and nurture is neither supported by the data nor is it a useful framework for understanding behavioral differences, in contrast to explanations that recognize the contribution of both biology and culture.

In the next section, we motivate our work within the Economics literature while in Section 3 we review evolutionary biology and cultural explanations of gendered behavior. We discuss the theoretical framework and highlight our main hypotheses in Section 4. Section 5 describes the experimental design. Section 6 reports the results and in Section 7 we offer some concluding remarks.

2. Motivation and Economics Literature

The idea that female behavior is passive, coy, risk averse, less competitive than male behavior was crystallized among the scientists of the 19th century, for whom a focus on sexual selection based on competition between males left females to be seen as either passively choosing the winner or accepting the fate that the prevailing male would impose (Darwin, 1871; Bateman, 1948; Trivers, 1972). Starting with the 1970s, significant advances in the fields of evolutionary biology, psychology and anthropology began to produce substantial works on the lesser known topic of the occurrence and evolutionary significance of female competition (e.g. Hrdy, 1981; Knight, 2002; Clutton-Brock, 2007; Brown et al. 2009; Stockley and Campbell, 2013). Providing evidence that females' reproductive success varies significantly (Clutton-Brock, 2009; Stockley and Jorgensen, 2011)---and in certain species as much or even more than males---opened the door to efforts documenting the importance of female competitiveness in humans and, in particular, to the study of how its determinants (health, physical resources, status, alliances and community status) influence reproductive success (Campbell, 1999; 2013; Hrdy, 2009; Benenson, 2013). If competitive traits are regarded as the product of evolutionary pressures, then men and women should have *both* evolved competitive qualities, although with differences in the way they manifest, a reflection of the different role played by each sex in reproduction as

it contributes to his/her fitness (Hrdy, 1999, 2009; Benenson and Markovits, 2014). Since then, studies have emerged documenting the pro-active role of the female in mate choices (by competing for the most suitable males with respect to what matters to the females) and female competitive behavior in a wide range of strategies designed to ensure benefits for her offspring (Gowaty, 2013; Campbell, 2013). The goal of this paper is to contribute new behavioral evidence to the study of women's desire to compete by proposing the use of different rewards (an experimental design based on vouchers) to bring to light the different modalities of women's motivation to compete.

In Economics, the notion of women's lower desire to compete has been advanced as contributing factor to why, despite significant progress, women are still far from reaching economic and political equality with men. At a global scale, only 24.3% of all national parliamentarians were women in 2019,[1] with only 11 serving as Head of State and 12 serving as Head of Government (UN Women, 2019). In the U.S., starting with the cohort born in the 1960s, women were more likely than men to obtain a college degree, yet their labor force participation has been hovering around 57%[2] (from a 60% peak in 1999) vs. 69% for men (Goldin, 2006; Bureau of Labor Statistics, 2015). Measures of aggregate earnings indicate that each cohort does have a higher ratio of female to male earnings than the preceding one, with an estimated gender pay gap that went from 59 cents on the dollar in the 1970s to a more recent 77 cents on the dollar (Goldin, 2014). Still, differences in earnings by sex remain pervasive and dramatically increase during the first decades of working life (Chung et al., 2018). Established explanations including gender differences in human capital accumulation (such as years of education, college major and accumulated labor market experience) and gender discrimination can only account for part of these gender pay/power gaps (Altonji and Blank, 1999; Blau and Kahn, 2017; Goldin and Rouse, 2000).

To account for the unexplained part of the gender pay gap, a behavioral hypothesis has emerged: If women are less competitively inclined than men, then women themselves would prefer to choose less competitive working environments and self-select instead into activities

[1] Nordic countries: 42.5%; Americas: 30.6%; sub-Saharan Africa: 23.9%; Asia: 19.8%; Arab States: 19%; and the Pacific: 16.3 %. Rwanda has the highest number of women parliamentarians worldwide (61.3%).

[2] Women have been holding roughly 5% of the CEO positions at S&P 500 companies and occupying only about 20% of the board members' seats---with little racial diversity as about 80% of these seats are being held exclusively by white women.

that have lower but more predictable returns (Gneezy et al., 2003; Niederle and Vesterlund, 2007). In support of this idea, a burgeoning literature of economic experiments has extensively documented the existence of a significant gender gap in competitiveness (Niederle and Vesterlund, 2011; Croson and Gneezy, 2009). Men have been found to both perform better than women under competitive environments, even when they perform equally well under non-competitive environments (e.g. Gneezy et al., 2003), and to prefer such competitive environments when given the choice (e.g. Niederle and Vesterlund, 2007). Confidence and risk aversion, commonly invoked as important determinants of competitive behavior, cannot generally explain away the gender gap in choosing to compete, suggesting there is something specific about competitions that make them less attractive to women than to men. Dozens of replications, especially in WEIRD countries (Western, educated, industrialized, rich, democratic), confirm that even between men and women of identical ability, when offered the choice to be paid based on a non-competitive, piece-rate payment scheme or on a tournament payment scheme, men chose the tournament scheme in significantly higher numbers than women (see literature below). Extensive cross-country surveys of attitudes further attest that women declare substantially lower self-reported preference to enter competitive situations than men, although with vast differences both within and across countries (Bönte, 2015; Del Giudice, 2015).

There are notable exceptions to these results. The gender gap in competitiveness can be greatly reduced when the experimental design is altered in important domains such as changes to the tournament rules like group vs. individual competition (Niederle et al., 2008; Healy and Pate, 2011), size of the incentives (Petrie and Segal, 2017), changes to the experimental task, e.g. verbal instead of mathematical (Shurchkov, 2012; Kamas and Preston, 2012; Gneezy and Rustichini, 2004; Grosse and Reiner, 2014; Gunther et al., 2009), gender-neutral vs male centric tasks (Apicella and Dreber, 2015) and the introduction of policies to bring about diversity, e.g. affirmative action (Niederle, Siegal, Vesterlund, 2013; Balafoutas and Sutter, 2012).

The experimental literature has documented that both nature and nurture matters. On the biological side, researchers have been focusing on the behavioral effects of hormones, stress, age and life stages (Haselton, 2018). Evidence that female competitiveness and bidding behavior may vary with hormone levels, depending on the phase of the menstrual cycle, has been found in the studies of Wozniak et al. (2014), Bateup et al. (2002), Chen, Katuscak, and Ozdenoren

(2010) and Buser (2012). Yet, experiments attempting to overcome the limitations of correlational studies linking naturally occurring hormonal fluctuations to behavior, for example by administering sex hormones or focusing on the 2D:4D marker for prenatal testosterone exposure, tend to find no causal effect on preferences (e.g. Ranehill et al., 2018; Parslow et al., 2019; for a review, Dreber and Johannesson, 2018). With respect to stress, Buser et al. (2017) find that the cortisol response seems to predict willingness to compete only for women but not to a level that could explain away the overall gender gap generally found. Looking at handedness, a proxy for nature as it does not correlate with nurture, Hoffman and Gneezy (2010) find that left-handed women compete more than right-handed men. Focusing on children, some as young as three years old, before sex/gender even means anything to a child and culture may have barely started to exert a substantial effect on behavior, Sutter and Glätzle-Rützler (2015) report sex differences that emerge early on in life and persist through adolescence till adulthood.

With respect to life stage and age (naturally correlated and often confounded), most of the studies conducted in western laboratories tend to recruit university students without children, a stage in life for which differences in competitiveness in experiments are expected to be high according to our framework and, in fact, they are (see above literature). When included in the studies, post-menopausal women have shown more competitiveness than younger women (Flory et al., 2012). After the reproductive years, female behavior may be insensitive to hormones, as shown by the experiment of Zethraeus et al. (2009) in which postmenopausal women, randomly assigned to either estradiol, testosterone, or placebo, display no significant differences for a variety of tasks.

Evidence that culture and institutions matter is now extensive, although it is often intertwined with age and life stages. Patriarchal societies differ with respect to economic development and gender egalitarianism, yet, studies comparing WEIRD societies to developing economies suggest, somewhat surprisingly, that behavioral gaps are more significant in the former, where survival is less at stake so the expression of individual differences is less costly (Falk and Hermle, 2018). Several studies have reported differences both between and within countries at similar levels of development but differing in institutions and cultural practices. For example, Gneezy, Leonard and List (2009) comparing competitiveness among patriarchal Maasai in Tanzania and the matrilineal and matrilocal Khasi in India (where men take on a large role in

childcare) find that women compete more than men in the matrilineal society while men are more competitively inclined than women in the patrilineal one. Along these lines, Flory et al. (2018), comparing women and men (aged between 12 and 90 years) in one matrilocal and one patrilocal culture in rural Malawi, replicate the finding that a gender gap can be found only in the patrilocal culture. Interestingly, patrilocal women increase their competitiveness at important fertility markers: adolescence, having a surviving child older than six, and menopause, displaying less competitive inclinations than male only early on, i.e. in post-adolescence without a child---while no such changes are found in the matrilocal society. Zhang (2019) finds no gender gap in competitiveness among a group of Han Chinese, but a significant gender gap among the minority Yi ethnic group attending the same high school, which is attributed to communist gender egalitarian reforms that the Yi were exempt from. In a similar vein Booth et al. (2019) find that mainland Chinese women exposed to communist ideology are more competitive than their Taiwanese counterparts, and more competitive than younger mainland Chinese women who were less exposed to such ideology.

With respect to age, the results differ between studies. Andersen et al. (2013), by looking at competitiveness in both matrilocal and patriarchal villages in India, find that the differences between girls and boys in the patriarchal village emerge when girls enter puberty. Contrary to other studies, they find that at age seven girls and boys are equally competitive in both types of society. After that, throughout puberty, girls in the patriarchal village become significantly less competitive than their male counterparts whereas girls in matrilocal village remain equally competitive. In Britain, Booth and Nolen (2012) find that girls attending single-sex schools compete as much as boys in coed educational settings, while coed school girls are remarkably less likely to enter tournaments. Group gender composition matters and it is usually the case that girls competing with girls choose tournament more than girls in mixed groups. In an international study of Colombian and Swedish children, Cardenas et. al. (2012) find, somewhat surprisingly, that Colombian girls age nine to twelve are equally competitive to boys in all tasks, but in Sweden (a country with higher gender equality rankings) boys compete more overall. Similarly, Almas et al. (2016) find that boys are more competitive than girls in a Norwegian sample. However, for certain tasks, girls' competitiveness has been found to exceed that of boys. Khachatryan et al. (2015) investigate youth preferences for Armenian children and adolescents and find a lack of gender differences in competitiveness even in a math task, lending further

support to the idea that culture and context are important determinant of gender behavioral differences.

In conclusion, the research accumulated so far supports the idea that competitive differences could have both a biological component and be affected by culture and circumstances. Such behavioral differences may matter as several studies have found that these elicited measures appear to correlate with various economic outcomes (e.g., Niederle and Vesterlund, 2010; Zhang, 2013; Buser, Niederle and Oosterbeek, 2014; Almenberg and Dreber, 2015). Yet, despite how pervasive this idea of women not reaching the top because of behavioral differences has become, labor market data do not provide unequivocal support for it[3] (e.g. Goldin, 2014; for a review see Shurchkov and Eckel, 2018).

3. Evolutionary Origins of Sex Differences in Behavior

Economists have long been interested in documenting potential behavioral differences between women and men in areas likely to have economic consequences, such as desire to compete, risk aversion, cooperation, trust and altruism. In this paper, we try to merge the economics understanding of the gap in competitiveness with an evolutionary approach that builds upon the root of what motivates individual behavior, offering a framework to explain the reasons for such sex gaps. After much debate over the roles of nature vs. nurture, the scientific literature, across multiple disciplines, has accumulated ample evidence in support of the idea that it is not fruitful to dwell on such a dichotomy, in favor of searching for models putting emphasis on *both* the biological and sociocultural aspects whose interplay could explain how differences in gendered behavior came about and continue to adapt and change.

3.1 Evolutionary Origins of Gendered Behavior

Evolutionary psychology---a theoretical framework in which the principles of evolution are applied to studying the structure of the human mind---sees human psychological traits as the results of adaptations, i.e. the product of the processes of natural and sexual selection according to which those preferences and behaviors that favor replication tend to survive and spread, while

[3] In particular, the data show that the gender wage gap is smallest not in the least competitive jobs, but in the jobs with the most flexibility (Goldin, 2014).

the others tend to disappear (Cosmides and Tooby, 1997; Buss, 1995a). Behavioral traits like cooperation, empathy, preferential treatment for kin, and preference for healthier mates seem to be universally found in all cultures, and hence represent good candidates for evolutionary adaptations. Consciousness is not required for this process of selection to happen, as individuals do not need to be aware, or capable of understanding that, with those behaviors, they are improving the odds of their reproductive success (Barkow, Cosmides, and Tooby, 1992; Hrdy, 1999). Individuals that exhibit such traits simply tend to do better in the mating game and have greater reproductive success. To the extent that certain behavioral traits are transmissible, those beneficial behaviors will tend to be passed down from one generation to the next and proliferate, while less successful behaviors for the mating game will diminish.

In this theoretical framework, males and females are predicted to behave similarly in all domains in which the sexes have faced equal adaptive problems. Since for the most part, the "hostile forces of nature" (i.e. the driving force in evolutionary selection) act similarly on both men and women, little differences should be expected in areas such as executive function, problem-solving, memory and intellectual abilities. For example, with respect to cognitive abilities, some differences have been found and attributed to natural selection: male would be better than women in dynamic spatial perception and targeting (consistent with men's participation in hunting and warfare) while female would be better than men at object location and landmark recognition (consistent with female gathering legacy), see the extensive survey in (Browne, 2006). Conversely, for those domains in which selection pressures manifest themselves differently, principally in sexual selection, differences between the minds of the two sexes are expected to emerge and persist (Buss, 1995b). Sexual selection is the process of the evolution of characteristics on the basis of reproductive advantage, as opposed to survival advantage (i.e. natural selection). So only for those domains critical for sexual reproduction, distinct pressures on the two sexes associated with mating and reproductive success would have shaped differently the minds of males and females (Campbell, 2002).

Among all mammals, reproduction requires the different sexes to pursue different strategies, depending on whether it is the female or the male that needs to invest more in her/his offspring. Adding to the Darwin-Bateman framework of sexual selection, parental investment theory postulates that the sex making the greater parental investment would become a resource for which members of the other sex would compete (Trivers, 1972). Among humans, it would

be the women who have to invest more in providing for an infant, at the very least through gestation and lactation, while men could invest less. Such difference in "investment" would have profound repercussions on the (optimal) adopted strategy: while men could increase their reproductive success by having numerous partners and increasing their number of offspring, women could not, as multiple partners would not necessarily ensure more offspring for the woman (see Gowaty (2013) for a critical review of this paradigm). This fundamental difference would have extensive psychological implications and offer the foundation for nature-based explanations of sex-related differences (Brown, Laland, and Mulder, 2009). Given the similar number of individuals of both sexes, men pursuing a multiple mating strategy would have to compete among themselves for the most desirable women (intra-sexual competition), while women would either passively choose the winner among the contenders or accept the will of the man winning the competition who prevent her from choosing someone else (Knight, 2002). Among men, this male-male competition could take many forms, from contests of physical power to the acquisition of status in society and the amassing of resources highly valued by women (Hill and Kaplan, 1993; von Rueden, Gurven and Kaplan, 2011; Henrich and Gil-White, 2001). Because of the higher variance in male reproductive success than female reproductive success (given the more or less fixed maximum number of offspring a woman can have), the rewards and the risks of the mating game would be higher for men than for women. Thus, evolutionary theory predicts that men, to be successful, should exhibit greater tolerance for competition, risk, and a behavior geared towards acquisition of dominance and status (Browne, 2006; Fisher, Garcia, and Sokol, 2013).

