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 investing directly into offspring, to attract and retain mates, and to not alienate potential allomaternal allies. Such a tradeoff does not appear similarly binding for men. To begin to test this idea, we conducted a series of experiments using cash and prizes (in-kind payments dedicated to either children's needs, gender-specific interests, or gender-neutral interests for placebo tests) to reward subjects at different life stages (parents and non-parents) from countries differing in economic development and culture (novel data from Togo, Sierra Leone, Bosnia, Colombia plus China data from Cassar, Wordofa and Zhang (2016)). Our hypothesis is that different incentive types (cash or prize) may induce specific frames which activate the motivation to compete in different domains of interest, with behavioral predictions that depend on an individual's gender and life stage. Consistent with the predictions, our results on parents from China, Togo, and Sierra Leone and from non-parents from Bosnia show that, once the incentives are switched from cash to child-benefitting or gender-stereotypical goods, the gender gap in competitiveness was largely eliminated, shrinking by more than 10 percentage points, whereas placebo prizes had no impact. 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 women can be much more intense than has been observed, once we include incentives that matter to women, with implications for policies designed to promote gender equality based on 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, with subjects from different life stages (parents and non-parents), and from societies spanning a range of socio-economic and cultural backgrounds (China, Togo, Sierra Leone, Bosnia, and Colombia).

Our work builds upon evolutionary psychology: the 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 resources (somatic effort), for features that appeal to the other sex (reproductive effort towards mating), and for 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 who can provide crucial allomaternal help for the care of children (Benenson, 2013); and although any economic resources acquired will benefit their offspring, it comes at the expense of direct maternal investment of time and energy (Bertrand et al., 2015; Murray-Close and Heggeness, 2018; 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 the 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, which may be perceived as the principal domain of male-male competition in many cultures. Hence, in certain cultures, using cash as experimental reward may elicit behavior more indicative of male

norms than true competitiveness per se and bias downward the way competitiveness is expressed by women (note that 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, may 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 prizes intended to benefit a subject's children (e.g., school supplies or children's clothes) or to allow subjects to conform to societal norms about femininity/masculinity (e.g., makeup or soccer gear). Our findings support our main hypotheses and indicate that the gender gap in competitiveness critically depends on how we elicit such preferences. We found that a gender gap was not always present to start with, but, 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 congruent with societal gender norms 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 aligns with the image of someone successful at securing good mates and providing for offspring.

Our work contributes a novel argument to the much-debated topic of how to close the gender gap in earnings and power: 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. Furthermore, when placed within the vast theoretical and empirical literature on gender differences, our work suggests that a dichotomy between nature and nurture is neither supported by the data nor is it a useful framework for understanding behavioral differences. Rather, our results favor 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 psychology 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

Economists have long been interested in documenting potential behavioral differences between women and men in areas likely to have economic consequences, such as a desire to compete, risk aversion, cooperation, trust, and altruism. In particular, the notion of women's lower desire to compete has been advanced as a contributing factor to why, despite significant progress, women are still far from reaching economic and political equality with men. On 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 (Goldin, 2014). Still, differences in earnings by sex remain pervasive and dramatically increase during the first decades of working life (Chung et al., 2018).

[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.

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 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 a 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, men choose to be paid according to a tournament scheme in significantly higher numbers than women. 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 matter. 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, 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. 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.[3] 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 only after the girls enter puberty. 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 tournaments 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 as 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

[3] Whereas Zhang (2019) was conducted in a remote agricultural county, studies conducted in Beijing and Shanghai have found somewhat larger gender gaps in willingness to complete of 7-12 percentage points (Cameron et al., 2013; Cassar et al., 2016).

gender differences in competitiveness even in a math task, lending further support to the idea that culture and context are important determinants 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 seem to have implications outside the lab as several studies have found that these elicited measures 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 the idea that women do not reach the top because of behavioral differences has become, labor market data do not provide unequivocal support for it[4] (e.g., Goldin, 2014; for a review, see Shurchkov and Eckel, 2018).

3. Origins of Sex Differences in Behavior

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 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.

[4] 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).

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 gender difference should be expected in areas such as executive function, problem-solving, memory, and intellectual abilities[5]. Conversely, for those domains in which selection pressures manifest themselves differently by gender, principally in sexual selection, differences between the minds of the two sexes are expected to emerge and persist (Buss, 1995b; Campbell, 2002). 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 that are 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).

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 on her (Darwin, 1871; Bateman, 1948; Trivers, 1972). 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 (for a critical review see, e.g., Gowaty, 2013). This fundamental difference would have

[5] For example, with respect to cognitive abilities, some gender differences have been found and attributed to natural selection: men would be better than women in dynamic spatial perception and targeting (consistent with men's participation in hunting and warfare) while women would be better than men at object location and landmark recognition (consistent with women gathering legacy), see the extensive survey in Browne (2006).

extensive psychological implications and offer the foundation for biology-based explanations of sex-related differences (Brown, Laland, and Mulder, 2009; Alger and Cox, 2013). Among men, the intra-sexual competition for women 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[6]. Thus, evolutionary theory predicts that men, to be successful, should exhibit greater tolerance for competition, risk, and a behavior geared towards the acquisition of dominance and status (Browne, 2006; Fisher, Garcia, and Sokol, 2013). In this framework, women would either passively choose the winner among the contenders or accept the will of the man winning the competition, who prevents her from choosing someone else (Knight, 2002).

Starting in 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 roles played by each sex in reproduction as it contributes to his/her fitness (Hrdy, 1999, 2009; Benenson and Markovits, 2014). Since then, studies have

[6] In addition to the works reviewed in Gowaty (2013) and Brown, Laland, and Mulder (2009), compelling arguments have been made that behavioural gender differences due to potential differences in reproductive success from promiscuity may not be as high as originally thought because of a series of factors such as hidden ovulation rather than testosterone (Fine, 2017) and the evolution of monogamy out of male mate guarding to ensure paternity (Schacht and Bell 2016). All these factors, in addition to father's substantial parental investment and women not mating all with just a few high-quality men, are advanced as reasons for why female-female competition could be expected to be higher than initially thought.

emerged documenting the proactive role of the female in mate choices (by competing for the most suitable males over what matters to the males) and female competitive behavior in a wide range of strategies designed to ensure benefits for her offspring (Gowaty, 2013; Campbell, 2013).

This less passive interpretation of the female role in the mating game advances that females, rather than being simply inert objects of male competition, to ensure the best possible outcome for their offspring, 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; 1999; Clutton-Brock, 2007; Stockley and Campbell, 2013). 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, with a focus on quality rather than quantity of offspring. For women, behaviors that involve physically risky competitions convey not only fewer reproductive rewards but also greater cost to reproductive success[7], 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, which 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.[8]

3.2 Cultural Origins of Gendered Behavior

[7] Another reason why females may have evolved to avoid physical risks, besides that their life is more critical to the survival of their offspring, is their lower variability in reproductive success than males (especially in species where a large percentage of males have no offspring while fertile females all do)."

[8] "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.

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 socio-economic 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 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 (tradition of plough use), affecting female participation in entrepreneurship, the labor market, and politics (Alesina et al., 2013; Carranza, 2014); and higher paternal authority, inheritance rules favoring male heirs, and lower female freedom of movement (Giuliano, 2015). Another mechanism through which different gender norms can arise across different locations is language, a fundamental channel for the transmission of norms

and cultural values (Galor et al., 2020, Gay et al., 2013). In addition to economic growth, development, and increases in education, other pre-industrial characteristics have been found 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.[9] Since 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 offspring until they are ready to reproduce themselves). As a result, 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; Alger and Cox, 2013).

[9] 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).

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 behavior 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 beneficial for securing men (each sex competes over things that matter to the other sex); it may also 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 children.

Importantly, such critical tradeoffs for women do not seem to matter for men[10]: men's efforts to gain resources and obtain status appear to help the individual with all three[11] (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; Foster and Stratton, 2021). These empirical findings have often been interpreted as the result of a negative reaction from the male partner attached to traditional gender norms. Another explanation is that women have a stronger preference for partners with incomes higher than one's own compared to men's preferences[12] (Ong and Wang, 2015; Ong, Yang, and Zhang, 2020).

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

[10] The findings that men put a premium on youth and beauty (ceteris paribus) while women on resources and status (ceteris paribus) have been widely replicated although some questions remain about the predictive power of actual mate-search behavior. For example, in the speed-dating experiment of Eastwick and Finkel (2008), the participants' ideal preferences elicited before the event failed to predict actual desires during the event.

[11] One empirical study showing the substantial strength of selection on male wealth is Nettle and Pollet (2008). Utilizing British data from the National Child Development Study and from seven other human societies, the authors find a significant positive selection on male income driven by higher childlessness among low-income men. On the contrary, for women, they found a negative association between personal income and reproductive success.

[12] While the first part of this empirical observation is not surprising and fits within an evolutionary explanation---as women have always been greatly preoccupied with securing the resources needed to ensure the successful raising of children---the reason why men are not that sensitive to a woman's material success remains an open question (as a wealthier mother could provide more resources for child-rearing, a public good from a man's perspective).

more. Similar backlash to women's success has been found with female friends (Benenson, 2014). Related to our work, Cadsby, Servátka, and Song (2013) primed MBA students by exposing them to questions concerning either gender/family or professional issues before exposing them to a real effort task to elicit their competitiveness. Their data indicate a significantly different reaction to priming between males and females, with females displaying a significantly greater preference for competition when exposed to the professional priming than to the gender/family priming.

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[13]. 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 and female allies 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 (Hrdy, 2009).

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

[13] For studies of the economics of match formation we refer to Hitsch, Hortaçsu, and Ariely (2010a), Ong and Wang (2015). For empirical works showing the predictive power of the revealed preferences for cohabitation and marriage behavior we refer to Hitsch, Hortaçsu, and Ariely (2010b), Nie (2020), Ong, Yang, and Zhang (2020), and Foster and Stratton (2021).

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[14]. 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 close the gender gap in competitiveness with fathers when the rewards of the competition directly benefit their children compared with cash rewards.
2. *Conformity to Femininity Norms:* Women (both mothers and those without children in their reproductive years) may be expected to close the gender gap in competitiveness, when the incentives are in the form of gender stereotypical goods compared with cash rewards.

5. Experimental Design

We propose to test both hypotheses through an experimental design uses a novel reward in addition to cash: a series of non-cash prizes specifically tailored to maternal and female interests. To further probe whether women's behavior is affected specifically by female-centric rewards or just by anything other than cash (in many cultures, 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).

Specifically, we introduce a novel treatment to the standard protocols based on the seminal Niederle and Vesterlund's (2007) paper: additional round/s where subjects make the choice to compete or not played for a set of rewards different than cash. This design was first introduced in Cassar, Wordofa, and Zhang (2016) and is here expanded by adding, depending on the specifics of the experimental site, placebo tests, and non-parent subjects. These different rewards are either vouchers equal in value to what the subject would have earned in cash or direct prizes (in locations where markets are either too distant from the subjects or where local

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

shops are unfamiliar with the idea of issuing gift cards). In either form, these rewards are 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 with varying levels of economic development and vast differences in culture: China, Togo (traditional sample and Nana Benz), Sierra Leone, Bosnia, and Colombia. Data from the China site have already been published (Cassar, Wordofa, and Zhang, 2016, and is included here to provide a more complete cross-cultural investigation of the theoretical framework advanced.

It is important to stress that our study is not a replication of the same design across different cultures. Rather, we took advantage of each site's unique opportunities to introduce additional components (non-parent subjects, gender-specific, and placebo prizes) to further probe the generalizability of the main framework. Each sample entered into the study as the opportunity arose, usually in the form of graduate students who belong to that particular demographic, uniquely able to contribute with their insider knowledge of the culture, mastery of the language, and network contacts necessary to carry out the experiment (recruitment, permissions, logistics). While far from a truly random sample of cultures across the world, the sites included in our study (inclusive of subjects possessing less commonly observed socioeconomic characteristics) contribute a great deal of diversity to the common pool of studied populations. Representativeness has always been a key characteristic sought after by empirical studies. In practice, though, research across the social sciences has mostly occurred either in 'WEIRD' samples (Western, educated, industrialized, rich, democratic, Henrich et al., 2010) or on the same set of rural people living in small groups (Barrett, 2020). Our work, by expanding the range of age, education, development level of the country, and relative income of the subjects, sits in the gap between those two ends of the spectrum and adds novel data points that can be used to assess the generality of certain behavioral traits.

