A TALE OF TWO FERTILITIES: A CROSS-CULTURAL INVESTIGATION OF FERTILITY REDUCTION

A Dissertation

by

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ABSTRACT

Seeking to understand what catalyzes and sustains fertility reduction, this research explores the reproductive tradeoffs and opportunity costs experienced by individuals in three unique environmental and cultural contexts. Examining individuals in a preindustrial, indigenous population, we ask how and why a pattern of reduced reproduction begins among pre-transitional societies. Among women in the United States, we question how exposure to reproduction and childrearing at an early age act upon fertility ideation. Among individuals in an institution of higher education where high educational and professional investment is normative, we examine how education and professional rank tradeoff against fertility. Within the preindustrial population with relatively recent and pervasive access to contraception, women translate access to wage labor and reproductive agency into higher fertility desires, and yet fertility is falling due to a changing material economy and a shift in reproductive prudence. Education expedites this effect, creating a reduction in desired fertility and a higher likelihood of using contraception. Among women in the United States, greater early experience with pregnancy, childbirth and childrearing leads to behaviors predictive of higher lifetime fertility, yet ultimate fertility is not significantly higher among those with increased experience. Women recalibrate fertility desires to accommodate life demands following entry into parenthood and feel little obligation to meet early goals for fertility. Among a similar, though more highly educated population with high professional pursuits, high educational investment is the strongest predictor of lower-than-desired fertility

outcomes. Professional rank shapes how individuals balance work and family formation, with high- and low-rank individuals using contrasting approaches to maintain professional pursuits while raising children; high-rank individuals decrease professional investments while raising young children and low-rank individuals increase professional investments. Women experience the highest levels of conflict when juggling professional and personal responsibilities.

Consistent among these studies, we find that fertility desires are often different than outcomes, changing opportunity costs contribute to reductions in fertility, and growing costs of material goods create pressure to engage in reproductive prudence, made possible by access to contraceptive technology. Women cross-culturally are more deeply impacted by the shifting educational and professional landscape, with each investment differentially impacting fertility outcomes.

DEDICATION

I dedicate this work to three people: my sons Jackson and Atticus, and my partner Jason. In 2008, Jackson came into the world, transforming my perceptions of motherhood. The sacred act of parenting was made real, prompting my curiosity about the experiences of mothers across time and space. I fell deeply in love with him and motherhood. Three years later Atticus joined our family. It was not until Atticus was born that I realized how much parents benefit from prior experience with children. The three years of parenting under my belt made me a gentler, happier, and more confident mother. I was reminded that motherhood is a fleeting gift meant to be savored. These two boys gave my life meaning and grounded me, inspiring me to squeeze every ounce of joy out of life and share it with those I love. Jackson and Atticus, I love you more than words can express.

Jason was with me through it all: parenting, juggling a career, pursuing a doctoral degree, and the beautiful, occasionally messy, ebb and flow of life. He cheered me on, showing genuine curiosity about anthropology, fieldwork, and each of the new opportunities and challenges we faced. Jason took for granted that I was capable of it all, making me more confident in my abilities. He showed me how to love and support someone even when it means that our own burden is heavier. He shouldered big pieces of our daily lives so that I could have space to think and learn. I could not have done this without you, Jason Kurten. I love you deeply and I'm so blessed to call you my life partner.

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In the United States, many women and men who participated in this research did so with incredible honesty and vulnerability. This research is deeply personal for many; each number and each word in these data represent a story that has shaped and defined the lives of those who share them. I have received stories of immense personal loss, of struggle and sacrifice, and of blessings that transform lives. This research has revealed to me the complexity and gravity of fertility decisions. While these decisions appear fragile, often swayed by external influences, each fertility decision and subsequent outcome bears some burden for an individual's sense of purpose and meaning. I am grateful for all of those who shared their stories, trusting me to represent their unique perspective in pursuit of greater understanding.

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1. INTRODUCTION

Fertility variation is the defining mechanism of evolution. Not only does fertility variation drive evolution, it complicates demographic predictions and the population outcomes on which they rest. Rates of fertility differ wildly cross-culturally, creating uncertainty around the timing and pace of population change. As an example of the variability of fertility around the world, the 2018 World Population Data Sheet (Kaneda, et al. 2018) capturing country-level total fertility rate (TFR) suggests that the highest country-level rate on record is Niger at 7.2, whereas many countries have TFRs way below replacement rates. Replacement fertility is usually 2.1, and yet nearly half of the countries in the world have TFRs below 2.1. The latest data for South Korea show a TFR of 0.95 with Singapore only slightly higher. Many sub-populations within these countries still maintain far higher TFRs, particularly in natural-fertility populations where anthropologists regularly conduct research.