More recently, a less passive interpretation of the female role in the mating game advances that females are actually not simply inert object of male competition, but, to ensure the best possible outcome for their offspring, they are active actors competing for the best suitable mates, evaluated in terms of genetic endowment, abilities and anticipated willingness to invest in them and their offspring (Hrdy, 1981; Clutton-Brock, 2007; Stockley and Campbell, 2013). So, while men would prefer quantity versus quality, for women a focus on the success of their children would make them prefer quality over quantity (Hrdy, 1999). According to this view, competitiveness is a trait as important for women as for men. Differences should be found only in the ways in which the trait is expressed, but not in the trait per se. For women, behaviors that involve physically risky competitions convey not only fewer reproductive rewards but also

greater cost to reproductive success, as the life prospects of children have been found more impaired by the loss of their mother than of their father (Campbell, 1999). For women, contrary to men, pursuing and achieving status and political power can actually be associated with reduced reproductive success. These psychological and behavioral differences, that are not based on an innately lower competitive trait but on both unconscious and deliberate choices to support offspring wellbeing, are then likely to have important economic consequences. If men strive to achieve high status by entering competitive environments, working longer hours and undertaking risks necessary to achieve top positions and greater income, while women strive to obtain the best possible outcomes for their children, differences in occupational interests and distributions are likely to emerge. Such differences would not be due to a lower female desire to compete, but rather due to the decision to compete in spheres and in ways that are of more critical importance to women.[4]

3.2 Cultural Origins of Gendered Behavior

A separate view of the origins of gendered behavior comes from biosocial theory (Wood and Eagly, 2012). While still recognizing that there are underlying biological differences between men and women, expressed in women's reproductive activities and men's greater strength and size, such differences are considered to be only distal causes of male and female behavior, while social processes are taken to be more proximal. According to this view, given the need to thrive and adapt to local socioeconomic and ecological environments, early human societies adopted a division of labor in which women specialized in activities compatible with infant caretaking (such as gathering) while men specialized in activities requiring greater physical strength, uninterrupted periods of time, and long-distance travel away from home (such as hunting). The advent of settled agriculture, and, specifically, its different types of technology depending on the geographical terrain, further differentiated gender activities and the role of women in society (Boserup, 1970). Specifically, the adoption of the plough made childcare less compatible with farm work, due to its requirements of more capital and physical strength (to pull it or guide the

[4] "At this moment in Western civilization, seeking clout in a male world does not correlate with child well-being. Today, striving for status usually means leaving your children with an au pair who's just there for a year, or in inadequate day care. So it's not that women aren't competitive; it's just that they don't want to compete along the lines that are not compatible with their other goals." – Sarah Hrdy, The New York Times 2016.

animal) than shifting agriculture (for which hand-held tools like the hoe and the digging stick rendered work in the field a labor intensive process with high female participation). As a consequence, men specialized in agricultural work outside the home while women stayed within. Such division of labor would be the origin of the different norms about women's appropriate roles in society and is then regarded as the basis for the social construction of gender: To ensure that children are well equipped to successfully fulfill adult roles, societies would socialize the young by instilling, expecting, punishing and rewarding behaviors consistent with the cultural beliefs about the attributes of the sexes. Cultural beliefs about masculine and feminine personality traits started then to be divided into two categories: communion, involving warmth and concern for others, and agency, involving assertiveness and competitiveness. As individuals internalize these beliefs, "culture gets inside the person" and creates observable sex differences in behavior.

A fascinating literature has started to document that such beliefs tend to persist even when the economy moves out of agriculture, affecting female participation in entrepreneurship, labor market and politics. Alesina et al. (2013) reports evidence of both a significant negative correlation between traditional plough use and female labor force participation in agriculture in pre-industrial societies and a persistent impact on current economic outcomes and gender norms. In countries with a tradition of plough use and/or among immigrants from such countries, contemporary women are still less likely to participate in the labor market or politics, to own firms, and are more likely to display traditional gender roles. Giuliano (2015) finds that historical plough use still matters for other gender norms too, like higher parental authority granted to the father, inheritance rules favoring male heirs, and lower female freedom of movement. Since agricultural technology is itself endogenous, dependent on the characteristics of the terrain, geography could be regarded as the ultimate determinant of gender differences. Evidence of that is advanced by Carranza (2014) who shows, for the case of India, that soil texture affects the technology used and, hence, determines the division of labor between men and women, explaining female participation in agriculture and infant sex ratio.

Another mechanism through which geography could influence gender norms is through language, a fundamental channel for the transmission of norms and cultural values. Galor et al. (2020) shows how agricultural characteristics (crops more or less cultivable by plough) fostered the emergence of grammatical gender in language and how such linguistic structure influenced

the transmission of gendered roles. Further along these lines, Gay et al. (2013) finds that contemporary women speaking languages with stronger gender distinctions are less likely to participate in economic and political activities and more likely to encounter obstacles in acquiring land and credit.

In addition to economic growth, development and increases in education, other pre-industrial characteristics have been found to matter and to explain part of the persistence of differences in gender norms: fishing economy (BenYishay et al., 2017), sex ratio (Grosjean and Khattar, 2019), and socialism, dowry and family structure (Giuliano, 2020). An active literature is now focusing on the channels of cultural transmission (e.g. Almas, 2016), and especially on three such forms: vertical (parental socialization), horizontal (peer effects) and oblique (e.g. sociocultural contexts, role models and teachers), and on backlash from gender-incongruent behavior (Rudman & Glick, 1999).

4. Theoretical Framework & Hypotheses

In this paper we advance a series of testable hypotheses rooted in the evolutionary psychology framework discussed in Section 3.1. In particular, we focus on life's tradeoffs. Resources are not infinite, so each organism evolved to allocate time and energy to tasks and traits in ways that maximize his/her fitness (Barkow et al., 1992; Del Giudice et al., 2015). Our ancestors, in order to have left descendants, must have solved the concurrent problems of both individual survival and reproduction. Such goals have been, and still are, in conflict with each other and an individual's effort and energy allocated to reproduction often increase his/her vulnerability.[5] Among humans, since resources (e.g. time and energy) are finite, each individual must optimally allocate what is available to him/her between somatic effort (individual growth, development, maintenance, and storage of resources), and reproductive effort (producing offspring who themselves survive to reproductive age). In addition, reproductive effort should further be optimally allocated between mating effort (locating, acquiring and, depending on the circumstances, maintaining a mate), and parenting effort (gestation, lactation and, caring for the

[5] For examples among animals, peacocks invest significant energy in producing magnificent trains to attract peahens, an expenditure of effort valuable for mating that, nonetheless, leaves the creature vulnerable to predators (Darwin, 1860). The nightly serenades of the male túngara frog (a tiny amphibian native to Central America) are another example: irresistible calls to the ears of their females, these songs are dangerously costly to the males, as they also attract predator bats (Ryan, 2018).

offspring until they are ready to reproduce themselves). As a result, according to this view, the physiological and behavioral characteristics of the individuals represent an approximate solution to the problem of optimizing the allocation of energy between somatic, mating and parenting efforts (Trivers, 1972; Hrdy, 1992; Clutton-Brock, 1991).

Optimal allocations of effort are expected to vary across the life course, making it important to consider the evolutionary forces that shaped the timing of life events involved in development, growth, reproduction, and aging, with particular solutions depending on the individual's evolutionary history as well as the current environmental circumstances and the immediate costs and benefits. With respect to women, the saliency of this tradeoff should change throughout life, with the expression of traits and behaviors particularly conducive to attracting and retaining mates during the reproductive years, while providing benefits to her children and her grandchildren through old age. Economic development, culture, and institutions further enter this picture by reinforcing preferences and behavioral traits, crystallized as slowly changing social norms, that are considered valuable in a mate for that society, re-producing the asymmetry between the sexes.

In this paper, we focus on competitiveness, a behavioral characteristic that the literature has regarded as a trait conducive to reproductive success for males but not necessarily for females (Campbell, 2013; von Rueden, Guerven and Kaplan, 2011; Hill & Kaplan, 1993; Henrich and Gil-White, 2001; Cassar and Rigdon, 2021 for further discussion). Given women's irreplaceable role as providers for their offspring and their offspring's offspring, female strategies have evolved to minimize physical harm and to steer clear of enemies (Benenson, 2014). Women tend to avoid participating and using physical force in domains of competition where injuries and life could be at stake, reflecting the asymmetry of consequences for offspring survival for whom a mother's death is more detrimental than a father's death (Hrdy, 1981, 1999, 2009; Kahlenberg et al., 2008).

Yet, in domains where life is not at risk, such as in contemporary labor markets, why would women, equally capable as men of winning competitions, leave resources on the table by hesitating to enter competitive environments? Our hypothesized answer to this puzzle is that women have adapted traits and internalized, more or less consciously, norms of behaviors reflective of female tradeoffs. Specifically, going aggressively after resources may not be a trait particularly liked by men (each sex competes over things that matter to the other sex), it may

alienate potential female allies, and create enemies. And, depending on the particulars of the job in question, despite a higher potential for material returns, competing for resources may come at the expense of time and energy that could have been directly invested into offspring. Importantly, such critical tradeoffs for women do not seem to matter for men: men's efforts to gain resources and secure status appear to help the individual with all three (survival, mating ability, and provisioning capabilities). For women, such efforts may hinder both parenting and mating as women bear material and "identity" costs associated with being successful in the economic and political spheres that men do not have. Several studies are starting to document the personal price of women's success, showing evidence that women are often not able to translate their material successes into better quality mates or more stable households, effectively making overt competitiveness an unsuccessful mating strategy (Buss, 1989; Fisher, 2013; Brown and Lewis, 2004; Fisman et al., 2006). Evidence has emerged that women who compete and win get punished: political victories and promotions to high-executive positions significantly increase the divorce rate for females, but not for males (Folke and Rickne, 2016), and women who earn more than their partners report lower marital satisfaction and higher divorce rates (Bertrand et al., 2015). Furthermore, research has shown that, as a result, women strategically downplay their economic aspirations, especially when such aspirations are observed by male peers who are single (Bursztyn et al., 2017). Somehow anticipating such personal costs, women strategically hide ambitions and minimize successes in front of others. For example, Murray-Close and Heggeness (2018) shows that respondents in the U.S. Census survey are more likely to under-report the woman's earnings and overreport the man's earnings when the woman in the household earns more. Similar backlash to women success has been found with female friends (Benenson, 2014).

In summary, among females of all species, maternal investment in offspring occurs at the expense of effort that she could have directed elsewhere. Among humans, women sacrifice their careers when they see that pursuing high positions in the economic arena may not be compatible with the raising of children, or attracting and maintaining male partners. Women have to constantly decide whether, given their life stage and economic circumstances, it is more advantageous for her lifetime reproductive success to invest effort and resources in raising her economic status or in trying to attract the more suitable mates; put more energy into the raising of her current offspring, or in focusing on herself to ensure future offspring. It is important to stress that this decision process does not need to be conscious: maternal behaviors and strategies

could have emerged as adaptations in the evolved psychology of the woman, so that even in rich countries where women could "earn" enough calories for themselves and their children, women would continue to care about attracting and maintaining quality mates because during evolutionary times, the times during which our mind evolved, maternal resources alone would not have been sufficient to raise an offspring to maturity (Cosmides and Tooby, 1997; Hrdy, 1999).

These considerations suggest that three factors should be especially relevant to women's tradeoff decisions: resources to invest in children, traits conducive to attracting and maintaining mates, and behaviors opportune to maintaining female allies and avoiding enemies. The specific solutions depend then on the socioeconomic and cultural context. Economic development may increase the gender behavioral divides as freedom from scarcity may shift the tradeoff in reproduction more towards securing a partner than to directly acquiring resources for her offspring. Culture may reinforce this process in predictable ways: in countries that are less gender egalitarian, focusing on retaining mates may trump female efforts towards gaining resources and status in domains traditionally reserved for male-male competition[6]. This theoretical framework produces many experimentally testable hypotheses about which factors should affect female competitiveness, from life stage to sex ratios, from scarcity to socioeconomic status, from local gender norms to policies and institutions.

Here, from this theory, we derive two such hypotheses:

1. *Maternal Investment Domain:* Mothers may be expected to be more competitive, and possibly close the gender gap with fathers (if one is present to begin with), when the rewards of the competition directly benefit their children.
2. *Conformity to Femininity Norms:* Women (both mothers and those without children in their reproductive years) may be expected to be more competitive relative to men when incentives are in the form of gender stereotypical goods, compared to when the rewards are gender-neutral or male-centric.

We propose to test both hypotheses through an experimental design that introduces as reward a series of vouchers specifically tailored to maternal and female interests. To further probe

[6] It is hard to conceptually disentangle attracting/maintaining a mate vs. acquiring resources, as in many cultures the "good" men come with economic resources.

whether women's behavior is affected specifically by female-centric rewards or just by anything other than cash (in many culture the traditional domain of male-male competition) we include tests with gender-neutral incentives given to parents and/or with children-benefitting incentives given to non-parents (placebo tests). In the rest of the paper we describe the design of the experiment, how we implemented it in the fields and adapted it across several countries, and provide some initial empirical evidence consistent with this theory.

5. Experimental Design

To test these ideas, we introduce a novel treatment to the seminal game protocol of Niederle and Vesterlund (2007): additional round/s where subjects make the choice to compete or not, played for a different set of rewards. This design was first introduced in Cassar, Wordofa and Zhang (2016). These different rewards are vouchers equal in value to what the subject would have earned in cash. They are restricted forms of cash, intended to make unambiguously clear the domain/frame of the competition: to benefit the subjects' children, to conform to society's stereotypical femininity/masculinity norms, or to appeal to gender-neutral interests (yet still different from cash). We run this experiment with either parents or non-parents from five different countries of varying levels of economic development with vast differences in culture: China, Togo (traditional sample and Nana Benz), Sierra Leone, Bosnia and Colombia.

As in the original design, our study participants are instructed to perform mathematical computations for a pre-specified period of time under different payment conditions. In the first round, *Piece-Rate*, all subjects experience a non-competitive piece-rate payment scheme: the payoff is a fixed amount per correct answer in a math addition task. In a second round, *Tournament*, all subjects are exogenously assigned a competitive tournament payment scheme, in which the payoff is twice as high per correct answer, but only if the subject has more correct answers than a random opponent. After that, the subjects are asked to guess their opponent's score in the compulsory tournament. The difference between their own score and their guess of their opponent's score is used to proxy for *Confidence*.

The behaviors of interest are the choices the subjects make in the third round of play and onward, when they are asked whether they would prefer to be paid for the coming round according to the already experienced piece-rate scheme or according to the winner-take-all tournament rules. These final two/three rounds differ in terms of the types of rewards at stake:

1. cash in *Choice-Cash* (the standard medium to incentivize participants in economic experiments); 2. goods intended to benefit one's child in *Choice-ChildrenVoucher* (a voucher for a scholastic bookstore, school supply or children clothes with equal face value as the corresponding cash reward); 3. goods intended to conform to societal norms about feminine and masculine interests in *Choice-GenderVoucher* (a voucher for a beauty store or a scarf for women, a voucher for soccer gears or rain slippers for men); 4. generic non-cash rewards in *Choice-NeutralVoucher* (a voucher for a restaurant). We adopt a within-subject experimental design, with all subjects participating in cash and voucher rounds[7], as we are interested in whether a change of reward type, by changing the frame of what a subject is competing for, can induce a change in the elicited desire to compete in different domains by the same individual. The purposes of the first two rounds of the experiment are to obtain benchmark measures of ability for each subject under each of the compulsory payment schemes, to have a measure of performance to be used in the subsequent rounds for determining competitions' winners and losers, and to make sure the subjects had experience with both payment schemes before making their choice to compete or not in subsequent rounds. At the end of each round, the subjects were notified of their own performance but not what other subjects scored and were told if they won or lost the competition only at the very end and only for the round randomly selected for payment (to limit the effect that winning or losing in one round may have on the choice of play in subsequent rounds).