As in the Niederle and Vesterlund (2007) 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 X per correct answer in a math addition task. In a second round, *Tournament*, all subjects are assigned to a competitive tournament payment

scheme, in which the payoff is 2X 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. If they choose piece-rate, they will be rewarded X per correct answer. If they choose tournament, they will be rewarded 2X per correct answer, but only if they score higher than a randomly selected opponent's score in the compulsory tournament.[15] Otherwise, they earn nothing. These final two/three rounds differ in terms of the types of rewards at stake: 1. cash in *Cash* (the standard medium to incentivize participants in economic experiments); 2. goods intended to benefit one's child in *ChildrenVoucher* (e.g., books, school supplies or children's clothing); 3. goods intended to conform to societal norms about feminine and masculine interests in *GenderVoucher* (e.g., beauty products or a scarf for women, soccer gear or rain slippers for men); 4. generic non-cash rewards in *NeutralVoucher* (e.g., restaurant meal or electricity credits). The non-cash rewards were in the form of vouchers with equal face value as the corresponding cash reward, except in Sierra Leone, where physical goods were used due to the lack of stores able to provide vouchers, explained in detail below.

We adopt a within-subject experimental design, with all subjects participating in cash and voucher rounds[16], 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

[15] This prevented a subject's choice from affecting another subjects' earnings. In all locations except Sierra Leone the random opponent was someone in the same session. In Sierra Leone, because the experiments were conducted one-on-one at the subject's house, the random opponent was someone who finished the experiment previously.
[16] The *Cash* and *Vouchers* 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).

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 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 focused on testing 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 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 the task across sites, 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 the MPL to the Unitary Lottery in countries where the MPL was found too difficult to understand during piloting (Colombia, Togo, and Sierra Leone). 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.

For a similar reason, in some of these countries (Colombia and Togo,) we also had to switch from using the MPL to using survey questions to elicit willingness to pay for the voucher.

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., choosing the tournament payment scheme over the piece-rate payment scheme) under cash versus noncash rewards, where we control for task performance, risk aversion, confidence, and valuation of the non-cash reward to account for the impact that gender differences in these variables may have on the gender gap in the willingness to compete. These control variables are allowed to impact cash and voucher/noncash treatments differently in panel analyses for each site. 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).

In all countries, we ensured that the non-cash rewards we offered were valued by the subjects and that subjects intended to use them as designed, i.e., subjects intended to use children's vouchers 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 or prize was valuable to them and, in the case of vouchers, who they would spend it on.

We found that vouchers were valued at a substantial discount from their face values (as observed in locations where we obtained WTP using the MPL).[17] All else equal, higher incentive values increase the difference between the payouts under the tournament payment scheme relative to payouts under the piece-rate payment scheme for would-be winners and can thus impact the willingness to compete. For example, subjects may find the tournament payment scheme in the voucher treatment less attractive than in the cash treatment because vouchers of the same face value are worth less than cash. Furthermore, although we controlled for measures of WTP for the vouchers, these measures may be noisy, given potential limitations in subject

[17] In China, subjects on average valued a voucher with a face value of RMB20 at RMB10.6. In Bosnia, subjects on average valued a voucher with a face value of BAM20 at BAM9.9 for the gender neutral voucher and BAM10.2 for the gender specific voucher.

comprehension.[18] Therefore, absolute changes in the willingness to compete from the cash to the voucher treatment are not necessarily indicative of the voucher effect, per se. Rather, and consistent with our hypotheses, we focus our analysis on *changes* in the gender gap in the willingness to compete from the cash to the voucher treatments.

As a final remark, we would like to point out that when a difference in gender competitiveness is found under cash, the decrease in the gap under the children-voucher treatment is not expected to be driven solely from an increase in women's competitiveness, as men's reaction to a shift in incentives, namely a decline, could also occur. Paternal provisioning is ubiquitous in human societies and its proportion and range are rather unique to us (e.g. Hrdy, 2011). Recent developments in parental investment theory (e.g. Alger et al., 2020) do not provide the ground to predict unequivocally either that the men should become less competitive when cash incentives are substituted with offspring-benefitting vouchers (as a consequence of male trade-off between mating effort and provisioning) or that they should necessarily remain equally competitive (as men do not appear to suffer any backlash from investing in their children). Therefore, a male response to a change in child-benefitting incentives could span from a non-detectable reaction to a decline in men's competitiveness, with a final outcome depending on the specifics of the local culture as social norms are expected to exert a powerful influence on everyone's behaviour, not just for the women but also for the men, whose variability in offspring providing and provisioning is well documented (e.g. Hrdy, 2011). Furthermore, the competitiveness gap could vanish also from both a modest increase in women's competitiveness and a contemporaneous modest decrease in men's, with only the combined effect significantly reducing the initial gender gap.

Recruitment procedures in each site are detailed below. Parents were largely recruited in connection with their child's school. Among parents, fathers tended to be less likely to select into our study than mothers, but the selection effect should work against us – those men who respond to our invitation are likely more invested in their child's education and perhaps overall

[18] Measurement error in WTP arising from classical noise would bias downwards the coefficient on observed WTP in a within-subject regression of the change in tournament entry rates from the cash to the voucher treatment on WTP, and can be misattributed to a voucher effect (see Gillen et al., 2019 for a similar argument regarding measurement error in control variables being misattributed to new phenomena). We refer the interested reader to Supplementary Appendix Tables A1-A5 for within-subject t-tests of tournament entry rates in the cash vs. voucher treatments by gender.

wellbeing, particularly where we recruited through their child's school than those who do not, which should bias the voucher effect downwards.

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 Appendix B, available online.

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

The task was to correctly add five two-digit numbers in three minutes. The experiment was administered using paper and pencil in groups. Answers were recorded by the participants and immediately graded by two research assistants and local enumerators. All details are reported in Appendix B.

In addition to cash, the child-benefitting prize utilized in the experiment were vouchers of the same face-value as the cash rewards in the cash treatment, 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 *Cash* (men: 8.67, women: 9.39, p=0.069), and higher, but not significantly so, in *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 schools and public announcements via radio. 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 population: the Nana Benz.[19] This sample was recruited at the market in Lome, where they work.

The task was to correctly add two two-digit numbers in three minutes. The experiment was administered using paper and pencil in groups and took place in rooms of the local schools. Answers were recorded by the participants and graded by local enumerators. All details are reported in Appendix B.

For the voucher treatments in these experiments, we employed two types of child benefitting prizes: for the summer sessions, given the lack of conveniently close stores willing to issue us vouchers, we brought a series of prizes directly into the experiment room (pencils, pen, rulers, erasers, copybooks, etc.…) and converted what the subjects won in the voucher treatment directly into these prizes, matching their value as close as possible to the face-value of their voucher winnings. For the winter sessions with the Nana Benz, the experiment was conducted very close to the central market in Lome, and we were able to obtain from some local stands vouchers (of the same face value as the cash rewards in the cash treatment) that our subjects

[19] 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).

could exchange for school supplies and children's clothing and food (as not all parents had children in school). The incentives in the voucher treatments were of the same face value as the cash incentives in the cash treatment.

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 prize for children relative to cash.

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 prize, 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 prize, 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 differences were significant. Parents and non-parents had a roughly equal valuation of the vouchers. The only differences between the sexes are found with respect to risk, with parents showing a 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, and over 90% accepted our invitation. The experiment was conducted in May-August 2018 with a team of enumerators hired through the charity organization BRAC (Building Resources Across

Communities). 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 (see instructions in Appendix B). 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. (2021) 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) at the subject's house, 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-cash prizes through the WTP instrument.

We employed two types of non-cash prizes: one intended to benefit children (a set of children's goods and school supplies) and one gender-specific (rain slippers for men, lapa scarfs for women). Both the children's goods and the gender stereotypical prizes came as just a fixed prize for the winner (chosen based on the subjects' preferences obtained through extensive interviews during focus groups and calibrated to be of roughly equal value to average compulsory tournament winnings). If a subject chooses the tournament payment scheme and scores higher than a randomly selected opponent, the subject receives the (fixed) prize directly. If a subject chooses the piece-rate payment scheme, he or she receives a cash payout calculated in the same way as the piece-rate option in the cash treatment.

Because of these modifications in the design in Sierra Leone, it is especially important to control for task performance and to allow task performance to impact the choice to compete differently in the cash and the voucher treatments: whereas in the cash treatment, higher task performance increases the difference in payouts from choosing tournament over piece-rate for would-be winners, in the voucher treatment, given fixed tournament winnings, higher task performance decreases the difference in payouts for would-be winners.

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 and by flyers posted at the University of Banjaluka. The study was carried out over 4 sessions in June-July 2016 in rooms of the university.

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). Each voucher had the same face value as the cash rewards in the cash treatment.

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. The experiment was conducted paper and pencils in the schools' locals during the days of parent-teacher conferences. 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=?). The instructions reported in Appendix B contains all the other details of the implementation.

In this site, the child-benefitting voucher was in the form of tokens redeemable at their child's school cafeteria ('tienda"), of the same face-value as the cash rewards in the cash treatment. 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. In the initial experimental design we also included a gender neutral reward in the form of vouchers for household electricity bills as a placebo test. However, in the process of conducting the experiment, we realized that many of the subjects were already receiving electricity subsidies given their low-income status, so that they did not value this reward (48% found the reward not useful or only somewhat useful). We therefore exclude this treatment from our main analysis.[20]

To elicit risk preferences, instead of the more complex MPL, we implemented the Unitary Lottery. 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, responses to the simple survey question of how useful the voucher is to them.

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

[20] The mean tournament entry rates in this treatment are reported in Figure 5 and A5 and the uncontrolled t-tests in Table A5. Regression results are reported in Appendix Table A7. No significant voucher effect was found.

confident than women (men: 0.41, women: -2.37, p=0.002). Still, male and female subjects revealed similar preferences toward risk and valuation for the vouchers. 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 is in the form of the non-cash reward. To simplify labeling, henceforth in the data analysis we will use the term "vouchers" as a shorthand for all non-cash rewards, even though in Sierra Leone non-cash rewards were in the form of direct prizes, as described in Section 5. 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 to 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 the 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. This flexibility is especially important in Sierra Leone due to modifications to the voucher treatment there as explained in Section 5. The results of this estimation are reported in Table 1 under the heading "Panel" for each country. We also report the results of this estimation without interacting the control variables with treatment in Appendix Table A8. In these alternative specifications, the voucher effects (the coefficient on female×voucher in the "Panel" specifications) are essentially identical to that in Table 1, with the exception of Sierra Leone, where both voucher effects are larger. Our preferred specification includes the interaction of the controls with treatment.

Importantly, reiterating the discussion in Section 5, 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 δ, 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 (Figure 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. 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, 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, the differences in the addition task across sites, and the differences in the noncash reward as discussed in the Experimental Design section. The results of this estimation are 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 to 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). In Appendix Table A6, we repeat the analysis using only the new data collection sites (i.e., without China). The results are similar to what we find in Table 2 Panel A: men are 20 percentage points more willing to compete for cash than women, significant at the one percent level (Column 1); in the voucher treatment, the gender gap in the willingness to complete is not statistically significant (Column 2); the difference in the gender gap across the cash and voucher treatment is 14 percentage points, significant at the 5% 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 "placebo vouchers" analysis also address the concern that the effect of "treatment vouchers" may be confounded with a value-of-incentives effect. If the "treatment voucher" effect comes entirely from the fact that the vouchers are valued at a substantial discount from their face-value, we would expect to see a similar effect of placebo vouchers, which are similarly valued at a substantial discount from their face-value. In fact, placebo vouchers have an effect close to zero. 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).[21] 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

[21] Specifications without interacting the control variables with treatment are reported in Appendix Table A8. The voucher effects are essentially identical to that found in Table 3.

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

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.

Women can have babies, men cannot. Yet, for most of human history, contributions from both mothers and fathers (and alloparents) 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 a trait, as specific responses 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 congruent 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's 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's 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 organizations), 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.

References

Alger, I., & Cox, D. (2013). The evolution of altruistic preferences: mothers versus fathers. *Review of Econics of the Household* 11(3), 421–446.

Alger, I., Hooper, P.L., Cox, D., Stieglitz, J. & Kaplan, H.S. (2020). Paternal provisioning results from ecological change. *Proceedings of the National Academy of Sciences*, 117(20), pp.10746-10754.

Alesina, A., Giuliano, P., & Nunn, N. (2013). On the origins of gender roles: Women and the plough. *The Quarterly Journal of Economics, 128*, 469–530.

Almås, I., Cappelen, A. W., Salvanes, K. G., Sørensen, E. Ø., & Tungodden, B. (2016). Willingness to compete: Family matters. *Management Science, 62*, 2149–2162.

Almenberg, J., & Dreber, A. (2015). Gender, stock market participation and financial literacy. *Economics Letters, 137*, 140–142.

Altonji, J., & Blank, R. (1999). Rage and Gender in the Labor Market. In O. Ashenfelter, & D. Card (Eds.), *Handbook of Labor Economics* (Vol. 3C, pp. 3143-3259). Amsterdam: Elsevier-North Holland.

Andersen, S., Ertac, S., Gneezy, U., List, J. A., & Maximiano, S. (2013). Gender, competitiveness, and socialization at a young age: Evidence from a matrilineal and a patriarchal society. *Review of Economics and Statistics, 95*, 1438–1443.

Apicella, C. L., & Dreber, A. (2015). Sex differences in competitiveness: Hunter-gatherer women and girls compete less in gender-neutral and male-centric tasks. *Adaptive Human Behavior and Physiology, 1*, 247–269.

Ariely, D. (2008). *Predictibly Irrational: The Hidden Forces That Shape Our Decisions.* HarperCollins.
Babcock, L., & Laschever, S. (2003). *Women Don't Ask: Negotiation and the Gender Divide.* Princeton, NJ: Princeton University Press.
Balafoutas, L., & Sutter, M. (2012). Affirmative action policies promote women and do not harm efficiency in the laboratory. *Science, 335*, 579–582.
Barkow, J. H., Cosmides, L., & Tooby, J. (1992). *The adapted mind: Evolutionary psychology and the generation of culture.* Oxford University Press, USA.
Bateman, A. J. (1948). Intra-sexual selection in Drosophila. *Heredity, 2*, 349–368.
Bateup, H. S., Booth, A., Shirtcliff, E. A., & Granger, D. A. (2002). Testosterone, cortisol, and women's competition. *Evolution and Human Behavior, 23*, 181–192.
Benenson, J. F. (2013). The development of human female competition: allies and adversaries. *Philosophical Transactions of the Royal Society B: Biological Sciences, 368*, 20130079.
Benenson, J. F. (2014). *Warriors and worriers: The survival of the sexes.* Oxford University Press.
Benenson, J. F., Markovits, H., & Wrangham, R. (2014). Rank influences human sex differences in dyadic cooperation. *Current Biology, 24*, R190–R191.
BenYishay, A., Grosjean, P., & Vecci, J. (2017). The fish is the friend of matriliny: Reef density and matrilineal inheritance. *Journal of Development Economics, 127*, 234–249.
Bertrand, M., Kamenica, E., & Pan, J. (2015). Gender identity and relative income within households. *The Quarterly Journal of Economics, 130*, 571–614.
Blau, F., & Kahn, L. (2000). Gender Differences in Pay. *Journal of Economic Perspectives, 14*(4), 75-99.
Blau, F., & Kahn, L. (2006). The Gender Pay Gap: Going, Going ... But Not Gone. In F. Blau, M. Brinton, & D. Grusky (Eds.), *The Declining Significance of Gender?* (pp. 37-66). New York: Russell Sage Foundation.
Blau, F., & Kahn, L. (2017). The gender wage gap: Extent, trends, and explanations. *Journal of Economic Literature, 55*, 789–865.
Bönte, W. (2015). Gender differences in competitive preferences: new cross-country empirical evidence. *Applied Economics Letters, 22*, 71–75.
Booth, A., & Nolen, P. (2012). Choosing to compete: How different are girls and boys? *Journal of Economic Behavior & Organization, 81*, 542–555.
Booth, A., Fan, E., Meng, X., & Zhang, D. (2019). Gender differences in willingness to compete: The role of culture and institutions. *The Economic Journal, 129*, 734–764.
Boserup, E. (2007). *Woman's role in economic development.* Earthscan.
Bowles, H. R., Babcock, L., & McGinn, K. L. (2005). Constraints and triggers: Situational mechanics of gender in negotiation. *Journal of personality and social psychology, 89*, 951.
Bro-Jørgensen, J. (n.d.). Sexual selection and female competition. *eLS*.
Brown, G. R., Laland, K. N., & Mulder, M. B. (2009). Bateman's principles and human sex roles. *Trends in Ecology & Evolution, 24*, 297–304.
Brown, S. L., & Lewis, B. P. (2004). Relational dominance and mate-selection criteria: Evidence that males attend to female dominance. *Evolution and Human Behavior, 25*, 406–415.
Browne, K. R. (2006). Evolved sex differences and occupational segregation. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 27*, 143–162.
Bureau of Labor Statistics (2015). *Occupational Outlook Handbook 2014-2015.* JIST Publishing.
Bursztyn, L., Fujiwara, T., & Pallais, A. (2017). 'Acting Wife': Marriage Market Incentives and Labor Market Investments. *American Economic Review, 107*, 3288–3319.

Buser, T. (2012). Digit ratios, the menstrual cycle and social preferences. *Games and Economic Behavior, 76*, 457–470.
Buser, T., Dreber, A., & Mollerstrom, J. (2017). The impact of stress on tournament entry. *Experimental Economics, 20*, 506–530.
Buser, T., Niederle, M., & Oosterbeek, H. (2014). Gender, competitiveness, and career choices. *The Quarterly Journal of Economics, 129*, 1409–1447.
Buss, D. M. (1989a). Sex Differences in Human Mate Preferences: Evolutionary Hypotheses Tested in 37 Cultures. *Behavioral and Brain Sciences, 12*, 1-14.
Buss, D. M. (1995b). Evolutionary psychology: A new paradigm for psychological science. *Psychological inquiry, 6*, 1–30.
Buss, D. M. (1995). Psychological sex differences: Origins through sexual selection.
Cadsby, C. Bram, Maroš Servátka, and Fei Song. 2013. "How Competitive Are Female Professionals? A Tale of Identity Conflict." *Journal of Economic Behavior & Organization* 92: 284–303.
Cameron, L., Erkal, N., Gangadharan, L., & Meng, X. 2013. Little emperors: behavioral impacts of China's One-Child Policy. *Science*, 339(6122), 953-957.
Campbell, A. (1999). Staying alive: Evolution, culture, and women's intrasexual aggression. *Behavioral and brain sciences, 22*, 203–214.
Campbell, A. (2002). *A mind of her own: The evolutionary psychology of women.* OUP Oxford.
Campbell, A. (2013). The evolutionary psychology of women's aggression. *Philosophical Transactions of the Royal Society B: Biological Sciences, 368*.
Cárdenas, J.-C., Dreber, A., Von Essen, E., & Ranehill, E. (2012). Gender differences in competitiveness and risk taking: Comparing children in Colombia and Sweden. *Journal of Economic Behavior & Organization, 83*, 11–23.
Carranza, E. (2014). Soil endowments, female labor force participation, and the demographic deficit of women in India. *American Economic Journal: Applied Economics, 6*, 197–225.
Cassar, A., Grosjean, P., Khan, F. J. and Lambert, M. (2021). Mothers, Fathers, and Others: Competition and Cooperation in the Aftermath of Conflict. Working paper available at: https://www.alessandracassar.net/uploads/2/4/9/8/24980150/competitioncooperationafterconflict_12-06-21.pdf
Cassar, A., & Rigdon, M. (2021). Option to cooperate increases women's competitiveness and closes the gender gap. Evolution and Human Behavior. 10.1016/j.evolhumbehav.2021.06.001.
Cassar, A., Wordofa, F., & Zhang, Y. J. (2016). Competing for the benefit of offspring eliminates the gender gap in competitiveness. *Proceedings of the National Academy of Sciences, 113*, 5201–5205.
Chen, Y., Katuscak, P., & Ozdenoren, E. (2010). Sealed-Bid Auctions with Human Auctioneers: An Experimental Study. *Sealed-Bid Auctions with Human Auctioneers: An Experimental Study*.
Chung, H., & Van der Horst, M. (2018). Women's employment patterns after childbirth and the perceived access to and use of flexitime and teleworking. *Human relations, 71*, 47–72.
Clutton-Brock, T. (1991). *The evolution of parental care* (Vol. 64). Princeton University Press.
Clutton-Brock, T. (2007). Sexual selection in males and females. *Science, 318*, 1882–1885.
Clutton-Brock, T. (2009). Sexual selection in females. *Animal behaviour, 77*, 3–11.
Cosmides, L., & Tooby, J. (1997). Evolutionary psychology: A primer.
Croson, R., & Gneezy, U. (2009). Gender differences in preferences. *Journal of Economic literature, 47*, 448–74.

Dariel, A., Kephart, C., Nikiforakis, N., & Zenker, C. (2017). Emirati women do not shy away from competition: Evidence from a patriarchal society in transition. *Journal of the Economic Science Association, 3*, 121–136.

Darwin, C. (1871). *The Descent of Man and Selection in Relation to Sex*. London: John Murray.

Datta Gupta, N., Poulsen, A., & Villeval, M. C. (2013). Gender Matching and Competitiveness: Experimental Evidence. *Economic Inquiry, 51*(1), 816-835.

Del Giudice, M. (2015). International encyclopedia of the social & behavioral sciences. In J. Wright (Ed.). Elsevier.

Dreber, A., & Johannesson, M. (2018). Sex hormones and economic decision making in the lab: A review of the causal evidence. *Routledge international handbook of social neuroendocrinology. Milton Park: Taylor & Francis Group*.

Eastwick, Paul W, and Eli J Finkel. 2008. "Sex Differences in Mate Preferences Revisited: Do People Know What They Initially Desire in a Romantic Partner?" Journal of personality and social psychology 94(2): 245–64.

Eckel, C. C., & Grossman, P. J. (2008). Men, women and risk aversion: Experimental evidence. *Handbook of experimental economics results, 1*, 1061–1073.

Falk, A., & Hermle, J. (2018). Relationship of gender differences in preferences to economic development and gender equality. *Science, 362*.

Fine, C. (2017). *Testosterone rex: Myths of sex, science, and society*. WW Norton & Company.

Fisher, M. L. (2013). Women's intrasexual competition for mates. *Evolution's empress: Darwinian perspectives on the nature of women*, 19–42.

Fisher, M. L., Garcia, J. R., & Sokol Chang, R. (2013). Evolution's empress: Darwinian perspectives on the nature of women. New York, NY, US: Oxford University Press. *Evolution's empress: Darwinian perspectives on the nature of women. New York, NY, US: Oxford University Press*.

Fisman, R., Iyengar, S. S., Kamenica, E., & Simonson, I. (2006). Gender differences in mate selection: Evidence from a speed dating experiment. *The Quarterly Journal of Economics, 121*, 673–697.

Flory, J. A., Gneezy, U., Leonard, K. L., & List, J. A. (2018). Gender, age, and competition: A disappearing gap? *Journal of Economic Behavior & Organization, 150*, 256–276.

Flory, J., Gneezy, U., Leonard, K. L., List, J. A., & others. (2012). Sex, competitiveness, and investment in offspring: On the origin of preferences. *Artefactual Field Experiments, 72*.

Falk, A. & Hermle, J. (2018). Relationship of gender differences in preferences to economic development and gender equality. *Science*, 362(6412).

Folke, O., & Rickne, J. (2016). The glass ceiling in politics: Formalization and empirical tests. *Comparative Political Studies, 49*, 567–599.