Following the set of rounds of play designed to elicit a subject's desire to compete in different domains, a second set of rounds of play was used to elicit the following: a subject's *Risk Tolerance* (by administering either the Multiple Price List (MPL) elicitation method or the Unitary Lottery method (Eckel and Grossman (2008)), and *Willingness to Pay* (WTP) to measure how much each individual valued the voucher (using either a WTP instrument similar to the previous MPL used to elicit risk preference or a modified procedure). As the last step, the subjects were administered a *Survey* asking demographic and socio-economic questions, as well as a series of questions about their beliefs. At the end, the subjects were compensated with a

[7] The *ChoiceCash* and *ChoiceVouchers* rounds were administered in random order (to control for order effects and learning) in all locations except for Sierra Leone (where they were maintained in the same order for logistical implementation considerations specific to this site, as the competition game was one of several games administered in random order as a block).

show-up fee plus the additional payments gained depending on the performance and choices in the round randomly selected for payment (among the six/seven rounds previously described).

The experimental treatments changed from country to country depending on the characteristics of the subject pool, i.e., in countries where we recruited parents, we tested whether men and women responded differently to cash versus vouchers for children, whereas in countries where we recruited non-parents we tested whether men and women responded differently to cash versus vouchers for gender-stereotypical or gender-neutral goods. Most experimental features were kept as close as possible across sites, although significant differences in education required us to adapt the protocol to local conditions to ensure that the subjects felt comfortable during the activities. Specifically, all locations used a math task to elicit the desire to compete, but, given the vastly different levels of numeracy across countries, we had to slightly modify it, e.g. subjects were asked to add five two-digit numbers (such as 78 + 23 + 69 + 35 + 10 =?) in China, but only one at a time in Sierra Leone. Similarly, we switched from MPL to Unitary Lottery in countries where MPL was found too difficult to understand during piloting. The Unitary Lottery instrument was similar to the Eckel and Grossman (2008) risk instrument, where subjects were asked to choose one lottery among a set of lotteries of varying expected value and variance in payoffs.

In all countries, we ensured that the vouchers we offered were valued by the subjects and that subjects intended to use them as designed, i.e., subjects intended to use children's voucher on goods for their children or subjects intended to use gender stereotypical vouchers on goods for themselves. To this end we conducted focus groups in the pilot phase where we asked participants with characteristics similar to the experimental subjects whether the voucher was valuable to them and who they would spend it on, in addition to eliciting individual evaluations (WTP round) during the experimental phase which were included as individual controls in the data analysis. The differences across experimental sites are not critical to our analysis as we are not interested in comparing, say, performance in the math addition task or risk aversion across countries. Rather, we conduct separate analyses for each site, in which we compare the gender gap in the willingness to compete (i.e., choose the tournament/competitive payment scheme over the piece-rate payment scheme) under cash versus voucher rewards, where we control for task performance, risk aversion, confidence, and valuation of the voucher to account for the impact that gender differences in these variables may have on the gender gap in

the willingness to compete. In analyses combining several sites, we allow for the control variables to impact the choice of payment scheme differently across sites (and across cash versus voucher rewards).

We report next the specifics of the implementation in each experimental site, and we provide more details in the Supplementary Appendix. The instructions and the surveys are available in the Online Appendix.

China. The Chinese sample pool is comprised of 358 parents (173 fathers, 185 mothers) of middle and high school students recruited in seven educational institutions in Shanghai, China, between June and August of 2012. The experiment was conducted on the days in which schools held parent-teacher conferences and extended over 18 experimental sessions lasting 45-60 minutes each.

In addition to cash, the child-benefitting prize utilized in the experiment were vouchers for specialized bookstores carrying school-books, highly valued by parents in a culture that puts a large emphasis on education. We confirmed our prior through initial focus groups with Shanghai teachers who reported unanimous belief that parents would use the vouchers to buy educational books for their children, in particular test preparation books. In addition, we recruited a convenience sample of 72 parents of high school students around Shanghai (with no overlap with the experimental sample) in which we handed out 20RMB bookstore vouchers identical to those used in the experiment, and we found that 85% of the sample indicated they would use it for their child.

Figure A1 in the Appendix displays the subjects' characteristics, performance in each treatment, risk tolerance, willingness to pay for the voucher and confidence by sex while Table A1 reports summary statistics by sex and the uncontrolled t-tests of sex differences. With respect to performance, i.e. the number of correct answers, women on average scored significantly higher than men in the compulsory treatments of the first two rounds (men: 7.03, women: 8.14, p=0.003 in *Piece-Rate*; men: 6.66, women: 7.64, p=0.009 in *Tournament*), marginally higher in *Choice-Cash* (men: 8.67, women: 9.39, p=0.069), and higher, but not significantly so, in *Choice-ChildrenVoucher* (men: 8.65, women: 9.18, p=0.199). Men and women were equally underconfident, guessing that their opponents would answer one more question correctly than

they themselves did (men: -1.25, women: -1.30 p=0.933). Elicited measures of risk tolerance and willingness to pay for the voucher were similar between men and women.

Table A1 shows age, years of education, and income by sex and the uncontrolled t-tests of sex differences. Men were on average older than women, and earned more income, although there were no significant differences in years of education.

Togo. The sample from Togo, West Africa, was collected in two waves in June-August 2016 and December-January 2017. The first wave consists of 243 subjects, 117 women and 126 men from Lomé (88 parents and 155 non parents), recruited through public announcements via radio and schools. They participated in 15 sessions. The second wave, comprised of 183 subjects, 94 females and 89 males, all parents, was intended to target a special a population: the Nana Benz.[8]

For these experiments we employed two types of child benefitting vouchers: one for school supplies and another for children's clothing (as not all parents had children in school). By recruiting non-parents, in addition to parents, in the first wave we were able to perform a placebo test: men and women who do not have children should not be differentially incentivized by the voucher for children relative to cash. The experiment was conducted paper and pencil, with participants having to solve three two-digit additions within three minutes. Risk attitudes were elicited through the Unitary Lottery method, asking subjects to choose one among six possible lottery choices, ranging from 1 (risk averse) to 6 (very risk tolerant). To measure men and women's valuation of the voucher, we asked a survey question about how much they valued the non-monetary rewards, as the WTP instrument was found too cumbersome by many in this subject pool.

Figures A2a-A2c in the Appendix report, separately for each subsample, the subjects' characteristics, performance in each treatment, risk tolerance, valuation of the voucher and confidence by sex. The data indicate no differences in the performance of men and women in any of the subsamples or for any of the treatments. Similarly, for confidence, none of the

[8] The Nana Benz's rise to power was tied to their economic fortunes made by trading textiles at the "Assigame", the "Grand Market" of Lomé. Their name is due to the fact that from the mid-50's through the 80's they were so successful, that they were the only people in Togo who could afford Mercedes Benz vehicles, so much so that the government used to rent their cars for important guests and state functions. The term 'Nana Benz' came then to symbolize the freedom, ingenuity, creativity, pride, achievement, success, and courage of these women whose raise to power was not through inheritance, but through their skills (Cordonnier, 1982).

differences were significant. Parents and non-parents had roughly equal valuation of the vouchers. The only differences between the sexes are found with respect to risk, with parents showing similar level of tolerance, while men without children showed significantly more tolerance than women without children (men: 2.43, women: 1.92, p=0.039). Interestingly, for the Nana Benz sample we found the opposite, with women displaying somewhat higher risk tolerance than men (men: 4.11, women: 4.45, p=0.060) and lower valuation of the voucher (men: 3.25, women: 1.61, p=0.004). Table A2a-A2c show age and education by sex for each subsample, as well as uncontrolled t-tests of the sex differences. Men were older and more educated than women in all three subsamples, although the age difference was not statistically significant for the non-parents and for the Nana Benz.

Sierra Leone. This sample consists of 135 individuals from fourteen villages randomly selected within two randomly selected provinces (Northern and Eastern) of Sierra Leone. Within each village, every third household in randomly selected neighborhoods was invited to participate. The experiment was conducted in May-August 2018. The full design for this site included both competition and cooperation games played against a series of characters in a person's network and included both individuals that were severely affected by the recent civil war and those who were not. For this study, to keep the sampling strategy as comparable as possible to the other sites, we include in the analysis only the rounds of competition games played against an anonymous other person from the same village and exclude those victimized (we refer to Cassar et al. (2020) for the study of the effect of war victimization on competitive preferences).

Given the relatively low level of literacy, the experiment was carried out one-on-one with the enumerator (rather than paper and pencil as in the other sites) and the task was modified to resemble a quotidian function performed by people during economic transactions: mental summation of a series of numbers, starting with one digit and adding only one-digit number to the previous total (e.g. 1+8=9, 9+3=12, 12+2=14, etc…), which also allowed those who struggled arithmetically to easily count up to the answer with their fingers. Risk tolerance was elicited using the Unitary Lottery and valuations of the non-monetary rewards through the WTP instrument. In Sierra Leone, we employed two types of non-cash prizes: one intended to benefit children (a set of children's goods and school supplies that could be bought in the experimental store) and one gender specific (rain slippers for men, lapa scarfs for women).

Figure A3 displays our sample's characteristics, performance in each treatment, risk tolerance, willingness to pay for each voucher and confidence by sex. The results show that men had higher ability than women under all treatments, similar level of risk tolerance and confidence, and significantly lower willingness to pay for either voucher (men: 4.55, women: 5.77, p=0.044 for the children voucher; men: 5.189, women: 6.79, p=0.009 for the gender-specific voucher). Table A3 shows age, education, and two proxy measures for poverty by sex, as well as the uncontrolled t-tests of sex differences. Men were older and more educated than women, but there the differences in the measures of poverty were not statistically significant.

Bosnia. The Bosnia sample consists of 119 subjects, 62 male and 57 female college students from Banjaluka, Republic of Srpska, Bosnia and Herzegovina. The subjects were recruited via email by inviting a random sample of 80 men and 80 women out of a pool of 300 potential subjects who initially responded to advertisements posted at the University of Banjaluka. The study was carried out over 4 sessions in June-July 2016.

The experiment was conducted using paper and pencil utilizing the 5 two-digit number addition task (e.g. 32+16+22+46+12=?). Given the high level of education, the MPL was administered to elicit risk preferences and the WTP instrument was employed to estimate individuals' valuation of the voucher. For this subject pool of non-parents, we employed two types of vouchers: a gender-neutral voucher (a gift certificate for a restaurant near the university), and a gender-specific voucher (for male subjects a coupon to spend in a sporting goods store mainly for soccer gears; for female subjects a coupon for a renowned cosmetics store).

Figure A4 and Table A4 report the subjects' characteristics, performances in each treatment, confidence, risk tolerance and willingness to pay for each voucher. With respect to the sociodemographic characteristics, we observe no significant differences between males and females in terms of age, education and income. With respect to performance, confidence and valuation of the vouchers, the uncontrolled t-tests show similar rates between males and females. The only statistically significant difference between males and females is in risk tolerance, with male subjects in the sample significantly more risk tolerant than female ones (men: 10.71, female: 8.91, p=0.013).

Colombia. The sampling strategy in Colombia shares the same design as the one in China, to test whether those initial results would replicate in an environment of greater economic scarcity, adversity and lower education. The sample includes 191 subjects from Medellin, 118 mothers and 73 fathers, recruited from 6 schools randomly selected among those in the lowest income stratification. The project was facilitated by the Medellin Secretary of Education. The experiment run over 14 two-hour sessions during May-August 2016. To accommodate subjects with low level of education, we reduced the number of two-digits to add to 4 (e.g. 45+30+65+95=?). Instead of the more complex MPL, we implemented the Unitary Lottery to elicit risk preferences. To obtain individual measures of how valuable the voucher was, we implemented the WTP protocol, but, since it turned out to be very difficult for the subjects to fully grasp, in the analysis we include, instead, answers to the simpler question of how helpful the voucher is to them. In this site, the child-benefitting voucher was in the form of tokens redeemable at their child's school cafeteria ('tienda"). With these tokens, the children could buy snacks, drinks, and cooked items like empanadas. To ensure the children could not trade the tokens with others, the parents' names were placed on the back of each token.

Figure A5 and Table A5 report the subjects' characteristics, performances in each treatment, confidence, risk tolerance and valuation of the voucher. Men performed better than women in all four rounds of the competition game, and, unsurprisingly, were much more confident than women (men: 0.41, women: -2.37, p=0.002). Still, male and female subjects revealed similar preferences toward risk and lower, but insignificantly so, valuation for the voucher for children's goods. Men were older and earned more income than women, but the sex difference in years of education was not statistically significant, similar to the pattern in the China sample.

6. Results

We first analyze the results from China, Bosnia, Togo, Sierra Leone, and Colombia, individually. We start with estimating the following model for each country:

$$y_i = \alpha + \delta Female_i + \sum_{j=1}^{J} \beta_j X_{ij} + \epsilon_i$$

where y_i is an indicator variable equal to 1 if subject i chooses the tournament payment scheme when the payment is made in cash and equal to 0 if the subject chooses the piece-rate payment scheme. Following the literature, the coefficient of interest, δ, indicates the residual gender difference in the willingness to compete for cash after controlling for better understood determinants of tournament entry: the X_{ij}s are performance in compulsory tournament, as measured by the number of correct answers given by subject i, risk tolerance, as measured by subject i's response in the risk instrument, and confidence, as proxied by the number of correct answers given by subject i in the compulsory tournament round minus subject i's guess of the number of correct answers given by his or her opponent. The linear probability model is used throughout the analysis in order to facilitate comparison with the findings from fixed effects regressions, discussed below, where non-linear models suffer from the incidental parameters problem. The results can be found in Table 1 under the heading "Cash" for each country.

Next, we estimate a similar model for each country, except y_i refers now to the choice of tournament versus piece-rate payment scheme when the payment form is the voucher. In this specification we add an additional control: the subject's valuation of the voucher as measured using a WTP instrument or a survey question. These results are reported in Table 1 under the heading "Voucher" for each country.

To test whether the gender gap in willingness to compete changes when the payment is vouchers versus cash, we restructure the data as a panel and estimate the following fixed effects regression:

$$y_{it} = \beta_0 Treatment_t + \delta Female_i \times Treatment_t + \sum_{j=1}^{J} \beta_j X_{ij} \times Treatment_t + a_i + \epsilon_{it}$$

where y_{it} indicates whether subject i chose the tournament payment scheme (=1) or the piece-rate payment scheme (=0) in treatment t. $Treatment_t$ equals 1 if the payment is made in the form of the voucher and 0 if the payment is in cash. The coefficient of interest, δ, indicates whether women increase their willingness to compete relative men in the voucher treatment relative to the cash treatment. The X_{ij}s are the control variables mentioned above: tournament round performance, risk tolerance, confidence, and valuation of voucher. We include the interaction of the control variables with treatment in order to allow more flexibility in the impact

of the control variables on the outcome variable, specifically, to allow the impact to differ across treatment. The results of this estimation are reported in Table 1 under the heading "Panel" for each country.

Importantly, because the voucher is generally valued at a cash equivalent that is substantially lower than its face-value, any within gender changes in the willingness to compete for cash versus vouchers will not be meaningful on its own, and hence we focus on the differences in the gender gap in willingness to compete across the cash and voucher treatments.

Note that raw rates of choosing the tournament payment scheme by gender and by incentive type for each country are displayed in Figures 1-5.