Foster, G., Stratton, L.S. (2021). Does female breadwinning make partnerships less healthy or less stable?. *Journal of Population Economics* 34, 63–96.

Galor, O., Özak, Ö., & Sarid, A. (2020). Linguistic Traits and Human Capital Formation. *AEA Papers and Proceedings*, *110*, pp. 309–13.

Gay, V., Santacreu-Vasut, E., & Shoham, A. (2013). The grammatical origins of gender roles. *Berkeley Economic History Laboratory Working Paper, 3*.

Gillen, B., Snowberg, E., & Yariv, L. (2019). Experimenting with measurement error: Techniques with applications to the Caltech cohort study. *Journal of Political Economy*, *127*(4), 1826-1863.

Giudice, M. D., Gangestad, S. W., & Kaplan, H. S. (2015). Life history theory and evolutionary psychology. *The handbook of evolutionary psychology*, 1–27.
Giuliano, P. (2015). The role of women in society: from preindustrial to modern times. *CESifo Economic Studies, 61*, 33–52.
Gneezy, U., & Rustichini, A. (2004). Gender and Competition at a Young Age. *American Economic Review (Papers and Proceedings), 94*(2), 377-81.
Gneezy, U., Leonard, K. L., & List, J. A. (2009). Gender differences in competition: Evidence from a matrilineal and a patriarchal society. *Econometrica, 77*, 1637–1664.
Gneezy, U., Niederle, M., & Rustichini, A. (2003). Performance in Competitive Environments: Gender Differences. *Quarterly Journal of Economics*, 1049-74.
Goldin, C. (2006). The quiet revolution that transformed women's employment, education, and family. *American economic review, 96*, 1–21.
Goldin, C. (2014). A Grand Gender Convergence: Its Last Chapter. *American Economic Review, 104*(4), 1091-1119.
Goldin, C., & Rouse, C. (2000). Orchestrating impartiality: The impact of" blind" auditions on female musicians. *American economic review, 90*, 715–741.
Gowaty, P. A. (2013). A Sex-Neutral Theoretical Framework for Making Strong Inferences About the Origins of Sex Roles. *Evolution's Empress: Darwinian Perspectives on the Nature of Women*, 85.
Grosjean, P., & Khattar, R. (2019). It's raining men! Hallelujah? The long-run consequences of male-biased sex ratios. *The Review of Economic Studies, 86*, 723–754.
Grosse, N., Riener, G., & Dertwinkel-Kalt, M. (2014). Explaining gender differences in competitiveness: Testing a theory on gender-task stereotypes. *Available at SSRN 2551206*.
Günther, C., Ekinci, N. A., Schwieren, C., & Strobel, M. (2010). Women can't jump?—An experiment on competitive attitudes and stereotype threat. *Journal of Economic Behavior & Organization, 75*, 395–401.
Haselton, M. (2018). *Hormonal: The Hidden Intelligence of Hormones–How They Drive Desire, Shape Relationships, Influence Our Choices, and Make Us Wiser*. Hachette UK.
Healy, A., & Pate, J. (2011). Can teams help to close the gender competition gap? *The Economic Journal, 121*, 1192–1204.
Henrich, J., & Gil-White, F. J. (2001). The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and human behavior, 22*, 165–196.
Henrich, J., Boyd, R., & Richerson, P. (2012). The Puzzle of Monogamous Marriage. *Phil. Trans. R. Soc. B, 367*, 657-669.
Hill, K., & Kaplan, H. (1993). On why male foragers hunt and share food. *Current anthropology, 34*, 701–710.
Hitsch, G., Hortaçsu, A., & Ariely, D. (2010a). Matching and Sorting in Online Dating. American Economic Review. 100. 130-63.
Hitsch, G., Hortaçsu, A., & Ariely, D. (2010b). What Makes You Click? Mate Preferences in Online Dating. Quantitative Marketing and Economics. 8. 393-427.
Hoffman, M., & Gneezy, U. (2010). Left handed women are more competitive than right handed men: On the biological basis of gender differences in competitiveness. *Work. Pap., Univ. Calif., San Diego*.
Hrdy, S. B. (1981). *The woman that never evolved*. Cambridge, MA: Harvard University Press.

Hrdy, S. B. (1992). Fitness tradeoffs in the history and evolution of delegated mothering with special reference to wet-nursing, abandonment, and infanticide. *Ethology and Sociobiology, 13*, 409–442.
Hrdy, S. B. (1999). *Mother nature: A history of mothers, infants, and natural selection.* New York.
Hrdy, S. B. (2009). *Mothers and others.* Harvard University Press.
Kahlenberg, S. M., Thompson, M. E., & Wrangham, R. W. (2008). Female competition over core areas in Pan troglodytes schweinfurthii, Kibale National Park, Uganda. *International Journal of Primatology, 29*, 931.
Kamas, L., & Preston, A. (2012). The importance of being confident; gender, career choice, and willingness to compete. *Journal of Economic Behavior & Organization, 83*, 82–97.
Khachatryan, K., Dreber, A., Von Essen, E., & Ranehill, E. (2015). Gender and preferences at a young age: Evidence from Armenia. *Journal of Economic Behavior & Organization, 118*, 318–332.
Knight, J. (2002). Sexual Stereotypes. *Nature, 415*, 254-256.
Manning, A., & Saidi, F. (2010). Understanding the Gender Pay Gap: What's Competition Got to Do with It? *Industrial and Labor Relations Review, 63*(4), 681-98.
Murray-Close, M., & Heggeness, M. L. (2018). Manning up and womaning down: How husbands and wives report their earnings when she earns more. *US Census Bureau Social, Economic, and Housing Statistics Division Working Paper, 20*.
Nettle, D. & Pollet, T. (2008). Natural Selection on Male Wealth in Humans. *The American Naturalist.* 172. 658-66.
Nie, G. (2020). Marriage squeeze, marriage age and the household savings rate in China. *Journal of Development Economics*, Volume 147.
Niederle, M., & Vesterlund, L. (2007). Do women shy away from competition? Do men compete too much? *Quarterly Journal of Economics, 122*, 1067-1101.
Niederle, M., & Vesterlund, L. (2008). Gender differences in competition. *Negotiation Journal, 24*, 447–463.
Niederle, M., & Vesterlund, L. (2010). Explaining the gender gap in math test scores: The role of competition. *Journal of Economic Perspectives, 24*, 129–44.
Niederle, M., & Vesterlund, L. (2011). Gender and Competition. *Annual Review of Economics, 3*, 601-630.
Niederle, M., Segal, C., & Vesterlund, L. (2013). How costly is diversity? Affirmative action in light of gender differences in competitiveness. *Management Science, 59*, 1–16.
Ong, D., Yang, Y., & Zhang, J. (2020). Hard to get: The scarcity of women and the competition for high-income men in urban China. *Journal of Development Economics*, vol. 144(C).
Ong, D. & Wang, J. (2015). Income attraction: An online dating field experiment. *Journal of Economic Behavior & Organization*, 111, pp.13-22.
Parslow, E., Ranehill, E., Zethraeus, N., Blomberg, L., von Schoultz, B., Hirschberg, A. L., Dreber, A. (2019). The digit ratio (2D: 4D) and economic preferences: no robust associations in a sample of 330 women. *Journal of the Economic Science Association, 5*, 149–169.
Petrie, R., & Segal, C. (2017). Gender Differences in Competitiveness: The Role of Prizes.
Ranehill, E., Zethraeus, N., Blomberg, L., von Schoultz, B., Hirschberg, A. L., Johannesson, M., & Dreber, A. (2018). Hormonal contraceptives do not impact economic preferences: Evidence from a randomized trial. *Management Science, 64*, 4515–4532.

Rudman, L. A., & Glick, P. (1999). Feminized management and backlash toward agentic women: the hidden costs to women of a kinder, gentler image of middle managers. *Journal of personality and social psychology, 77*, 1004.

Schacht, Ryan, and Adrian V. Bell. 2016. "The Evolution of Monogamy in Response to Partner Scarcity." Scientific Reports 6(1): 1–9.

Sear, R., & Mace, R. (2008). Who Keeps Children Alive? A Review of the Effects of Kin on Child Survival. *Evolution and Human Behavior, 29*(1), 1-18.

Shurchkov, O. (2012). Under pressure: gender differences in output quality and quantity under competition and time constraints. *Journal of the European Economic Association, 10*, 1189–1213.

Shurchkov, O., & Eckel, C. C. (2018). *Gender differences in behavioral traits and labor market outcomes.* Oxford, UK: Oxford University Press.

Stockley, P., & Campbell, A. (2013). Female competition and aggression: interdisciplinary perspectives. *Philosophical Transactions of The Royal Society B, 368*(20130073).

Sutter, M., & Glätzle-Rützler, D. (2015). Gender differences in the willingness to compete emerge early in life and persist. *Management Science, 61*, 2339–2354.

Toulabor, C. (2012). Les Nana Benz de Lomé. *Afrique contemporaine*, 69–80.

Trivers, R. (1972). Parental investment and sexual selection. *Sexual Selection & the Descent of Man, Aldine de Gruyter, New York*, 136–179.

UN Women, U. N. (2020). Annual report 2019–2020. *New York, NY: UN Women*.

Villeval, M. C., & Kuhn, P. J. (2015). Are Women More Attracted to Co-operation Than Men? *The Economic Journal, 125*(582), 115-140.

Von Rueden, C., Gurven, M., & Kaplan, H. (2011). Why do men seek status? Fitness payoffs to dominance and prestige. *Proceedings of the Royal Society B: Biological Sciences, 278*, 2223–2232.

Wood, W., & Eagly, A. H. (2012). Biosocial construction of sex differences and similarities in behavior. In *Advances in experimental social psychology* (Vol. 46, pp. 55–123). Elsevier.

Wozniak, D., Harbaugh, W. T., & Mayr, U. (2014). The menstrual cycle and performance feedback alter gender differences in competitive choices. *Journal of Labor Economics, 32*, 161–198.

Zethraeus, N., Kocoska-Maras, L., Ellingsen, T., Von Schoultz, B. O., Hirschberg, A. L., & Johannesson, M. (2009). A randomized trial of the effect of estrogen and testosterone on economic behavior. *Proceedings of the National Academy of Sciences, 106*, 6535–6538.

Zhang, Y. J. (2013). Can experimental economics explain competitive behavior outside the lab? *Available at SSRN 2292929*.

Zhang, Y. J. (2019). Culture, institutions and the gender gap in competitive inclination: Evidence from the communist experiment in China. *The Economic Journal, 129*, 509–552.

Tables and Figures

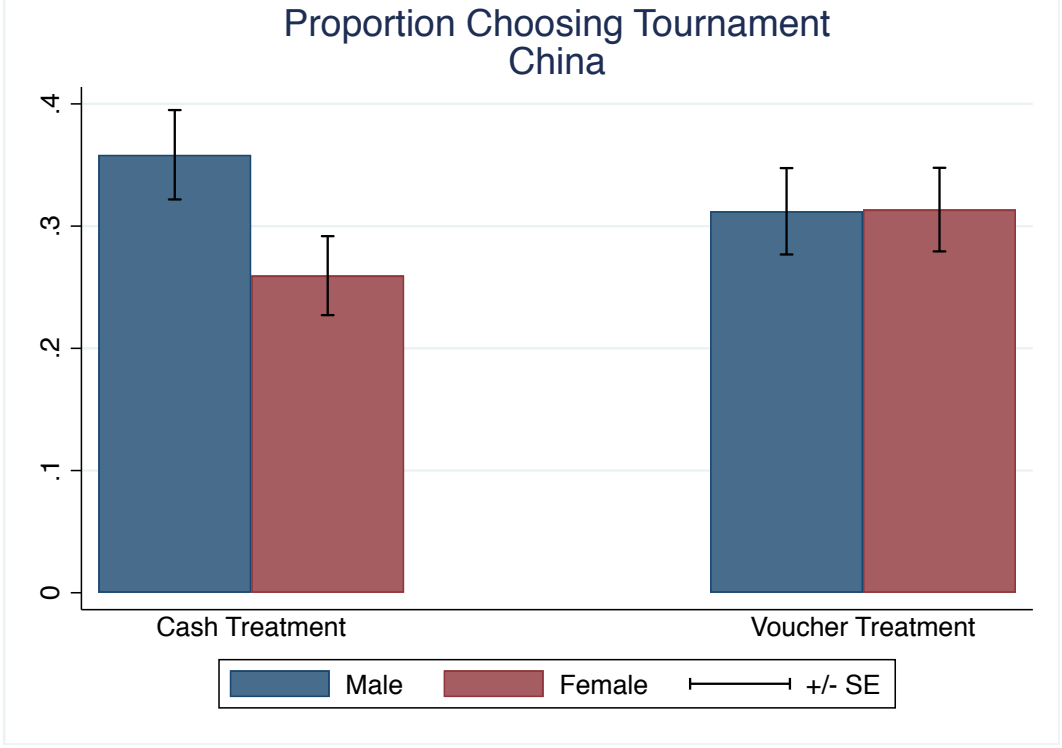

Figure 1. **Tournament entry decision – China (parents).** Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash* and *ChildrenVoucher*. Error bars represent mean +/- SE. Under *Cash*, the 10 percentage point gender difference in tournament entry is significant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

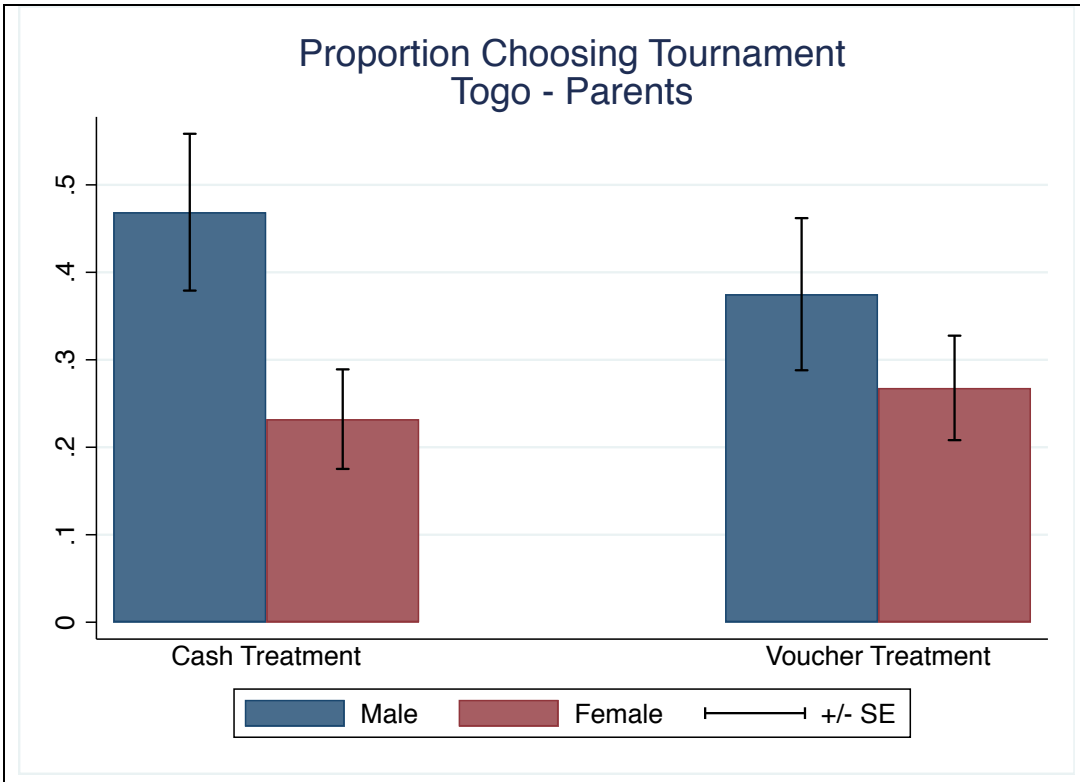

Figure 2a. **Tournament entry decision: Togo (parents)**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash* and *ChildrenVoucher*. Error bars represent mean +/- SE. Under *Cash*, the 24 percentage point gender difference in tournament entry is significant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

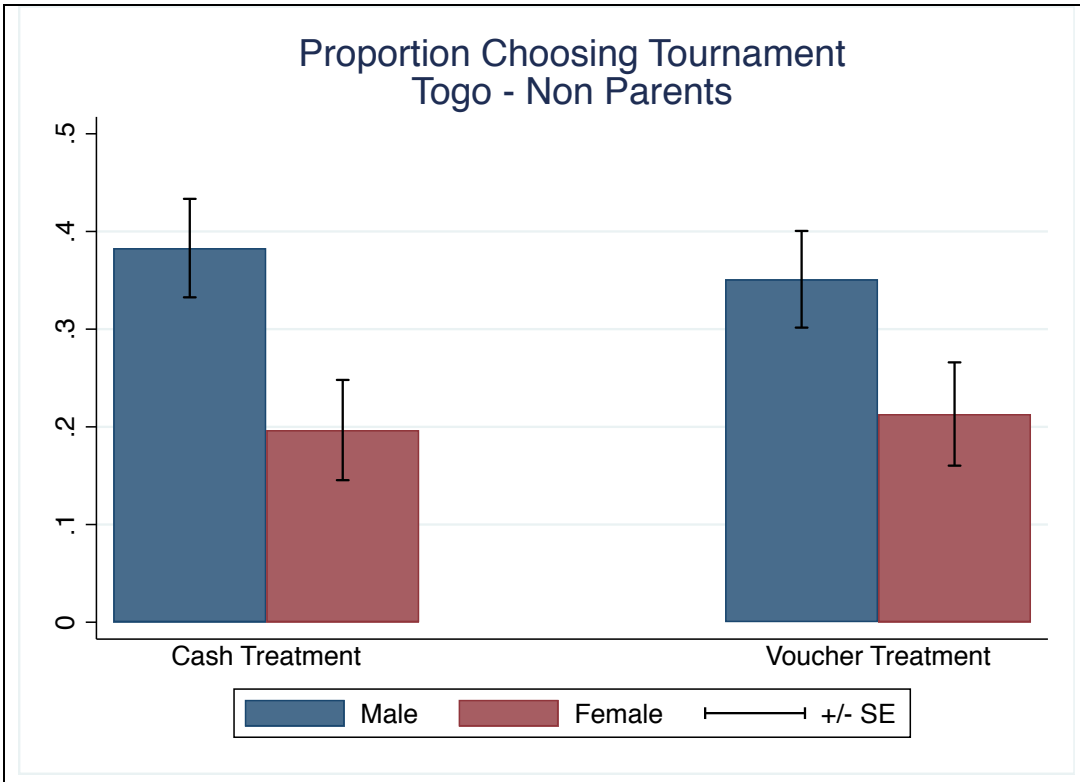

Figure 2b. **Tournament entry decision: Togo (non-parents)**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash* and *ChildrenVoucher* (placebo treatment). Error bars represent mean +/- SE. Under *Cash*, the 18 percentage points gender difference in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

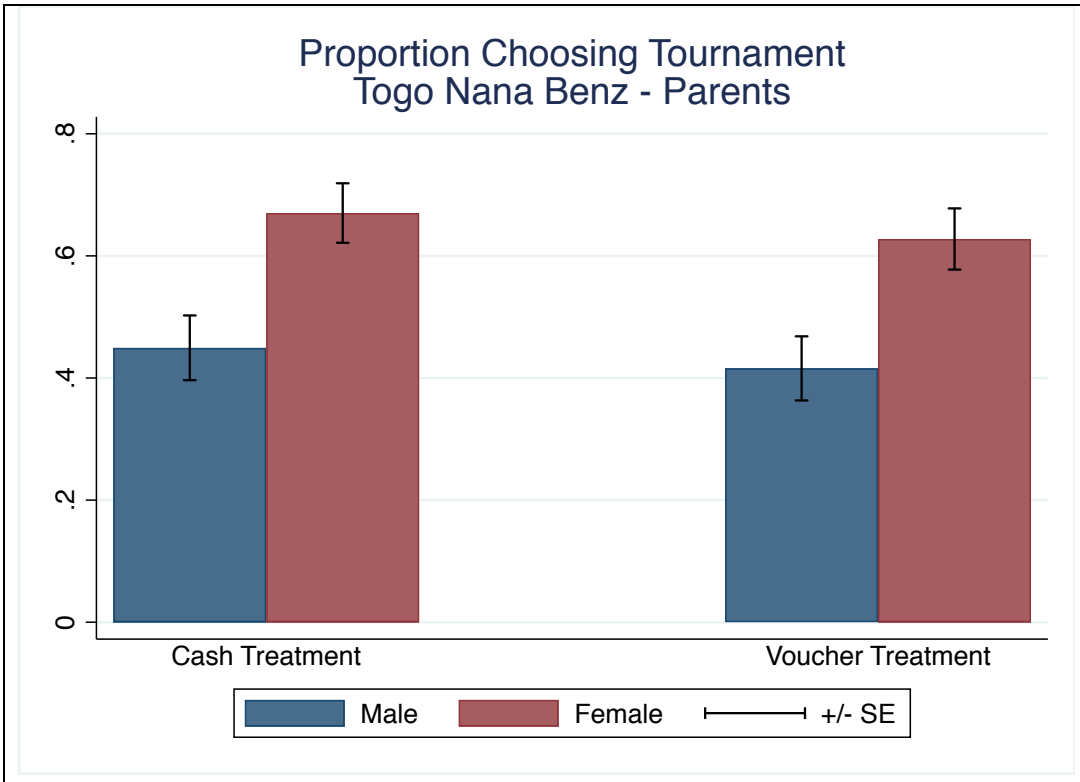

Figure 2c. **Tournament entry decision: Nana Benz (parents)**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash* and *ChildrenVoucher*. Error bars represent mean +/- SE. For this sample in which women are economically empowered, the gender gap reverses to a negative and significant gender difference in tournament entry of over 20 percentage points under both *Cash*, (men: 0.45, women: 0.67, p=0.002) and *ChildrenVoucher* (men: 0.42, women: 0.63, p=0.004).

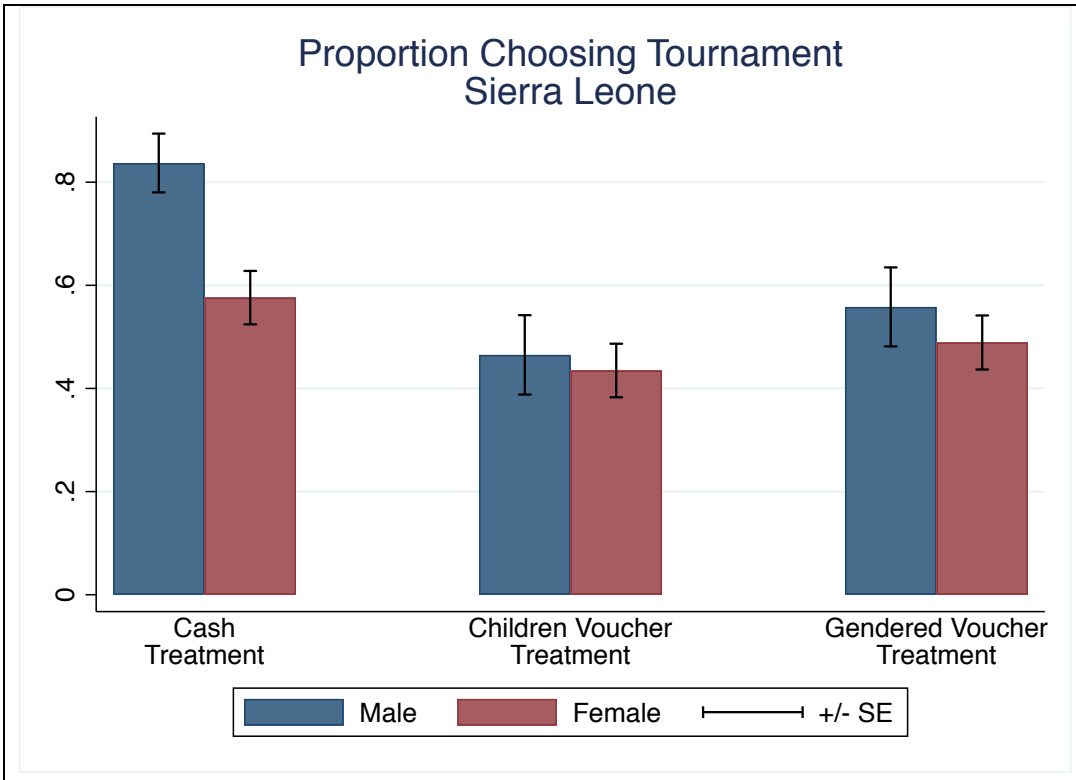

Figure 3. **Tournament entry decision: Sierra Leone (parents).** Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash*, *ChildrenVoucher* and *GenderedVoucher* (placebo treatment). Error bars represent mean +/- SE. Under *Cash*, the 26 percentage points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