6.1 Sites Reproducing Gender Gap in Willingness to Compete for Cash

We first discuss the four locations where we were able to replicate the finding in the literature that men are more willing to compete for cash than women: China (Figure 1), Togo (Figures 2a), Sierra Leone (Figure 3) and Bosnia (Figure 4).

In China, Togo and Sierra Leone, we test the maternal investment domain hypothesis (Hypothesis 1), using subjects who are parents.[9] Referring to Table 1 Panel a, in China we find that when the competition was for cash, fathers were 11.6 percentage points more willing to choose the tournament payment scheme than mothers, a difference which is statistically significant at the five percent level (Column 1). However, when the payment was in the form of a voucher for their children (Column 2), the gender gap reduced to 1.5 percentage points. The difference in the gender gap across the cash and voucher treatments (Column 3) is 9.7 percentage points, statistically significant at the five percent level. Note that all panel fixed effects specifications include controls for tournament round performance, risk preference, confidence, and valuation of the voucher, and the interactions of the voucher treatment with each of the control variables. The estimated coefficients on these control variables are suppressed to aid readability. These findings support Hypothesis 1 – mothers, relative to fathers,

[9] Data from the China site have already been published (Cassar, Wordofa and Zhang, 2016), but we include them here because our study is a cross-cultural investigation of the theoretical framework advanced, for which each site is included to contribute a specific element designed to test the predictive power of the theory. Furthermore, this multi-country effort supports the goals of the replicability movement and contributes to the body of evidence from non-WEIRD countries in order to further our understanding of the foundations of human behavior.

are more competitive when the competition is in the domain of maternal investment than in the standard domain of cash.

In Togo, using a sample drawn from a typical patriarchal population, we similarly find that fathers were more willing to choose the tournament payment scheme than mothers with cash incentives (see Table 1 Panel c, Column 1). The gender gap is 19.5 percentage points, significant at the ten percent level. When the incentive is in the form of a voucher for their children, the gender gap reduces to 10.9 percentage points (Column 2). The difference in the gender gap across the cash and voucher treatments is 12.2 percentage points (Column 3). Due to the smaller sample size, the difference in the gender gap is not statistically significant, even though it is similar in magnitude as that found in the China sample. An alternative interpretation of the findings is that women are more willing to compete when it benefits other people than when it benefits themselves, as suggested by the finding in the bargaining literature that women bargain harder on behalf of others than for themselves (Bowles et al., 2005). To address this concern, in Togo we additionally conducted a placebo experiment where we used subjects who were non-parents. While we would still expect men to be more willing to compete than women for cash, for those without children, the theory does not predict a change in the gender gap when the incentive becomes a voucher for children. This is exactly what we find. The gender gap with cash incentives (Column 4) is 16.2 percentage points, statistically significant at the five percent level, and the gender gap with the child voucher (Column 5) is 14.6 percentage points. The magnitude of difference in the gender gap across the two treatments is 0.8 percentage points (Column 6). The findings of the main and placebo experiments indicate that while mothers are more willing to compete for vouchers for their children than cash (relative to fathers), women without children do not respond differently to the children's vouchers than men without children.

In Sierra Leone, we again find fathers to be more competitive than mothers for cash, by 12.8 percentage points, significant at the ten percent level (Table 1 Panel d, Column 1). When the incentive is in the form of a voucher for their children, the sign of the gender gap is flipped, with mothers being 3.2 percentage points more willing to compete than fathers (Column 2). The difference in the gender gaps is 17 percentage points, significant at the ten percent level (Column 3). These findings combined with the above findings from Togo provide further support for Hypothesis 1.

In Bosnia, we test Hypothesis 2 – that women compete more (relative to cash and relative to men) for a prize that conforms to femininity norms. Our sample consisted of young people without children. We find that men were more likely to compete than women for cash by 26.1 percentage points, significant at the one percent level (Table 1 Panel b, Column 1). However, when the incentive was a voucher for a gender stereotypical good (makeup for women and sporting goods for men), the gender gap reduced to 17.3 percentage points, significant at the 10 percent level (Column 2). The change in the gender gap is 11.8 percentage points (Column 3). Although it is not statistically significant due to the small sample size, the magnitude of the change is similar to the magnitude of the change associated with the child voucher in China (9.7 percentage points) and Togo (12.2 percentage points). We additionally conducted a placebo treatment to test whether women simply shy away from competing for cash, and are more likely to compete for vouchers of any type. In the placebo treatment, a gender-neutral voucher (for restaurant dining) was used. In this treatment, men were more willing to compete than women, by 25.8 percentage points, significant at the one percent level. The difference in the gender gap across the cash treatment and the gender-neutral voucher treatment is 1.8 percentage points, in the opposite direction as that in the previously discussed results. The placebo treatment findings suggest that a generic voucher will not raise women's willingness to compete. Taken together, results from Bosnia support Hypothesis 2.

In Sierra Leone, we included an additional voucher treatment in which the voucher was for gender stereotypical goods (scarves for women and sandals for men) to test the strength of the maternal investment domain against the strength of conformity to femininity norms. The theory does not explicitly predict which effect would be stronger, however, given that the subjects were mothers and fathers, our prior was that the maternal investment domain would have a stronger impact. Recall that the gender gap in willingness to compete for cash was 12.8 percentage points, significant at the ten percent level (Table 1 Panel D, Column 1). Using the gender stereotypical goods, the sign of the gender gap flipped, with women 6.6 percentage points more willing to compete than men (Column 4). The difference in the gender gap across the cash treatment and the gender stereotypical voucher treatment is 16.1 percentage points, significant at the ten percent level (Column 5). This is very similar in magnitude to the difference in the gender gap across the cash treatment and the voucher for children (Column 3). Therefore, we do not find support for our prior that competing in the maternal investment domain has a

stronger effect than competing for a prize that conforms to femininity norms for our population of parents.

We next test the broader predictions of the theory we have advanced - that women face different tradeoffs than men do, whether it is between competing for cash resources and competing to improve the outcomes of their children, or between competing for cash resources and competing to attract the best mates. To this end we combine the data across different sites and test whether the voucher treatments designed to be in the maternal investment domain or to allow for conformity to femininity norms have an impact on the gender gap in the willingness to compete in the predicted direction. These vouchers will be referred to as "treatment vouchers," in contrast to "placebo vouchers" which are vouchers that are not expected to impact the gender gap in willingness to compete, according to the theory. Analogous to the analysis for individual countries, we first establish whether a gender gap exists in the willingness to compete in cash and voucher treatments in the combined data. We estimate the following model, where we allow the impact of the control variables to differ across experimental sites:

$$y_{is} = \delta Female_{is} + \sum_{j=1}^{J} \sum_{s=1}^{S} \beta_{js} X_{isj} \times Site_s + \sum_{s=1}^{S} \beta_{0s} Site_s + \epsilon_{is}$$

where y_{is} is the outcome variable indicating whether subject i chose the tournament payment scheme (=1) or the piece-rate payment scheme (=0). As before, δ is the coefficient of interest. The X_{isj}s are tournament round performance, risk tolerance, confidence when cash incentives are used, and the X_{isj}s additionally include willingness to pay for the voucher when the experimental payment is in the form of a voucher. $Site_s$ are dummy variables for each experimental site. It is particularly important to include the interaction of the X_{isj}s with $Site_s$ because of the differences in the way in which risk preferences and valuations of the vouchers were collected across sites, and the differences in the addition task across sites, as discussed in the Experimental Design section. The results of this estimation is reported in Table 2, under the column headings of "Cash" and "Voucher."

We then test the predictions of the theory by estimating the following fixed effects model:

$$y_{its} = \beta_0 Treatment_t + \delta Female_i \times Treatment_t + \sum_{j=1}^{J} \sum_{s=1}^{S} \beta_{js} X_{isj} \times Treatment_t \times Site_s + a_i + \epsilon_{its}$$

where y_{its} indicates whether subject i chose the tournament payment scheme (=1) or the piece-rate payment scheme (=0) in treatment t in site s. $Treatment_t$ equals 1 if the payment is made in the form of the voucher and 0 if the payment is in cash. The coefficient of interest, δ, indicates whether women increase their willingness to compete relative men in the voucher treatment relative to the cash treatment. The X_{isj}s are the control variables tournament round performance, risk tolerance, confidence, and willingness to pay for the voucher. By including the triple interaction of the control variables with $Treatment_t$ and with $Site_s$, we allow the impact of the control variable to differ across treatment and across experimental site. The results of this estimation are reported in Table 2 under the heading "FE Panel."

The experimental sites included in the combined "treatment voucher" analysis are China, Bosnia (gender stereotypical voucher), Togo (parent subjects), and Sierra Leone (voucher for children). Referring to Table 2 Panel A, we find that in the combined data men are 15 percentage points more willing to compete for cash than women, significant at the one percent level (Column 1). When the form of payment is a "treatment voucher," we do not find a statistically significant gender gap in the willingness to compete – the magnitude of the coefficient on female is 4.1 percentage points (Column 2). The difference in the gender gap across the cash and "treatment voucher" treatment is 11.6 percentage points, significant at the one percent level (Column 3).

For the "placebo voucher" analysis we include data from Bosnia (gender neutral voucher) and Togo (non-parent subjects). Referring to Panel B of Table 2, we find that with cash incentives men are 20.5 percentage points more willing to compete than women, significant at the one percent level (Column 1). When the payment is a "placebo voucher," men remain statistically significantly more willing to compete than women, by 17.7 percentage points, significant at the one percent level (Column 2). We do not find a statistically significant difference in the gender gap between the cash treatment and the "placebo voucher" treatment – the magnitude of the coefficient on the interaction of female with treatment is 1.2 percentage points (Column 3). The evidence consistently show that vouchers reduce the gender gap in

willingness to compete as seen with cash incentives only when the vouchers relate to the maternal investment domain or allow for conformity to femininity norms, and not when vouchers are generic or inappropriately targeted as when non-parents are incentivized with vouchers for children. The finding that men and women respond differently to competitive situations where the competition is for cash versus when the competition is for vouchers framed as an evolutionary benefit is consistent with the theory that differentiates male and female evolutionary strategies.

6.2 Sites Not Reproducing the Gender Gap in Willingness to Compete for Cash

In two experimental sites we did not find evidence replicating the literature finding that men are more willing to compete than women with cash incentives. In Colombia (Figure 5), where the subjects were parents, we found no gender difference in the willingness to compete for cash (Table 3 Panel A). The only other evidence from Colombia in the literature of which we are aware was conducted with school children, and found no gender differences in the willingness to compete for points that could be exchanged for school supplies (Cardenas et al., 2012). In Togo, in a second wave of data collection in which we recruited only from the Nana Benz population (Figure 2c), we found women to be 24.7 percentage points more willing to compete than men for cash, significant at the one percent level (Table 3 Panel B). This is one of the only findings in the world of a population where women are statistically significantly more willing to compete than men, and the magnitude of the "reverse" gender gap is one of the largest if not the largest in the literature (see Dariel et al. (2017) for a review).

In both Colombia and with the Nana Benz of Togo, we found the voucher treatment to have had no impact – the gender gap or lack thereof in willingness to compete for cash was also found when the incentive was in the form of a voucher for children (Table 3, Panel A and B, Columns 2 and 3). We offer one interpretation of these findings below, although we acknowledge that it is not the only interpretation and further research will be necessary to test this explanation. According to the theoretical framework, women face a tradeoff between competing for cash resources and competing for other evolutionary benefits that men do not face or face to a lesser extent. The maternal investment and conformity to femininity norms frames can reduce or eliminate the perceived tradeoff, by allowing women to also achieve these other evolutionary beneficial goals through entering the competition, and thus the gender gap

revealed in the voucher treatment approaches the gender gap in willingness to compete if women did not face the tradeoff. In most cases this reduces the gender gap in the willingness to compete, because women's willingness to compete approaches that of the men's, who do not face the tradeoff, or face it to a lesser extent. The rare cases where women are not less willing to compete than men for cash may be an indication that, possibly for cultural reasons, women do not face a greater tradeoff than men do in these societies. In these cases, the voucher treatment will be ineffectual, as women's willingness to compete is already at the level it would be in the absence of a tradeoff. Again, further research, especially in populations where women are as or more willing to compete for cash than men, will be necessary to evaluate the merits of this explanation.

Final Discussion

Women can have babies, men cannot. Yet, for most of human history, contributions from both mothers and fathers (and others!) were necessary for children to reach maturity. The need to produce successful offspring, well prepared to navigate adult life in their society, is at the origin of both biological and cultural explanations of the behavioral differences between the sexes. While explanations based on nature refer to the biological structures and processes and explanations based on nurture refer to the sociocultural influences, crossing the nature-nurture boundaries offers a promising path for understanding sex differences in behavior.

In this paper, we advance a theoretical framework grounded in evolutionary psychology to explain the gender gap in competitiveness found in many economic experiments. Like all living creatures, humans have evolved facing life tradeoffs. Women's psychology has been shaped by the need to optimally allocate resources of time and energy between three competing interests: acquiring resources to provide for children, finding/retaining mates, and maintaining allies. For men the world over, from hunter-gatherer societies to post-industrial democracies, on the contrary, the successful acquisition of material resources and the achievement of high status in society appear to procure success in all three spheres (providing for children, finding/maintaining mates, securing allies). As shown by the studies described in the previous sections, psychologists have documented important asymmetries between the sexes: women find cues to resource acquisition (such as earning capacity and behavioral traits related to the ability to successfully compete in the social, economic and political arena) more attractive in a prospective mate than men do. With intra-sex competition based on things that matter to the

opposite sex, women have been found to strategically downplay such ambitions. Women who reach high status and popularity pay a price on the domestic front by having higher rates of divorce and by being less liked by their female friends, while, on the contrary, high status men are admired and prized as coveted coalition partners by other men.

Yet, the benefits to having resources is so critical for reproductive success that there are no reasons to expect that women should be less competitive than men. Where men and women may differ is in the modalities in which that behaviour gets expressed and an evolutionary psychology approach could help predict which determinants should matter. Then, the specifics of the local environment, from the level of economic development to its cultural norms, would further shape the details of the expression of such trait, as specific response to local constraints. Here, we focus on one such determinant: making the domain of competition explicit as either benefitting one's children (if the subjects are parents) or in line with local femininity/masculinity norms. In these spheres, crucial to female evolved concerns, women's competitiveness may be triggered above the level reserved for anonymous generic interactions. In our experiments we first replicate the standard design using cash as reward medium and obtain, for most samples but not for all, the usual result that women enter competitive environments less than men. Then, depending on the sample, we introduce incentives that are not culturally charged as local domains of male-male competitions, but are comprised of vouchers for commodities that matter to women, from children school supplies to beauty products, i.e. we change the frame of the domain of competition. Under these new frames, we observe a significant change in women's elicited desire to compete and a vanishing of the gap (in the samples that presented one in the cash case). These results suggest that women are not less competitive than men in general. In fact, once we include in the experimental protocols elements that matter to them, behavioral gaps can disappear.

For experimental economists, the use of cash to incentivize subjects in experiments is considered the standard protocol. Our work suggests that using cash may not always be perceived as a "neutral" frame for eliciting behaviour, but rather, it may be suggestive of anonymous market interactions, which, in certain cultures, may bias downward women's true willingness to compete as it interferes with deep-seated gender differences in mating and parenting strategies. From a broader scientific perspective, if we elicit willingness to compete with methods that favor the observation of male expressions of a trait, we might miss out on

the other ways in which that trait is expressed, namely by females, and erroneously conclude that one sex has more of it than the other.