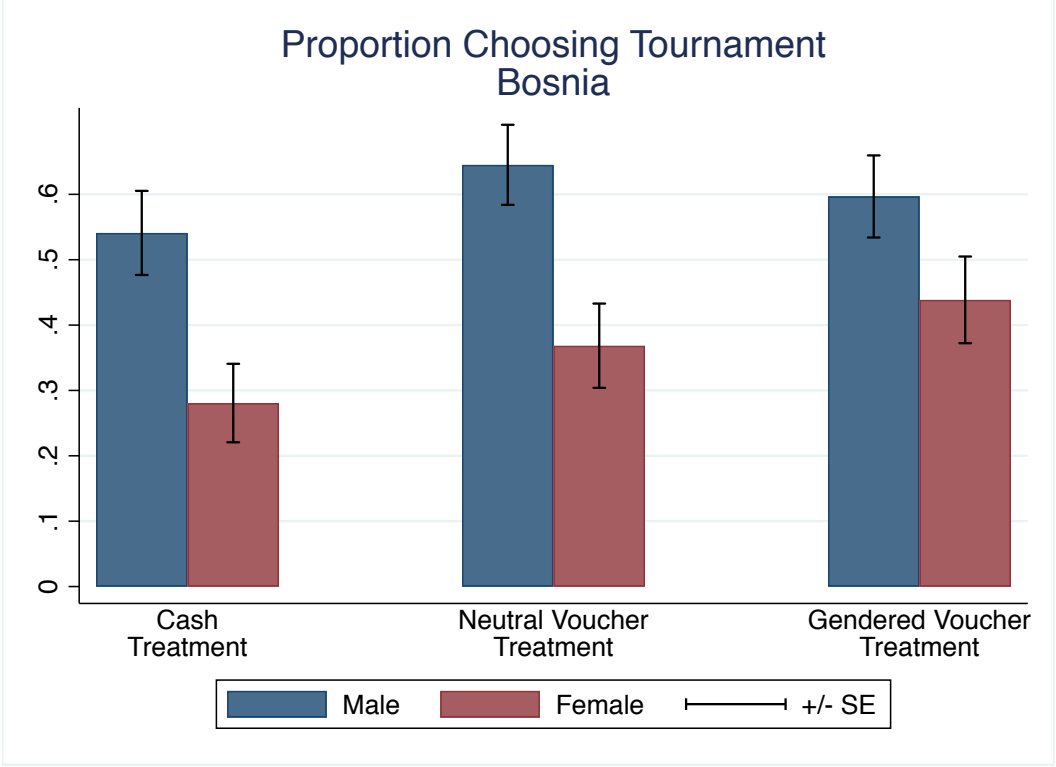

Figure 4. **Tournament entry decision**: **Bosnia (non-parents).** Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash, NeutralVoucher* (first placebo treatment) and *GenderedVoucher* (second placebo treatment). Error bars represent mean +/- SE. Under *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 *NeutralVoucher* (men: 0.65, women: 0.37, p=0.002), but it shrinks in half and loses significance under *GenderedVoucher* (men: 0.60, women: 0.44, p=0.086).

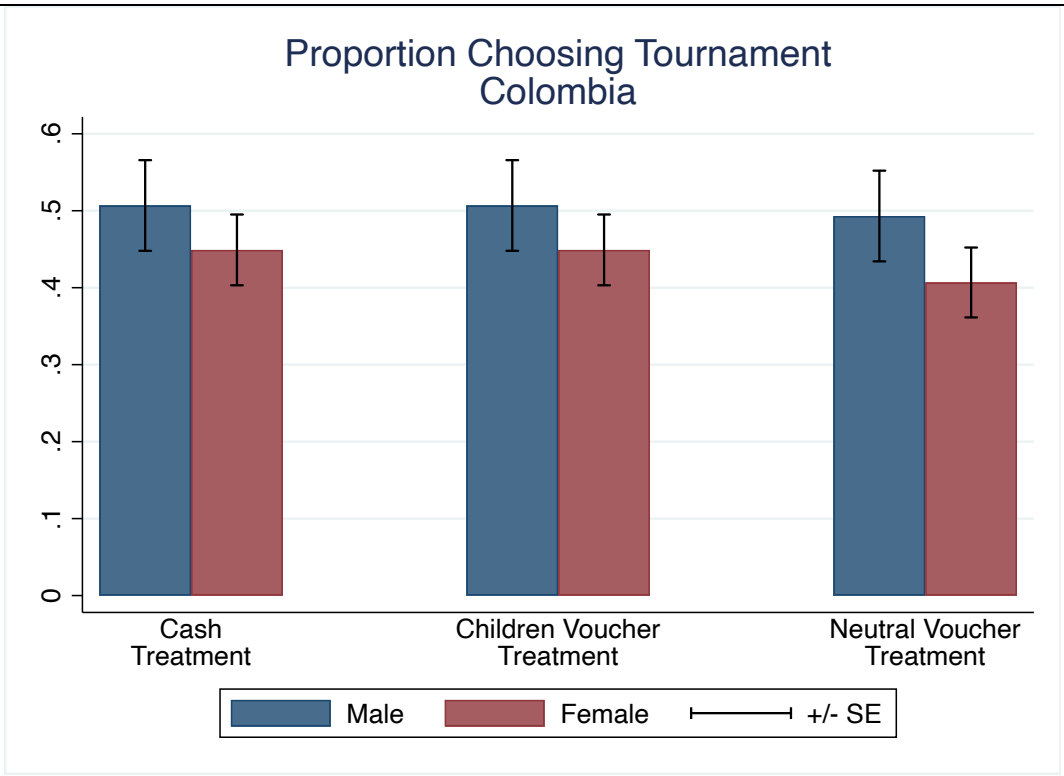

Figure 5. **Tournament entry decision: Colombia (parents)**. Bars display the proportion of men (blue) and women (red) choosing to enter the tournament under *Cash, ChildrenVoucher* and *NeutralVoucher*. Error bars represent mean +/- SE. Results are virtually identical in all three conditions: under both *Cash* and *ChildrenVoucher* the 6 percentage point gender difference in tournament entry is not significant (men: 0.51, women: 0.45, p=0.44) and under *NeutralVoucher* the 8 percentage point gender difference in tournament entry is not significant (men: 0.49, women: 0.41, p=0.245)

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	-0.013	
	(0.082)	(0.080)	
Voucher			0.046
			(0.114)
Female*Voucher			-0.004
			(0.063)
Compulsory Tr Score	0.020**	0.010	
	(0.009)	(0.009)	
Risk Tolerance	0.025	0.011	
	(0.021)	(0.021)	
Confidence	-0.007	0.009	
	(0.009)	(0.009)	
WTP for voucher		0.077**	
		(0.036)	
Constant	0.219	0.182	0.486***
	(0.160)	(0.173)	(0.014)
Observations	179	179	358
Number of individuals			179

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 & Y. Jane Zhang

2 December, 2021

Supplementary Appendix

A1. China

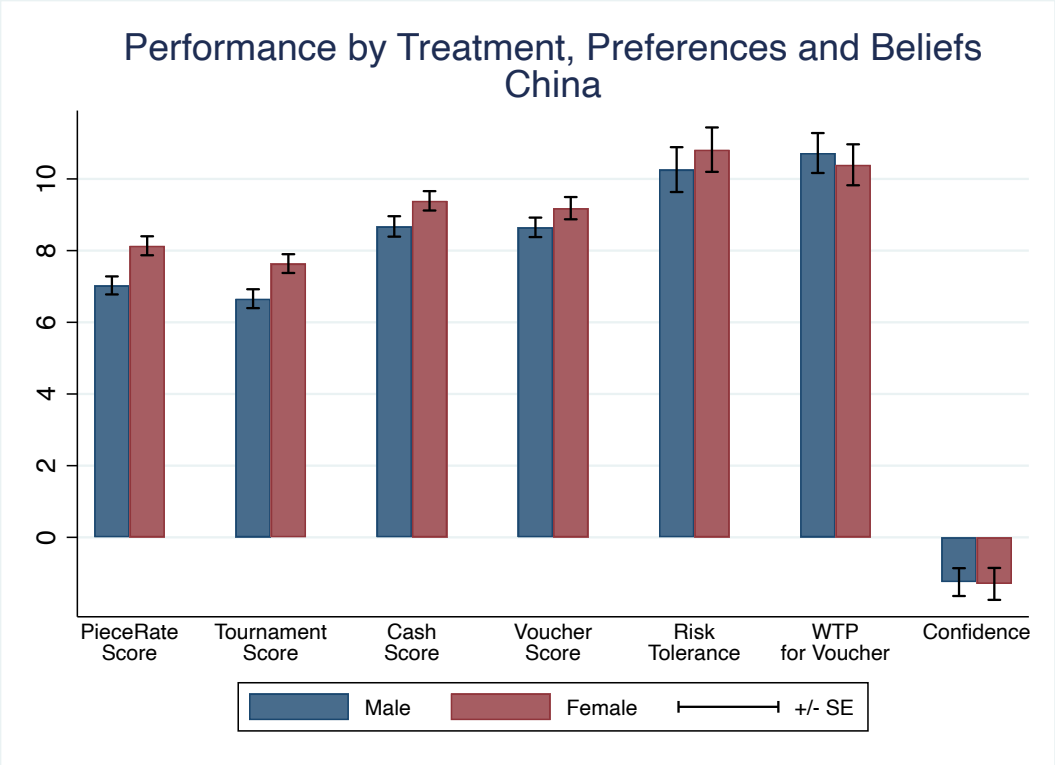

Figure A1. Performance by Treatment, Preferences and Beliefs – China

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 - Cash Treatment	8.67	9.39	9.05	0.069
	(0.29)	(0.27)	(0.20)	
Score - Voucher Treatment	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)	
T-Test (paired)				
p-value Cash vs. Children	0.131	0.105		
N	173	185	358	