One may then argue that the cash frame is the relevant one to understand women behavior in real world labor market situations. We agree. Yet, real world jobs are characterized by many other features besides monetary rewards, such as: the task itself, education required, experience, number of hours, rigid hours vs. flexibility in the schedule, to name a few. Our work, by showing that women's competitiveness responds significantly and systematically to the types of incentives, suggests the rewards and job characteristics could be translated into labor contracts that better address labor market inequalities. Quality day care (even on site in large companies), benefits in the form of vouchers for schools of choice, flexible schedule, paid family leave, and so forth could all induce more women to enter and thrive in competitive workplace situations. In other words, policies better suited to close the gap should be focusing on changing the system, rather than on trying to change women (e.g. LeanIn). With women still earning less than men and vastly underrepresented in positions of power and leadership, this topic is timely and relevant and recognized as of our generation's pressing challenges.

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Tables and Figures

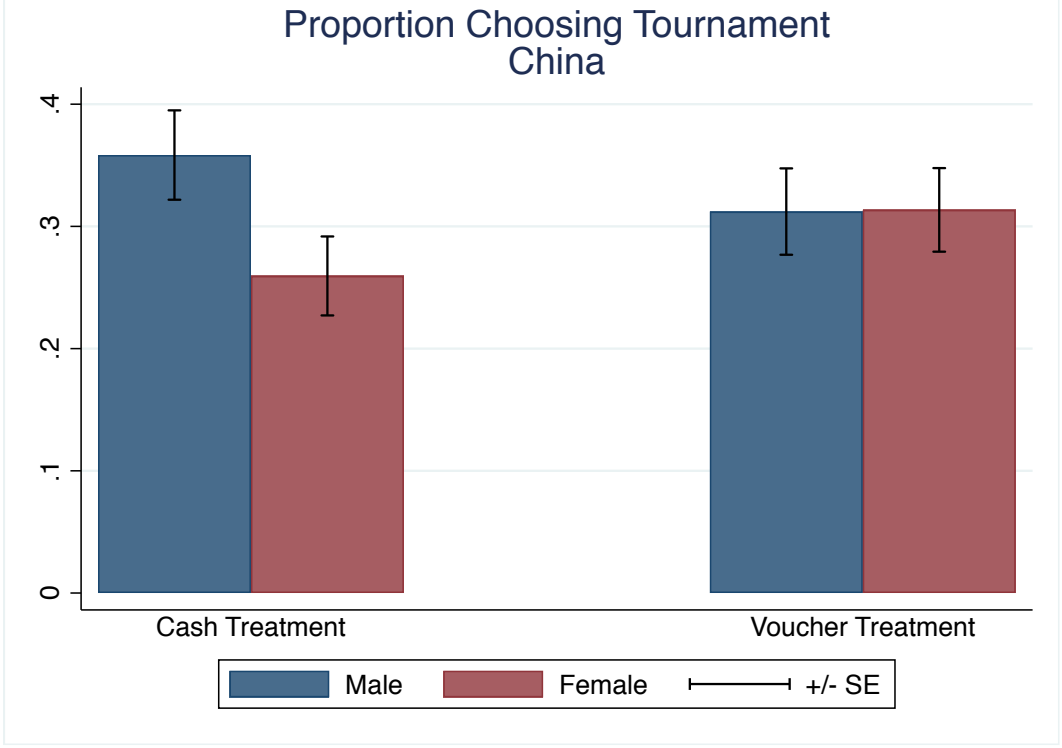

Figure 1. **Tournament entry decision – China.** Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash* and *Choice-ChildrenVoucher*. Error bars represent mean +/- SE. Under *Choice-Cash*, the 10 percentage point gender difference in tournament entry is significant (men: 0.36, women: 0.26, p=0.043) but it disappears under *Choice-ChildrenVoucher* (men: 0.31, women: 0.31, p=0.978).

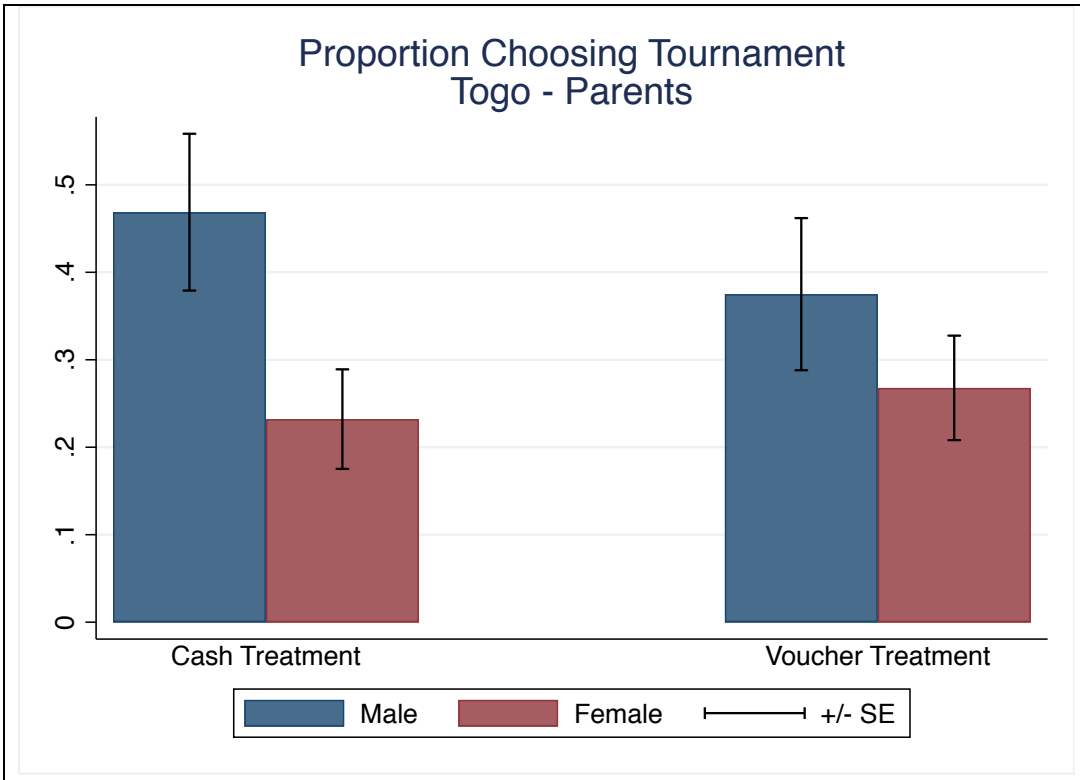

Figure 2a. **Tournament entry decision: Togo Parents**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash* and *Choice-ChildrenVoucher*. Error bars represent mean +/- SE. Under *Choice-Cash*, the 24 percentage point gender difference in tournament entry is significant (men: 0.47, women: 0.23, p=0.022) but it diminishes to 11 percentage points and its significance disappears under *Choice-ChildrenVoucher* (men: 0.38, women: 0.27, p=0.300).

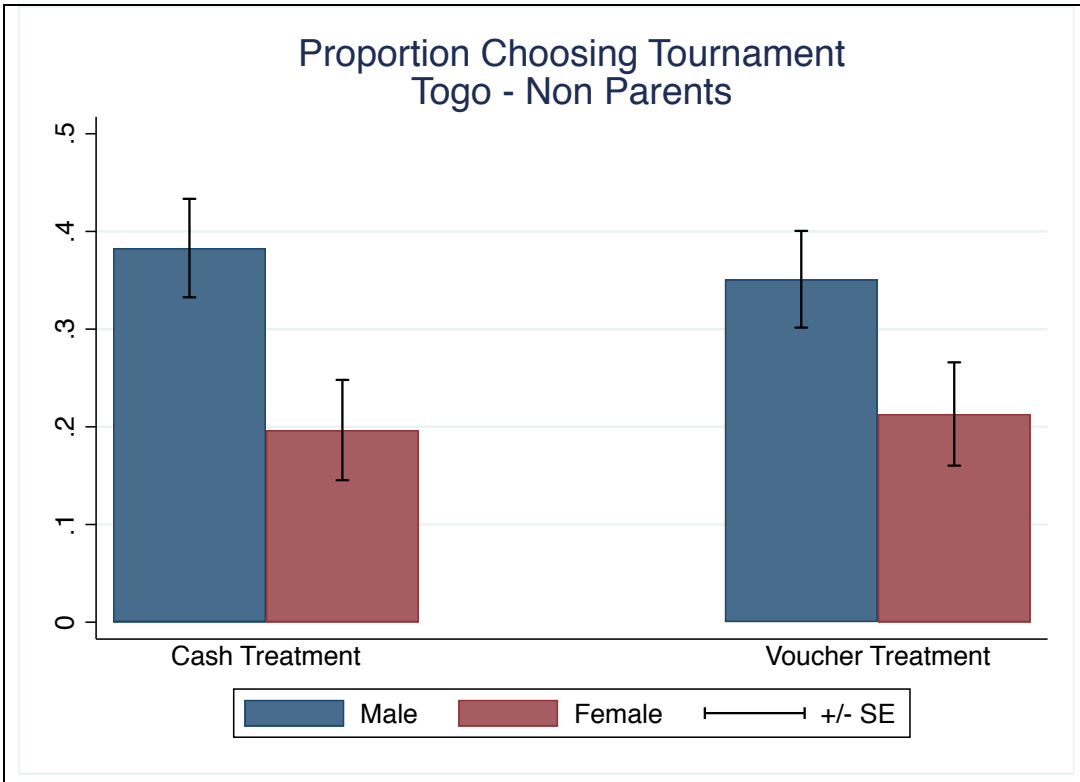

Figure 2b. **Tournament entry decision: Togo Non Parents**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash* and *Choice-ChildrenVoucher*. Error bars represent mean +/- SE. Under *Choice-Cash*, the 18 percentage points gender difference in tournament entry is significant (men: 0.38, women: 0.20, p=0.014), but it remains similar under *Choice-ChildrenVoucher* (men: 0.35, women: 0.21, p=0.067).

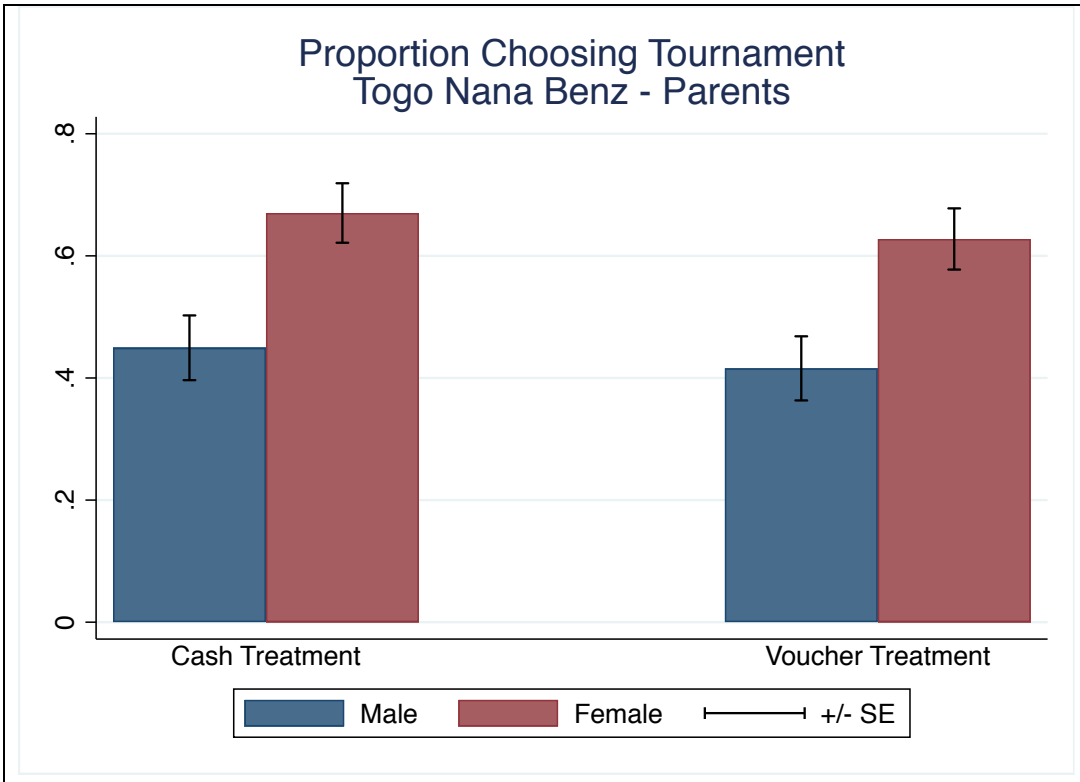

Figure 2c. **Tournament entry decision: Nana Benz**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash* and *Choice-ChildrenVoucher*. Error bars represent mean +/- SE. For this population of economically empowered women, the gender gap reverses: there is a negative and significant 22/21 percentage points opposite gender difference in tournament entry under both *Choice-Cash*, (men: 0.45, women: 0.67, p=0.002) and *Choice-ChildrenVoucher* (men: 0.42, women: 0.63, p=0.004).

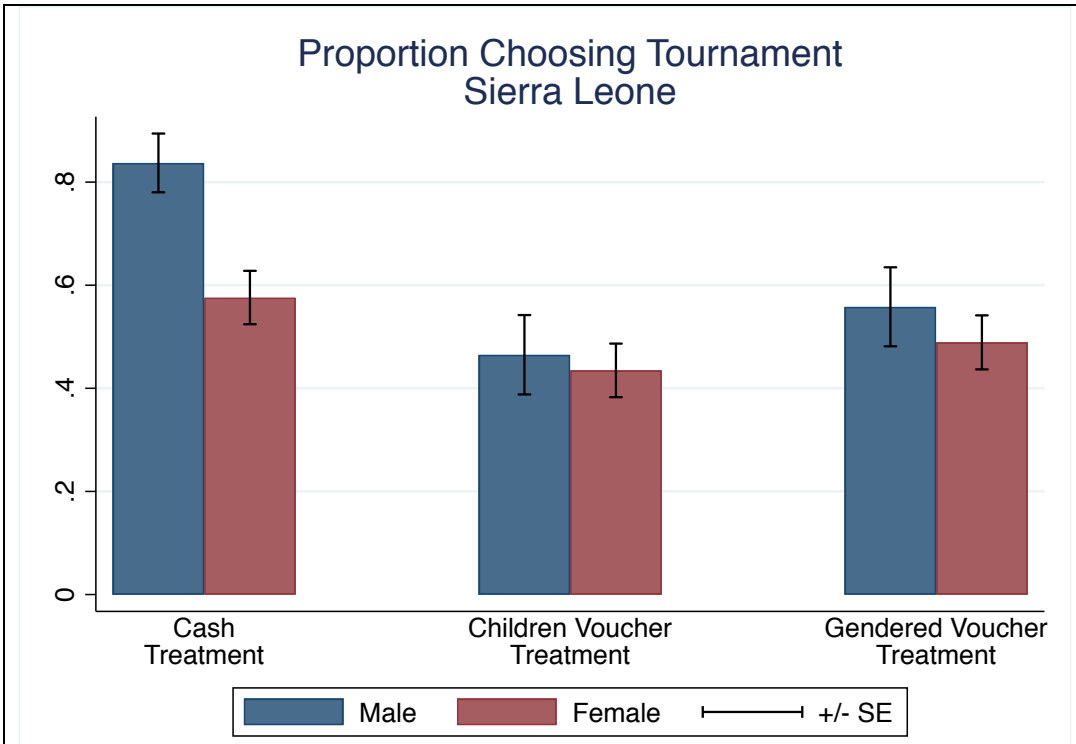

Figure 3. **Tournament entry decision: Sierra Leone.** Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash*, *Choice-ChildrenVoucher* and *Choice-GenderedVoucher*. Error bars represent mean +/- SE. Under *Choice-Cash*, the 26 percentage points gender difference in tournament entry is significant (men: 0.84, women: 0.58, p=0.003), but it vanishes to 3 percentage points under *Choice-ChildrenVoucher* (men: 0.47, women: 0.44, p=0.743) and to 7 percentage points under *Choice-GenderedVoucher* (men: 0.56, women: 0.49, p=0.459).

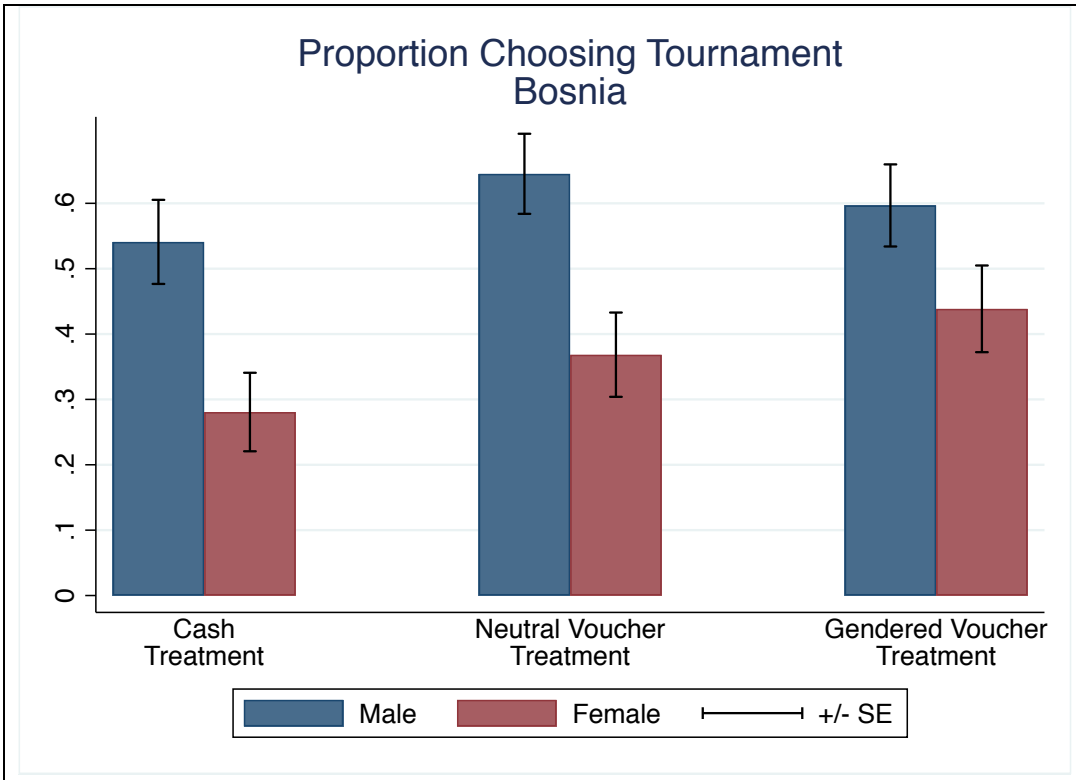

Figure 4. **Tournament entry decision**: **Bosnia.** Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash, Choice-NeutralVoucher* and *Choice-GenderedVoucher*. Error bars represent mean +/- SE. Under *Choice-Cash*, the 26 percentage point gender difference in tournament entry is significant (men: 0.54, women: 0.28, p=0.004), it remains 28 percentage points and significant under *Choice-NeutralVoucher* (men: 0.65, women: 0.37, p=0.002), but it shrinks in half and loses significance under *Choice-GenderedVoucher* (men: 0.60, women: 0.44, p=0.086).

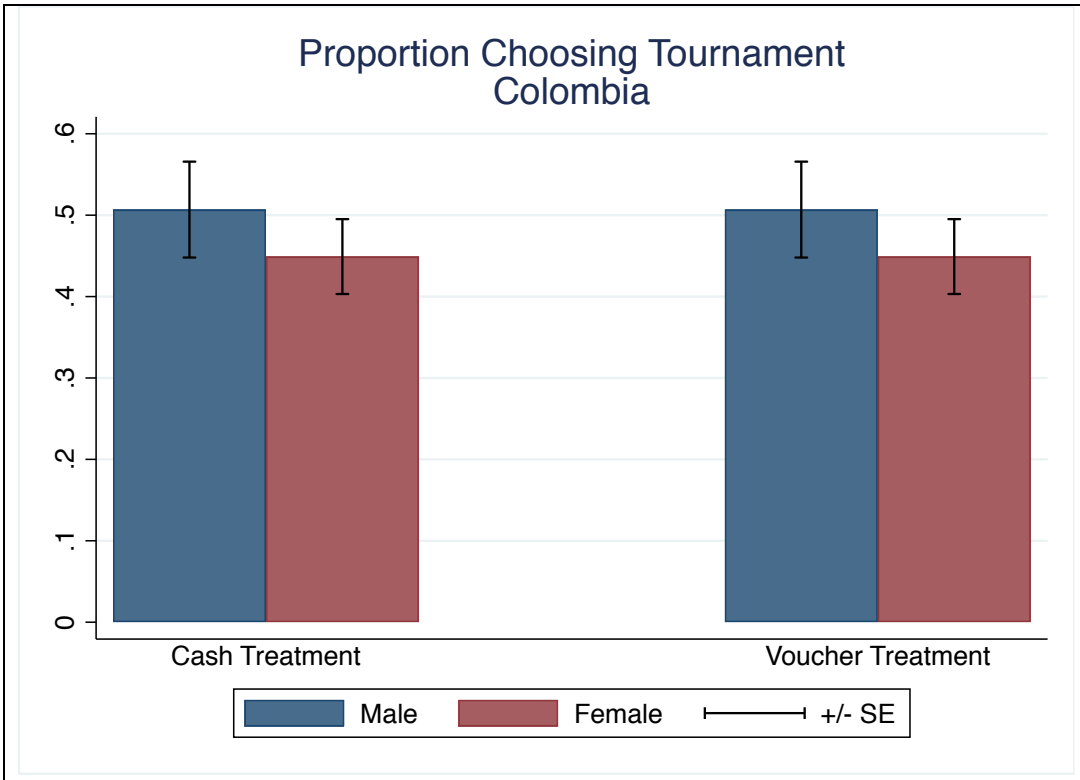

Figure 5. **Tournament entry decision: Colombia**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Choice-Cash* and *Choice-ChildrenVoucher*. Error bars represent mean +/- SE. Results are virtually identical, under both *Choice-Cash* and *Choice-ChildrenVoucher* the 6 percentage point gender difference in tournament entry is not significant (men: 0.51, women: 0.45, p=0.44).

Table 1

Panel A

Shanghai

	(1) Cash	(2) Voucher - Child	(3) FE Panel (Voucher)
Female	-0.116**	-0.015	-
	(0.047)	(0.048)	
Voucher	-	-	-0.061
			(0.059)
Female*Voucher	-	-	0.097**
			(0.046)
Compulsory Tr Score	0.016**	0.020***	-
	(0.007)	(0.007)	
Risk Tolerance	0.006**	0.003	-
	(0.003)	(0.003)	
Confidence	0.010***	0.006	-
	(0.003)	(0.004)	
WTP for voucher	-	0.007**	-
		(0.003)	
Constant	0.201***	0.077	0.308***
	(0.068)	(0.070)	(0.011)
Observations	357	357	714
Number of individuals			357

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. All subjects are parents.
(1) OLS regression; incentive is cash. (2) OLS regression; incentive is voucher for children. (3) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children.

Panel B

Bosnia

	(1) Cash	(2) Voucher - Gendered	(3) FE Panel	(4) Placebo voucher	(5) FE Panel (Placebo)
Female	-0.261***	-0.173*	-	-0.258***	-
	(0.088)	(0.091)		(0.091)	
Voucher	-	-	-0.070	-	0.019
			(0.234)		(0.243)
Female*Voucher	-	-	0.118	-	-0.018
			(0.107)		(0.121)
Compulsory Tr Score	-0.011	-0.008	-	0.013	-
	(0.014)	(0.017)		(0.016)	
Risk Tolerance	0.008	0.007	-	0.011	-
	(0.013)	(0.013)		(0.013)	
Confidence	0.066***	0.064***	-	0.012	-
	(0.017)	(0.023)		(0.022)	
WTP for voucher	-	0.011	-	0.001	-
		(0.009)		(0.009)	
Constant	0.566***	0.505**	0.421***	0.423**	0.416***
	(0.179)	(0.202)	(0.026)	(0.204)	(0.026)
Observations	117	118	235	118	235
Number of individuals			118		118

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. All subjects are young people, non-parents.
(1) OLS regression; incentive is cash. (2) OLS regression; incentive is gender stereotypical voucher. (3) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the gender stereotypical voucher. (4) OLS regression; incentive is gender neutral voucher. (5) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the gender neutral voucher.

Table 1 Cont'd

Panel C

	Togo					
	(1) Cash	(2) Voucher - Child	(3) FE Panel (Voucher)	(4) Placebo - cash	(5) Placebo - voucher	(6) FE Panel (Placebo)
Female	-0.195*	-0.109	-	-0.162**	-0.146*	-
	(0.102)	(0.109)		(0.076)	(0.078)	
Voucher	-	-	0.040	-	-	0.188
			(0.180)			(0.125)
Female*Voucher	-	-	0.122	-	-	0.008
			(0.086)			(0.074)
Compulsory Tr Score	0.028	0.015	-	0.026	-0.009	-
	(0.019)	(0.021)		(0.016)	(0.017)	
Risk Tolerance	0.056*	0.017	-	0.049*	0.048*	-
	(0.032)	(0.034)		(0.026)	(0.028)	
Confidence	0.015	0.018	-	-0.002	-0.004	-
	(0.011)	(0.012)		(0.014)	(0.015)	
WTP for voucher	-	-0.005	-	-	0.001	-
		(0.012)			(0.009)	
Constant	0.191	0.284	0.309***	0.101	0.291**	0.295***
	(0.159)	(0.176)	(0.020)	(0.119)	(0.134)	(0.018)
Observations	88	81	162	154	146	292
Number of individuals			81			146

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses.
(1) OLS regression; incentive is cash; all subjects are parents. (2) OLS regression; incentive is voucher for children; all subjects are parents. (3) Fixed effects regression, all subjects are parents; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children. (4) OLS regression; incentive is cash; all subjects are non-parents. (5) OLS regression; incentive is voucher for children; all subjects are non-parents. (5) Fixed effects regression; all subjects are non-parents; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children.

Table 1 Cont'd

Panel D

Sierra Leone

	(1) Cash	(2) Voucher - Child	(3) FE Panel	(4) Voucher - Gendered	(5) FE Panel (Voucher - Gendered)
Female	-0.128*	0.032	-	0.066	-
	(0.074)	(0.095)		(0.097)	
Voucher	-	-	-0.168	-	-0.215**
			(0.118)		(0.099)
Female*Voucher	-	-	0.170*	-	0.161*
			(0.089)		(0.085)
Compulsory Tr Score	0.103***	0.045**	-	0.067***	-
	(0.019)	(0.019)		(0.019)	
Risk Tolerance	-0.024	-0.042*	-	-0.030	-
	(0.019)	(0.023)		(0.023)	
Confidence	-0.015	0.036*	-	0.023	-
	(0.024)	(0.022)		(0.022)	
WTP for voucher	-	0.025**	-	-0.014	-
		(0.012)		(0.013)	
Constant	0.303***	0.081	0.659***	0.223	0.659***
	(0.112)	(0.142)	(0.019)	(0.148)	(0.017)
Observations	135	135	270	135	270
Number of individuals			135		135

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. All subjects are parents.

(1) OLS regression; incentive is cash. (2) OLS regression; incentive is voucher for children. (3) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children. (4) OLS regression; incentive is gender stereotypical voucher. (5) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the gender stereotypical voucher.

Table 2

Panel A

Combined Voucher Experiments
(where gender gap in competition for cash is found)

	(1) Cash	(2) Voucher	(3) FE Panel (Voucher)
Female	-0.150***	-0.041	-
	(0.034)	(0.037)	
Voucher	-	-	-0.063
			(0.057)
Female*Voucher	-	-	0.116***
			(0.035)
Constant	0.304***	0.153**	0.398***
	(0.064)	(0.068)	(0.009)
Observations	697	692	1,383
Number of individuals			692

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. Data include China (incentives are cash and voucher for children), Bosnia (incentives are cash and gender stereotypical voucher), Togo (incentives are cash and voucher for children, subjects are parents), Sierra Leone (incentives are cash and voucher for children).
(1) OLS regression; incentive is cash; controls include interactions of site with tournament round score, risk preferences, and confidence. (2) OLS regression; incentive is voucher; controls include interactions of site with tournament round score, risk preferences, confidence, and willingness to pay for the voucher. (3) Fixed effects regression; controls include triple interactions of site with treatment and with tournament round score, risk preferences, confidence, and willingness to pay for the voucher.

Panel B

Combined Placebo Experiments
(where gender gap in competition for cash is found)

	(1) Cash	(2) Voucher	(3) FE Panel (Voucher)
Female	-0.205***	-0.177***	-
	(0.057)	(0.062)	
Voucher	-	-	0.040
			(0.228)
Female*Voucher	-	-	0.012
			(0.071)
Constant	0.520***	0.427**	0.349***
	(0.169)	(0.191)	(0.016)
Observations	271	255	509
Number of individuals			255

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. Data include Bosnia (incentives are cash and gender neutral voucher) and Togo (incentives are cash and voucher for children, subjects are non-parents).
(1) OLS regression; incentive is cash; controls include interactions of site with tournament round score, risk preferences, and confidence. (2) OLS regression; incentive is voucher; controls include interactions of site with tournament round score, risk preferences, confidence, and willingness to pay for the voucher. (3) Fixed effects regression; controls include triple interactions of site with treatment and with tournament round score, risk preferences, confidence, and willingness to pay for the voucher.

Table 3

Panel A

Colombia

	Cash	Voucher	FE Panel (Voucher)
Female	-0.006	0.003	-
	(0.082)	(0.083)	
Voucher	-	-	0.135
			(0.103)
Female*Voucher	-	-	0.001
			(0.064)
Compulsory Tr Score	0.020**	0.010	-
	(0.009)	(0.009)	
Risk Tolerance	0.025	0.017	-
	(0.021)	(0.022)	
Confidence	-0.007	0.008	-
	(0.009)	(0.009)	
WTP for voucher	-	0.005	-
		(0.007)	
Constant	0.219	0.314*	0.497***
	(0.160)	(0.162)	(0.015)
Observations	179	173	346
Number of individuals			173

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. All subjects are parents.
(1) OLS regression; incentive is cash. (2) OLS regression; incentive is voucher for children. (3) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children.

Panel B

Togo - Nana Benz

	Cash	Voucher	FE Panel (Voucher)
Female	0.247***	0.210**	-
	(0.070)	(0.082)	
Voucher	-	-	-0.119
			(0.204)
Female*Voucher	-	-	-0.044
			(0.081)
Compulsory Tr Score	0.052***	0.018	-
	(0.017)	(0.017)	
Risk Tolerance	0.005	0.034	-
	(0.030)	(0.033)	
Confidence	-0.010	0.001	-
	(0.009)	(0.010)	
WTP for voucher	-	-0.009	-
		(0.012)	
Constant	0.089	0.196	0.601***
	(0.179)	(0.200)	(0.018)
Observations	177	158	316
Number of individuals			158

Linear regressions. Dependent variable = 1 if subject chooses tournament payment scheme; =0 if subject chooses piece rate payment scheme. Robust standard errors in parentheses. All subjects are parents.
(1) OLS regression; incentive is cash. (2) OLS regression; incentive is voucher for children. (3) Fixed effects regression; controls include interactions of treatment with tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children.