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

A2. Togo

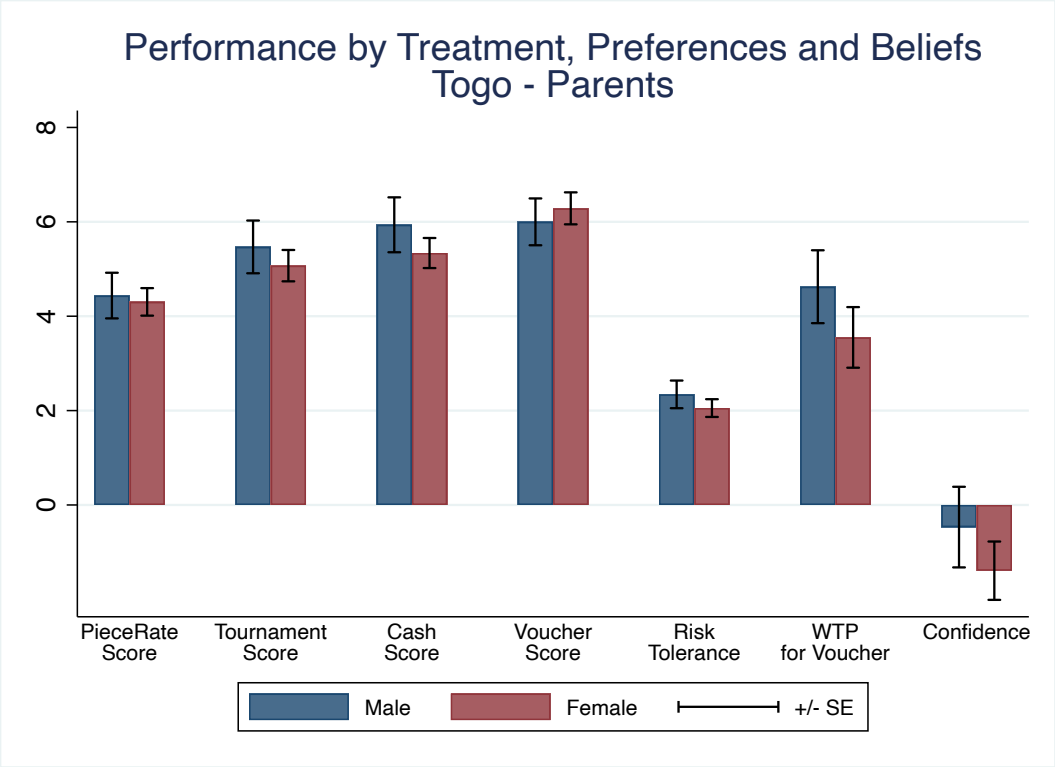

Figure A2a. Performance by Treatment, Preferences and Beliefs – Togo Parents

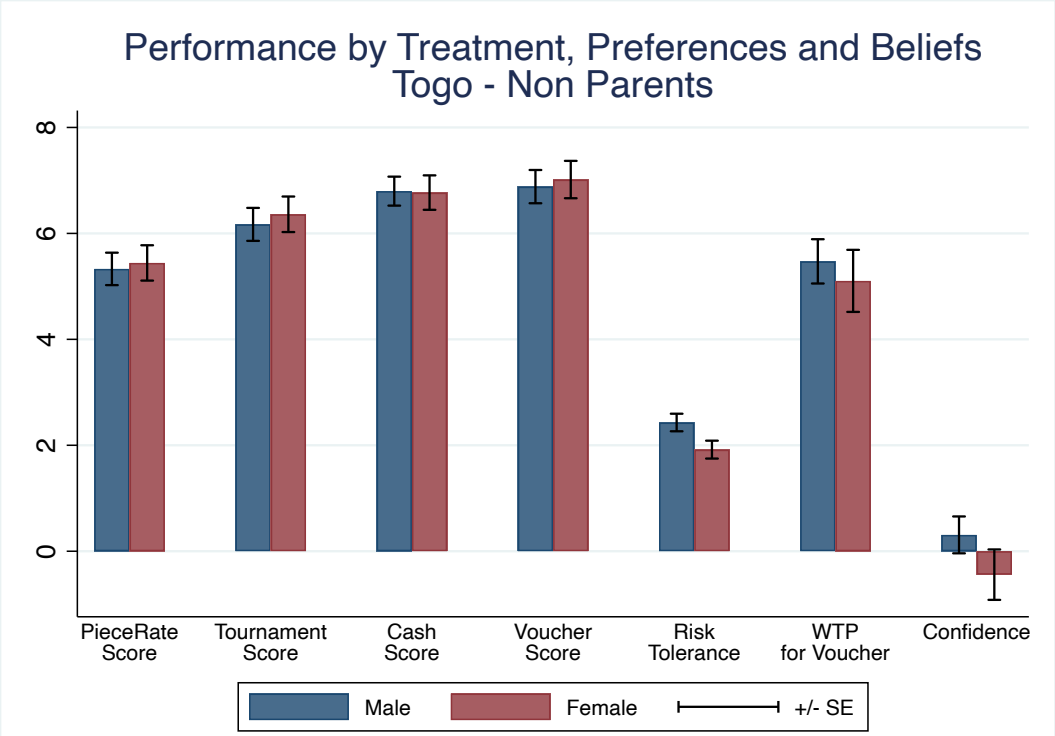

Figure A2b. Performance by Treatment, Preferences and Beliefs – Togo Non Parents

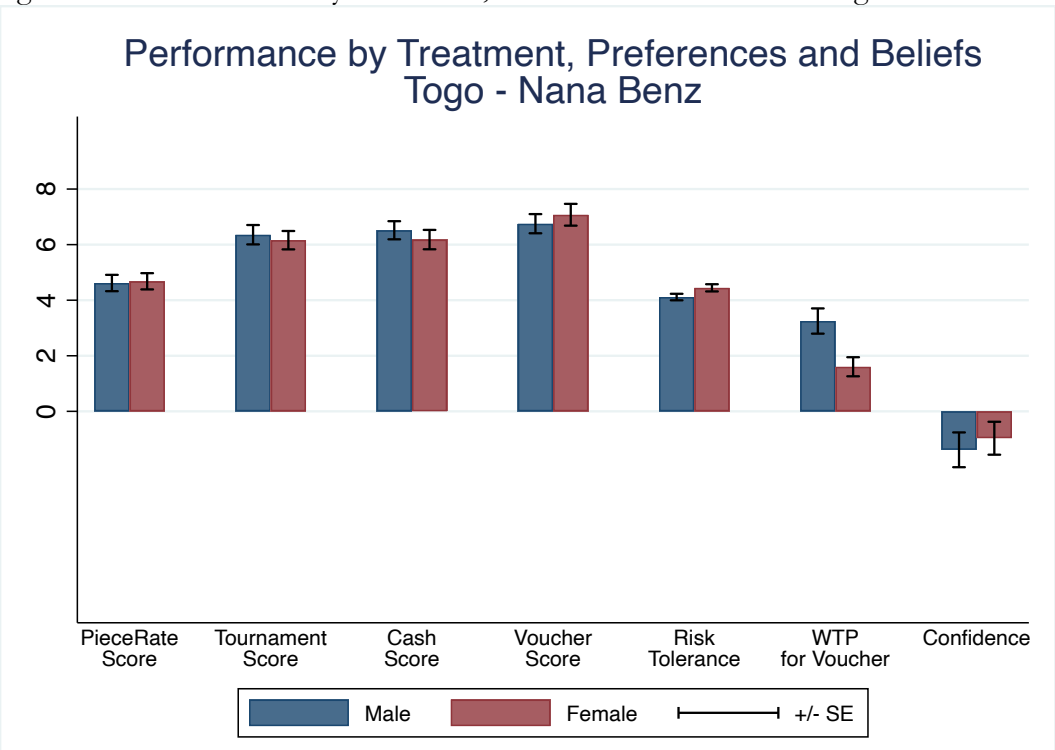

Figure A2c. Performance by Treatment, Preferences and Beliefs – Togo Nana Benz

Table A2a. Summary Statistics: Togo - Parents

	Male 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	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 - Cash Treatment	5.94	5.34	5.56	0.328
	(0.58)	(0.32)	(0.29)	
Score - Voucher Treatment	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	0.291
	(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	0.300
	(0.09)	(0.06)	(0.05)	
T-Test (paired)				
p-value Cash vs. Voucher	0.184	0.419		
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 - Cash Treatment	6.80	6.77	6.79	0.949
	(0.27)	(0.33)	(0.21)	
Score - Voucher Treatment	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	0.600
	(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)	
T-Test (paired)				
p-value Cash vs. Voucher	0.516	0.784		
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	0.000
	(0.34)	(0.49)	(0.32)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	4.62	4.68	4.63	0.880
	(0.29)	(0.29)	(0.21)	
Score - Tournament	6.36	6.16	6.25	0.682
	(0.35)	(0.33)	(0.24)	
Score - Cash Treatment	6.52	6.18	6.35	0.483
	(0.33)	(0.35)	(0.24)	
Score - Voucher Treatment	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	0.060
	(0.12)	(0.13)	(0.09)	
WTP for Voucher	3.25	1.61	2.38	0.004
	(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)	
T-Test (paired)				
p-value Cash vs. Voucher	0.552	0.320		
N	89	94	183	

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

A3. Sierra Leone

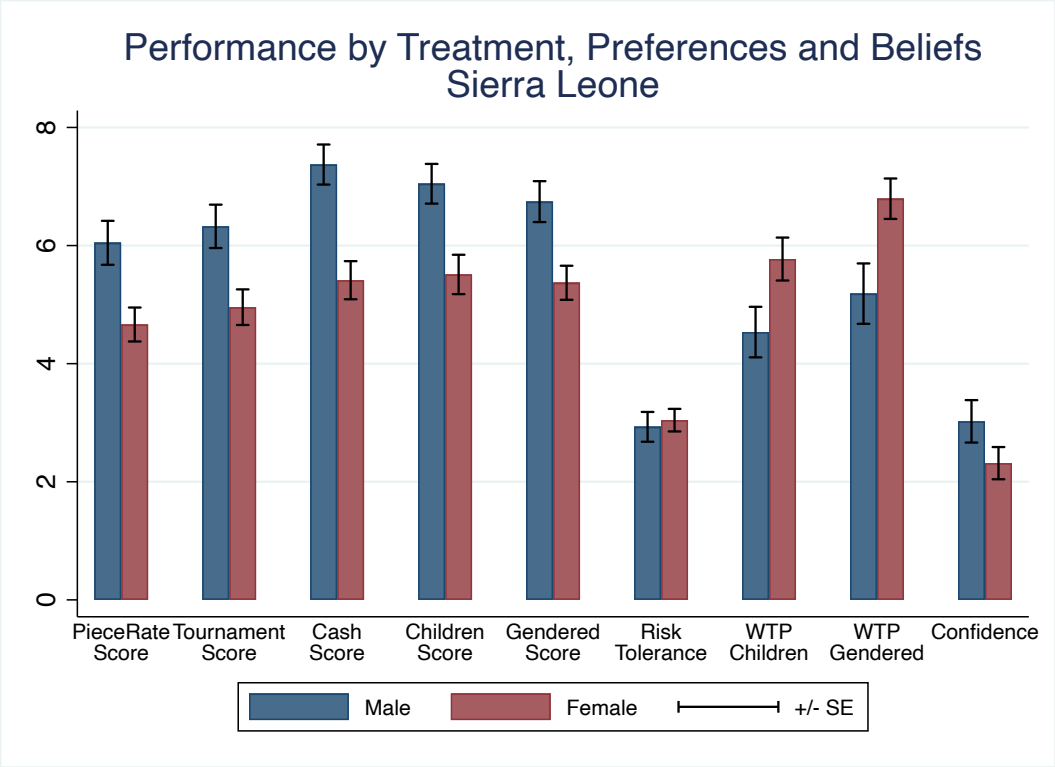

Figure A3. Performance by Treatment, Preferences and Beliefs – Nana Benz

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 - Cash Treatment	7.37	5.41	6.04	0.000
	(0.34)	(0.32)	(0.26)	
Score - Children V. Treatment	7.05	5.51	6.00	0.005
	(0.34)	(0.33)	(0.26)	
Score - Gendered V. Treatment	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. Treatment	0.47	0.44	0.44	0.743
	(0.08)	(0.05)	(0.04)	
Entry - Gendered V. Treatment	0.56	0.49	0.51	0.459
	(0.08)	(0.05)	(0.04)	
T-Test (paired)				
p-value Cash vs. Children	0.000	0.001		
p-value Cash vs. Gendered	0.001	0.020		
p-value Children vs. Gendered	0.044	0.096		
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