The Competitive Woman

Evolutionary Insights and Cross-Cultural Evidence into Finding the *Femina Economica*

Alessandra Cassar[1*] & Y. Jane Zhang[2*]

14 January, 2021

Supplementary Appendix

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A1. China

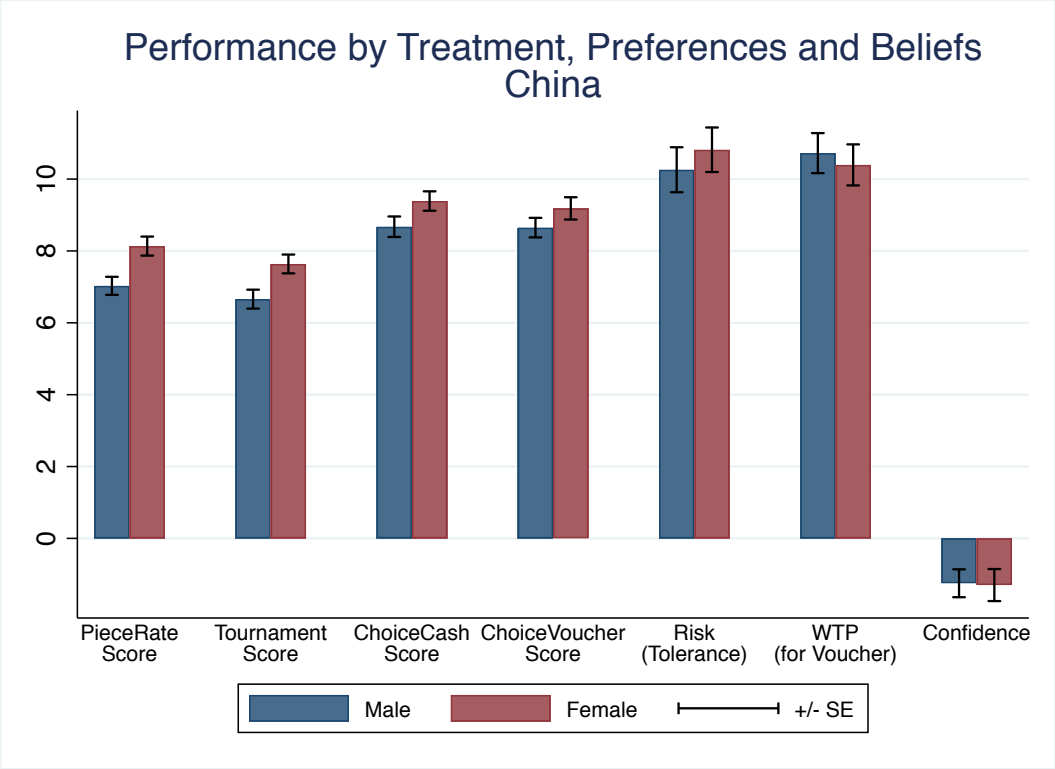

Figure A1. Performance by Treatment, Preferences and Beliefs - China

Table A1 - Summary Statistics: China

	Male	**Female**	**All**	**T-Test**
	Mean	Mean	Mean	(1)vs.(2)
	(S.E.)	(S.E.)	(S.E.)	p-value
	(1)	(2)		
Panel A: Sociodemographic variables				
Age	46.48	42.43	44.37	0.000
	(0.51)	(0.41)	(0.34)	
Education	13.31	13.20	13.25	0.740
	(0.22)	(0.22)	(0.15)	
Income	7559.8	5566.3	6554.0	0.000
	(448.3)	(326.6)	(281.6)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	7.03	8.14	7.60	0.003
	(0.25)	(0.27)	(0.19)	
Score - Tournament	6.66	7.64	7.17	0.009
	(0.26)	(0.26)	(0.19)	
Score - Choice Cash	8.67	9.39	9.05	0.069
	(0.29)	(0.27)	(0.20)	
Score - Choice Voucher	8.65	9.18	8.93	0.199
	(0.27)	(0.31)	(0.21)	
Confidence	-1.25	-1.30	-1.28	0.932
	(0.39)	(0.45)	(0.30)	
Risk Tolerance	10.26	10.82	10.55	0.528
	(0.63)	(0.62)	(0.44)	
WTP for Voucher	10.72	10.40	10.55	0.682
	(0.56)	(0.57)	(0.40)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.36	0.26	0.31	0.043
	(0.04)	(0.03)	(0.02)	
Entry - Voucher Treatment	0.31	0.31	0.31	0.978
	(0.04)	(0.03)	(0.03)	
N	173	185	358	

Notes: Age is in years. Education is in years. Income is individual income in RMB.

A2. Togo

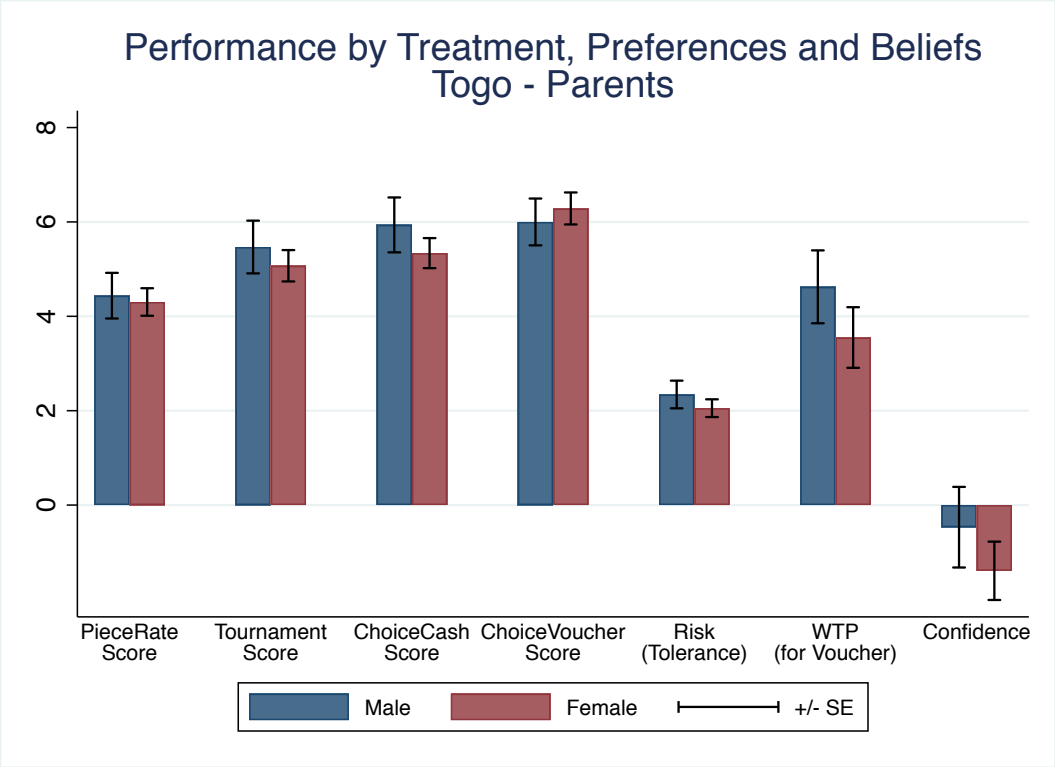

Figure A2a. Performance by Treatment, Preferences and Beliefs – Togo Parents

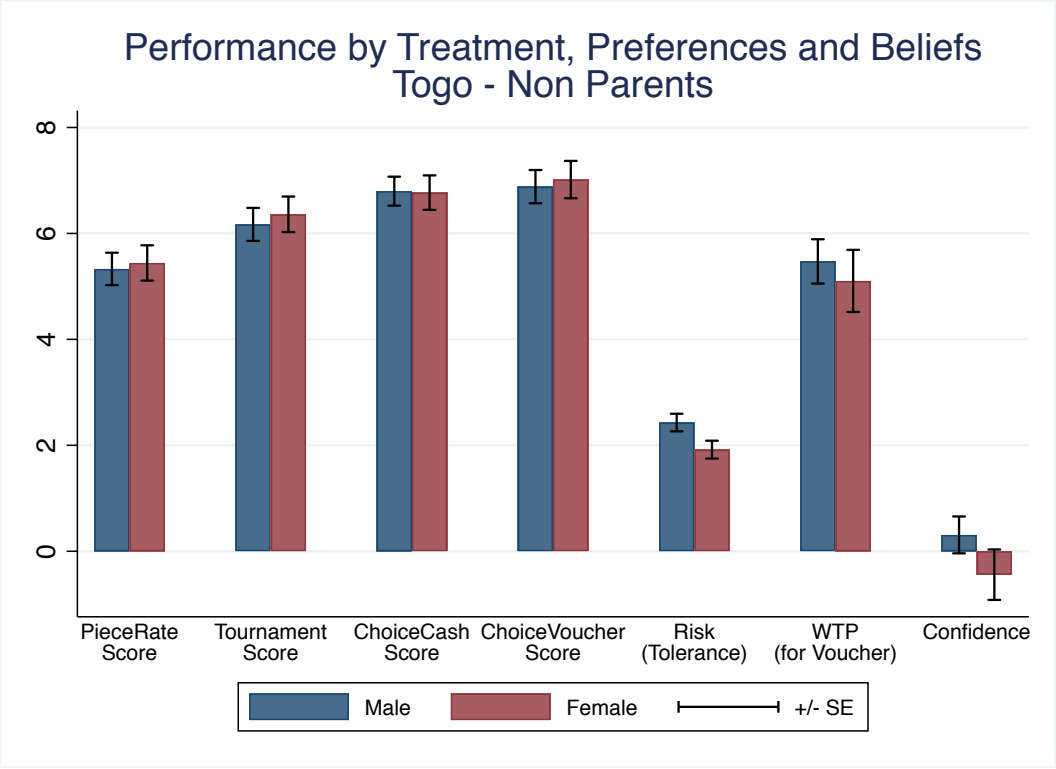

Figure A2b. Performance by Treatment, Preferences and Beliefs – Togo Non Parents

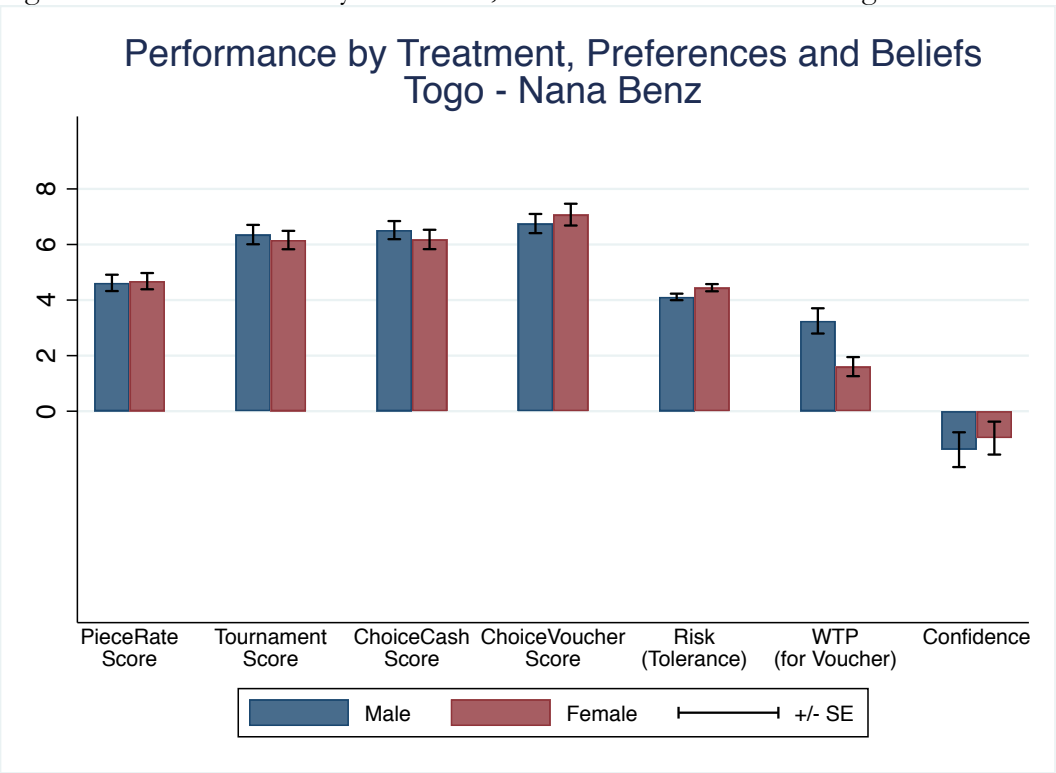

Figure A2c. Performance by Treatment, Preferences and Beliefs – Togo Nana Benz

Table A2a. Summary Statistics: Togo - Parents

	Male	**Female**	**All**	**T-Test**
	Mean	Mean	Mean	(1)vs.(2)
	(S.E.)	(S.E.)	(S.E.)	p-value
	(1)	(2)		
Panel A: Sociodemographic variables				
Age	39.78	35.28	36.98	0.086
	(2.08)	(1.58)	(1.27)	
Education	12.44	10.91	11.48	0.081
	(0.65)	(0.55)	(0.43)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	4.44	4.30	4.35	0.801
	(0.48)	(0.29)	(0.25)	
Score - Tournament	5.47	5.07	5.22	0.516
	(0.56)	(0.33)	(0.29)	
Score - Choice Cash	5.94	5.34	5.56	0.328
	(0.58)	(0.32)	(0.29)	
Score - Choice Voucher	6.00	6.29	6.18	0.626
	(0.50)	(0.34)	(0.28)	
Confidence	-0.47	-1.39	-1.06	0.378
	(0.85)	(0.62)	(0.50)	
Risk Tolerance	2.34	2.05	2.16	0.386
	(0.29)	(0.19)	(0.16)	
WTP for Voucher	4.63	3.55	3.98	(0.29)
	(0.77)	(0.64)	(0.49)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.47	0.23	0.32	0.022
	(0.09)	(0.06)	(0.05)	
Entry - Voucher Treatment	0.38	0.27	0.31	0.3
	(0.09)	(0.06)	(0.05)	
N	32	56	88	

Notes: Age is in years. Education is in years.

Table A2b. Summary Statistics: Togo - Non Parents

	Male	**Female**	**All**	**T-Test**
	Mean	Mean	Mean	(1)vs.(2)
	(S.E.)	(S.E.)	(S.E.)	p-value
	(1)	(2)		
Panel A: Sociodemographic variables				
Age	23.23	22.03	22.75	0.137
	(0.53)	(0.57)	(0.39)	
Education	14.36	13.28	13.92	0.013
	(0.30)	(0.27)	(0.22)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	5.33	5.44	5.37	0.809
	(0.31)	(0.33)	(0.23)	
Score - Tournament	6.17	6.36	6.25	0.687
	(0.31)	(0.34)	(0.23)	
Score - Choice Cash	6.80	6.77	6.79	0.949
	(0.27)	(0.33)	(0.21)	
Score - Choice Voucher	6.88	7.02	6.94	0.782
	(0.31)	(0.35)	(0.24)	
Confidence	0.31	-0.44	0.01	0.195
	(0.35)	(0.48)	(0.28)	
Risk Tolerance	2.43	1.92	2.23	0.039
	(0.17)	(0.17)	(0.12)	
WTP for Voucher	5.47	5.10	5.33	(0.60)
	(0.42)	(0.59)	(0.34)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.38	0.20	0.31	0.014
	(0.05)	(0.05)	(0.04)	
Entry - Voucher Treatment	0.35	0.21	0.30	0.067
	(0.05)	(0.05)	(0.04)	
N	94	61	155	

Notes: Age is in years. Education is in years.

Table A2c - Summary Statistics: Togo - Nana Benz

	Male	**Female**	**All**	**T-Test**
	Mean	Mean	Mean	(1)vs.(2)
	(S.E.)	(S.E.)	(S.E.)	p-value
	(1)	(2)		
Panel A: Sociodemographic variables				
Age	39.82	39.69	39.80	0.944
	(1.28)	(1.30)	(0.91)	
Education	12.39	9.00	10.69	0
	(0.34)	(0.49)	(0.32)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	4.62	4.68	4.63	0.88
	(0.29)	(0.29)	(0.21)	
Score - Tournament	6.36	6.16	6.25	0.682
	(0.35)	(0.33)	(0.24)	
Score - Choice Cash	6.52	6.18	6.35	0.483
	(0.33)	(0.35)	(0.24)	
Score - Choice Voucher	6.75	7.07	6.91	0.541
	(0.35)	(0.39)	(0.26)	
Confidence	-1.38	-0.97	-1.19	0.629
	(0.63)	(0.59)	(0.43)	
Risk Tolerance	4.11	4.45	4.28	0.06
	(0.12)	(0.13)	(0.09)	
WTP for Voucher	3.25	1.61	2.38	(0.00)
	(0.46)	(0.34)	(0.28)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.45	0.67	0.56	0.002
	(0.05)	(0.05)	(0.04)	
Entry - Voucher Treatment	0.42	0.63	0.52	0.004
	(0.05)	(0.05)	(0.04)	
N	89	94	183	

Notes: Age is in years. Education is in years.

A3. Sierra Leone

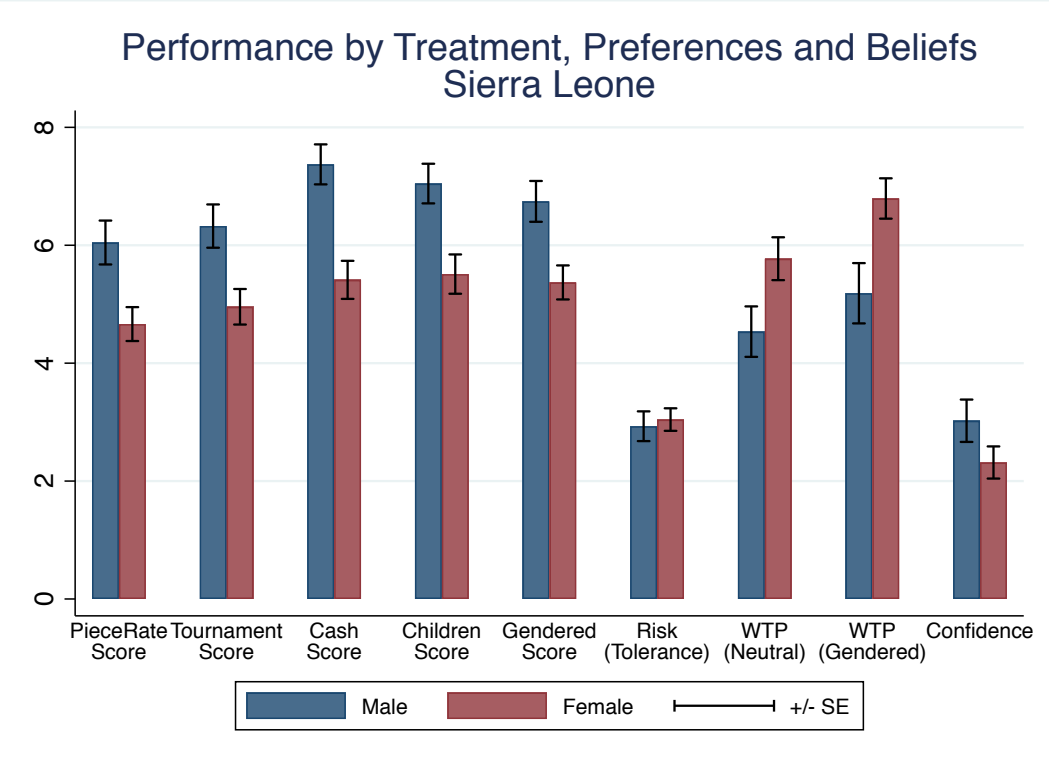

Figure A3. Performance by Treatment, Preferences and Beliefs – Nana Benz

Table A3. Summary Statistics: Sierra Leone

	Male	**Female**	**All**	**T-Test**
	Mean	Mean	Mean	(1)vs.(2)
	(S.E.)	(S.E.)	(S.E.)	p-value
	(1)	(2)		
Panel A: Sociodemographic variables				
Age	35.95	28.92	31.16	0.001
	(1.48)	(1.26)	(1.02)	
Education	6.69	3.74	4.66	0.001
	(0.82)	(0.46)	(0.42)	
Food	4.49	4.30	4.36	0.280
	(0.14)	(0.10)	(0.08)	
Money	3.49	3.35	3.40	0.296
	(0.11)	(0.07)	(0.06)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	6.05	4.66	5.10	0.006
	(0.37)	(0.29)	(0.24)	
Score - Tournament	6.33	4.96	5.39	0.008
	(0.37)	(0.30)	(0.24)	
Score - Choice Cash	7.37	5.41	6.04	0.000
	(0.34)	(0.32)	(0.26)	
Score - Choice Children V.	7.05	5.51	6.00	0.005
	(0.34)	(0.33)	(0.26)	
Score - Choice Gendered V.	6.74	5.37	5.81	0.005
	(0.35)	(0.29)	(0.23)	
Confidence	3.02	2.32	2.54	0.133
	(0.36)	(0.27)	(0.22)	
Risk Tolerance	2.93	3.04	3.01	0.731
	(0.25)	(0.19)	(0.15)	
WTP for Children V.	4.54	5.77	5.38	0.044
	(0.43)	(0.36)	(0.29)	
WTP for Gendered V.	5.19	6.79	6.28	0.009
	(0.51)	(0.34)	(0.29)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.84	0.58	0.66	0.003
	(0.06)	(0.05)	(0.04)	
Entry - Children V. Treat.	0.47	0.44	0.44	0.743
	(0.08)	(0.05)	(0.04)	
Entry - Gendered V. Treat.	0.56	0.49	0.51	0.459
	(0.08)	(0.05)	(0.04)	
N	43	92	135	

Notes: Age is in years. Education is in years. Instruments for Income:

Food: "In the past 3 months, how often have you or your immediate family not had food to eat?" Answers from 1 (never) to 5 (one or more meal per day), scale reversed.

Money: "In the past 3 months, how often have you or immediate family finished your money?" Answers from 1 (never) to 4 (more than 5 time in 3 months), scale reversed.

A4. Bosnia

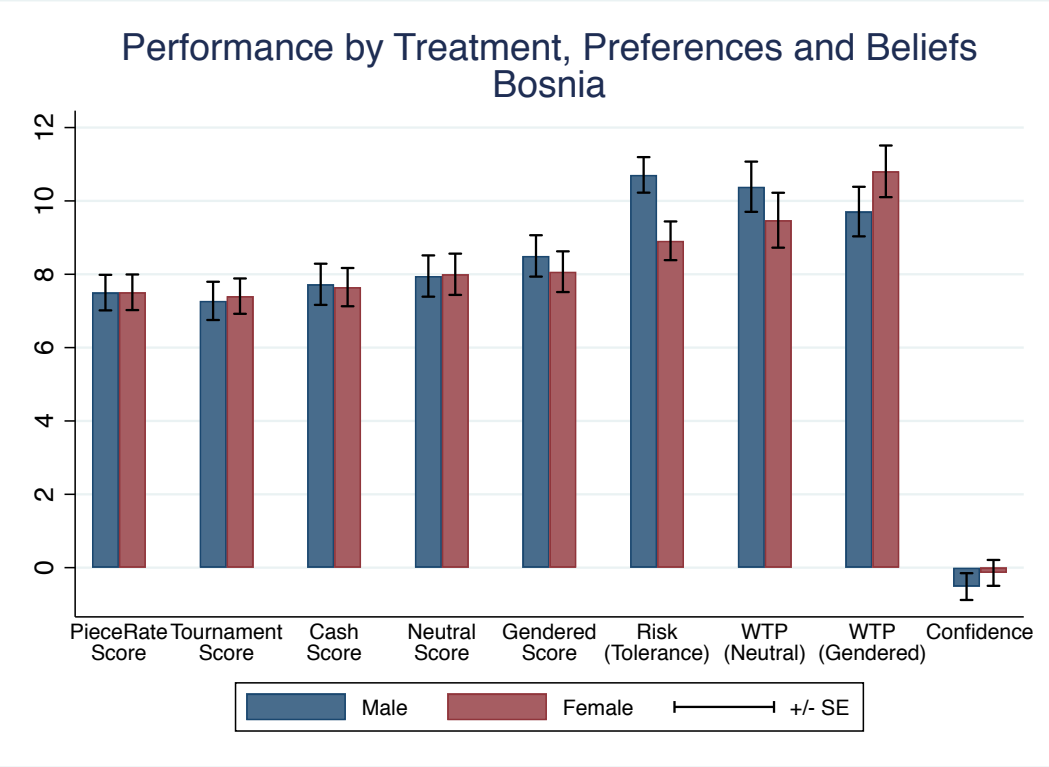

Figure A4. Performance by Treatment, Preferences and Beliefs - Bosnia

Table A4. Summary Statistics: Bosnia

	Male	**Female**	**All**	**T-Test**
	Mean	Mean	Mean	(1)vs.(2)
	(S.E.)	(S.E.)	(S.E.)	p-value
	(1)	(2)		
Panel A: Sociodemographic variables				
Age	23.27	23.84	23.54	0.262
	(0.35)	(0.36)	(0.25)	
Education	13.43	13.72	13.57	0.445
	(0.26)	(0.27)	(0.19)	
Individual Income	365.6	250.5	310.1	0.067
	(47.7)	(39.0)	(31.4)	
Household Income	2023.3	2004.1	2014.0	0.950
	(144.8)	(275.2)	(151.7)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	7.50	7.51	7.50	0.990
	(0.48)	(0.49)	(0.34)	
Score - Tournament	7.27	7.40	7.34	0.857
	(0.52)	(0.48)	(0.36)	
Score - Choice Cash	7.73	7.65	7.69	0.921
	(0.56)	(0.52)	(0.38)	
Score - Choice Neutral V.	7.95	8.00	7.98	0.952
	(0.56)	(0.56)	(0.40)	
Score - Choice Gendered V.	8.50	8.07	8.29	0.589
	(0.56)	(0.56)	(0.40)	
Confidence	-0.52	-0.14	-0.34	0.466
	(0.37)	(0.35)	(0.25)	
Risk Tolerance	10.71	8.91	9.85	0.013
	(0.49)	(0.53)	(0.37)	
WTP for Neutral V.	10.39	9.47	9.95	0.369
	(0.69)	(0.75)	(0.51)	
WTP for Gendered V.	9.71	10.81	10.24	0.263
	(0.68)	(0.70)	(0.49)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.54	0.28	0.42	0.004
	(0.06)	(0.06)	(0.05)	
Entry - Neutral V. Treat.	0.65	0.37	0.51	0.002
	(0.06)	(0.06)	(0.05)	
Entry - Gendered V. Treat.	0.60	0.44	0.52	0.086
	(0.06)	(0.07)	(0.05)	
N	62	57	119	

Notes: Age is in years. Education is in years. Income (indiv. and hh.) are in BAM.

A5. Colombia

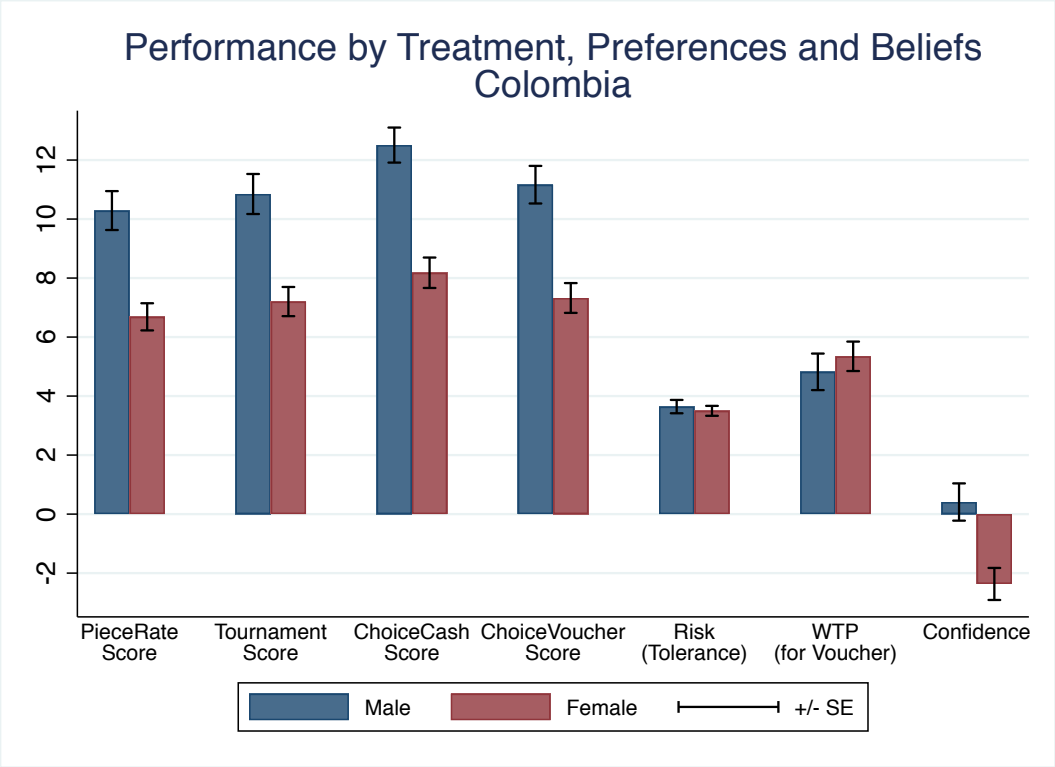

Figure A5. Performance by Treatment, Preferences and Beliefs - Colombia

Table A5 - Summary Statistics: Colombia

	Male Mean (S.E.) (1)	**Female** Mean (S.E.) (2)	**All** Mean (S.E.)	**T-Test** (1)vs.(2) p-value
Panel A: Sociodemographic variables				
Age	44.49	41.18	42.41	0.043
	(1.44)	(0.91)	(0.79)	
Education	7.40	7.14	7.24	0.608
	(0.41)	(0.30)	(0.24)	
Income	241.2	209.5	221.7	0.025
	(12.8)	(7.7)	(6.9)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	10.29	6.69	8.06	0
	(0.66)	(0.46)	(0.40)	
Score - Tournament	10.85	7.20	8.60	0
	(0.68)	(0.49)	(0.42)	
Score - Choice Cash	12.51	8.18	9.84	0
	(0.59)	(0.52)	(0.42)	
Score - Choice Voucher	11.16	7.33	8.80	0
	(0.64)	(0.51)	(0.42)	
Confidence	0.41	-2.37	-1.37	0.002
	(0.63)	(0.54)	(0.43)	
Risk Tolerance	3.64	3.50	3.56	0.605
	(0.23)	(0.17)	(0.14)	
WTP for Voucher	4.82	5.35	5.14	(0.51)
	(0.62)	(0.50)	(0.39)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.51	0.45	0.47	0.44
	(0.06)	(0.05)	(0.04)	
Entry - Voucher Treatment	0.51	0.45	0.47	0.44
	(0.06)	(0.05)	(0.04)	
N	73	118	191	

Notes: Age is in years. Education is in years.