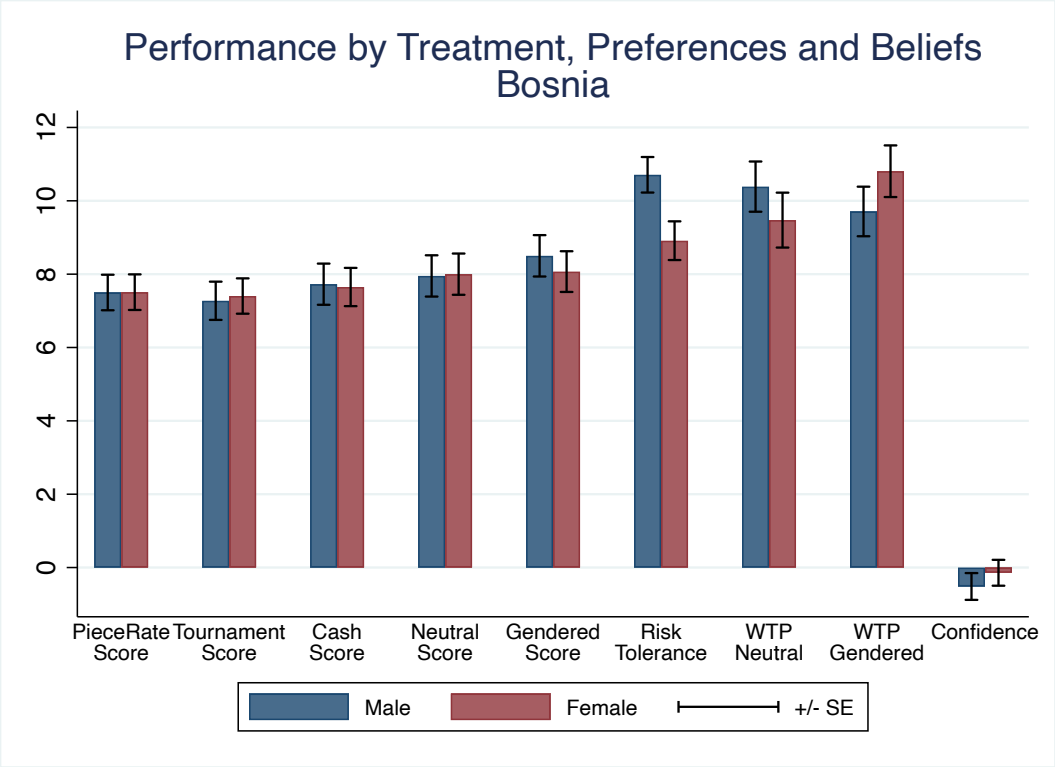

Figure A4. Performance by Treatment, Preferences and Beliefs - Bosnia

Table A4. Summary Statistics: Bosnia

	Male 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	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 - Cash Treatment	7.73	7.65	7.69	0.921
	(0.56)	(0.52)	(0.38)	
Score - Neutral V. Treatment	7.95	8.00	7.98	0.952
	(0.56)	(0.56)	(0.40)	
Score - Gendered V. Treatment	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. Treatment	0.65	0.37	0.51	0.002
	(0.06)	(0.06)	(0.05)	
Entry - Gendered V. Treatment	0.60	0.44	0.52	0.086
	(0.06)	(0.07)	(0.05)	
T-Test (paired)				
p-value Cash vs. Neutral	0.128	0.255		
p-value Cash vs. Gendered	0.496	0.038		
p-value Neutral vs. Gendered	0.410	0.350		
N	62	57	119	

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

A5. Colombia

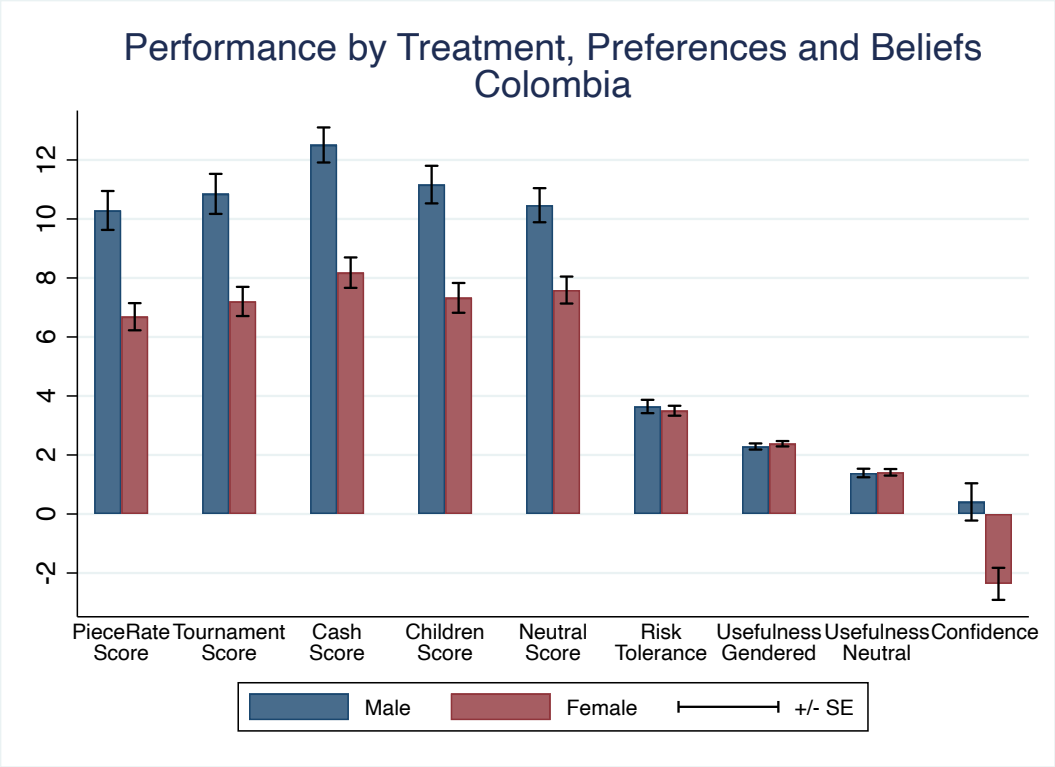

Figure A5. Performance by Treatment, Preferences and Beliefs - Colombia

Table A5 - Summary Statistics: Colombia

	Male	**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	44.492	41.182	42.411	0.043
	(1.435)	(0.913)	(0.790)	
Education	7.403	7.144	7.242	0.608
	(0.410)	(0.304)	(0.244)	
Income	241.199	209.466	221.658	0.025
	(12.793)	(7.664)	(6.886)	
Panel B: Performance, Preferences and Beliefs				
Score - Piece Rate	10.288	6.686	8.063	0.000
	(0.660)	(0.460)	(0.400)	
Score - Tournament	10.849	7.203	8.597	0.000
	(0.679)	(0.494)	(0.420)	
Score - Cash Treatment	12.507	8.179	9.842	0.000
	(0.594)	(0.516)	(0.419)	
Score - Children V. Treatment	11.164	7.325	8.800	0.000
	(0.637)	(0.505)	(0.417)	
Score - Neutral V. Treatment	10.466	7.590	8.695	0.000
	(0.578)	(0.457)	(0.372)	
Risk Tolerance	3.644	3.500	3.556	0.605
	(0.226)	(0.169)	(0.135)	
Usefulness of Children V.	2.288	2.381	2.346	0.511
	(0.104)	(0.092)	(0.069)	
Usefulness of Neutral V.	1.389	1.412	1.403	0.897
	(0.145)	(0.111)	(0.088)	
Confidence	0.409	-2.368	-1.366	0.002
	(0.631)	(0.543)	(0.426)	
Panel C: Results - Proportion Choosing Tournament				
Entry - Cash Treatment	0.507	0.449	0.471	0.440
	(0.059)	(0.046)	(0.036)	
Entry - Children V. Treatment	0.507	0.449	0.471	0.440
	(0.059)	(0.046)	(0.036)	
Entry - Neutral V. Treatment	0.493	0.407	0.440	0.245
	(0.059)	(0.045)	(0.036)	
T-Test (paired)				
p-value Cash vs. Children	1.000	1.000		
p-value Cash vs. Neutral	0.708	0.299		
p-value Children vs. Neutral	0.741	0.355		
N	73	118	191	

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

Table A6

Combined Voucher Experiments not including China
(where gender gap in competition for cash is found)

	(1) Cash	(2) Voucher	(3) FE Panel (Voucher)
Female	-0.195***	-0.077	
	(0.050)	(0.057)	
Voucher			-0.086
			(0.225)
Female*Voucher			0.140**
			(0.055)
Constant	0.511***	0.442**	0.495***
	(0.168)	(0.195)	(0.013)
Observations	340	335	669
Number of individuals			335

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 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.

Table A7

	Colombia				
	Cash	Voucher	FE Panel (Voucher)	Placebo - voucher	FE Panel (Placebo)
Female	-0.006	-0.013		-0.051	
	(0.082)	(0.080)		(0.083)	
Voucher			0.046		1.111***
			(0.114)		(0.117)
Female*Voucher			-0.004		-0.054
			(0.063)		(0.062)
Compulsory Tr Score	0.020**	0.010		0.014	
	(0.009)	(0.009)		(0.009)	
Risk Tolerance	0.025	0.011		0.030	
	(0.021)	(0.021)		(0.021)	
Confidence	-0.007	0.009		-0.000	
	(0.009)	(0.009)		(0.009)	
WTP for voucher		0.077**		-0.023	
		(0.036)		(0.032)	
Constant	0.219	0.182	0.486***	1.292***	0.500***
	(0.160)	(0.173)	(0.014)	(0.163)	(0.015)
Observations	179	179	358	174	348
Number of individuals			179		174

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 neutral voucher for electricity. (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 for electricity.

Table A8

Panel A

	Shanghai		
	(1) Cash	(2) Voucher - Child	(3) FE Panel (Voucher)
Female	-0.116**	-0.015	
	(0.047)	(0.048)	
Voucher			-0.046
			(0.030)
Female*Voucher			0.100**
			(0.045)
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 tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children (which drop out in the fixed effects regression).

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			0.049		0.115
			(0.072)		(0.074)
Female*Voucher			0.112		-0.025
			(0.104)		(0.107)
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**	0.417***
	(0.179)	(0.202)	(0.026)	(0.204)	(0.027)
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 tournament round score, risk preferences, confidence, and willingness to pay for the gender stereotypical voucher (which drop out in the fixed effects regression). (4) OLS regression; incentive is gender neutral voucher. (5) Fixed effects regression; controls include tournament round score, risk preferences, confidence, and willingness to pay for the gender neutral voucher (which drop out in the fixed effects regression).

Table A8 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			-0.094			0.000
			(0.069)			(0.049)
Female*Voucher			0.135			0.000
			(0.085)			(0.077)
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)	(0.019)
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 tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children (which drop out in the fixed effects regression). (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 tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children (which drop out in the fixed effects regression).

Table A8 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			-0.372***		-0.279***
			(0.081)		(0.076)
Female*Voucher			0.231**		0.192**
			(0.092)		(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 tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children (which drop out in the fixed effects regression). (4) OLS regression; incentive is gender stereotypical voucher. (5) Fixed effects regression; controls include tournament round score, risk preferences, confidence, and willingness to pay for the gender stereotypical voucher (which drop out in the fixed effects regression).

Table A8 Cont'd

Panel E

	Colombia				
	Cash	Voucher	FE Panel (Voucher)	Placebo - voucher	FE Panel (Placebo)
Female	-0.006	-0.013		-0.051	
	(0.082)	(0.080)		(0.083)	
Voucher			-0.015		0.985***
			(0.040)		(0.035)
Female*Voucher			-0.003		-0.049
			(0.057)		(0.054)
Compulsory Tr Score	0.020**	0.010		0.014	
	(0.009)	(0.009)		(0.009)	
Risk Tolerance	0.025	0.011		0.030	
	(0.021)	(0.021)		(0.021)	
Confidence	-0.007	0.009		-0.000	
	(0.009)	(0.009)		(0.009)	
WTP for voucher		0.077**		-0.023	
		(0.036)		(0.032)	
Constant	0.219	0.182	0.486***	1.292***	0.500***
	(0.160)	(0.173)	(0.014)	(0.163)	(0.015)
Observations	179	179	358	174	348
Number of individuals			179		174

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 tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children (which drop out in the fixed effects regression). (4) OLS regression; incentive is gender neutral voucher for electricity. (5) Fixed effects regression; controls include tournament round score, risk preferences, confidence, and willingness to pay for the gender neutral voucher for electricity (which drop out in the fixed effects regression).

Table A8 Cont'd

Panel F

Togo - Nana Benz

	Cash	Voucher	FE Panel (Voucher)
Female	0.247***	0.210**	
	(0.070)	(0.082)	
Voucher			-0.041
			(0.062)
Female*Voucher			-0.031
			(0.076)
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)	(0.019)
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 tournament round score, risk preferences, confidence, and willingness to pay for the voucher for children (which drop out in the fixed effects regression).