Decades of researchers have attempted to make sense of fertility reduction seen during demographic transitions around the world. During early stages of demographic transition as societies modernize, improvements in food availability, infrastructure to distribute resources, and public health improvements all lead to a decline in mortality which leads to an initial increase in population. In later stages of transition, populations become more urbanized, families become more dispersed seeking employment, and the costs of living grow as education and material goods become normalized. These shifts in social organization and economic production shift the motivations and payoffs for

having children, leading to lowered fertility. This occurs despite the trend whereby fertility patterns among pre-industrial populations most frequently rise as more resources become available.

To contribute to our understanding of these demographic transitions and the contextual changes that catalyze them, this dissertation will present three journal article manuscripts, each investigating a separate, but related component of cross-cultural differences in fertility and family formation behavior. In particular, we seek to understand what catalyzes and sustains fertility reduction cross-culturally. Each article addresses the tradeoffs and opportunity costs experienced by individuals in different environmental and cultural contexts as they engage in decisions about reproduction. Each article tests hypotheses specific to the experiences of the individuals in the sample population, while exploring the forces that drive early and sustained reductions in fertility. Pressures being investigated range from cultural factors such as contraception and access to education, to the presence of small children during one's upbringing which might provide individuals with a better understanding of what parenthood entails. The complex array of influences on fertility outcomes is vast; the work revealed in this document will attempt to illuminate several components of reproductive decision-making among women and men across a range of cultural environments and reproductive norms.

Before delving into each research study, we present the theoretical underpinnings of this work, as well as existing literature about fertility ideation. We will describe some historical approaches to explain fertility reduction including economic shifts and social

reorganization following industrialization, evolutionary approaches that contrast pressures faced by early human ancestors with modern life, and life-history tradeoffs that explore quality versus quantity of offspring. We will then describe a more holistic approach to these questions, looking to Embodied Capital theory to explain the investments that parents make in themselves as well as their children. We will also review what existing literature tells us about the nature of reproductive ideation, emphasizing early life experiences, information transmission within cultures, and the influence of religious practice.

1.1. Embodied Capital and Other Theoretical Approaches

Researchers across disciplines have attempted to explain the nature and cause of fertility reduction that is experienced during a demographic transition, often termed "fertility transition". Several explanatory approaches address the economic or financial considerations of parenting to explain reduced fertility. Over the past half century, several theories have emerged that all rely on the same basic principle: the costs of raising children has become higher, and this cost is no longer offset by the economic benefits of having children (Becker 1960; Blackburn and Cipriani 2005; Caldwell 1976; Caldwell 2005). In agrarian societies where labor and production occur largely within the nuclear family or among close kin, children are an important component of collective survival. Offspring make contributions to a family's resource stability into adulthood, even if those children never fully repay the investments made by parents and other caretakers (Kaplan 1994). As societies industrialize and move away from family

production toward labor specialization, net wealth increasingly moves directionally from parent to child.

Some explanatory approaches for demographic transitions look to changes in social organization as a catalyst for reductions in fertility. Such theories suggest that discontinuities in traditional social organization are responsible for major shifts in social transmission of reproductive norms (Kohler 2001; Newson, et al. 2005; Zhang, et al. 2013). These posit that as individuals become more socially and spatially mobile, individuals experience reductions in parental or kin influence that are evolutionarily more likely to promote high fertility. In addition, close connections with kin provide reproductive age individuals the allomaternal care (Hrdy 2008; Hrdy 2009) and transmission of knowledge about pregnancy and infants necessary to support reproduction during the period of life when resource and labor needs exceed availability. Changes in social organization pose challenges for young reproductive-aged individuals who have historically relied upon kin to bridge the energetic deficits of parenthood.

Evolutionary approaches generally argue that cultural bias and individual behavior, calibrated to our evolutionary past, have led to maladaptive reproductive norms (Kaplan 1996; Richerson and Boyd 2004), particularly as changes in social organization lead individuals to a greater reliance on non-kin than kin for information about optimal reproductive behavior (Hewlett and Cavalli-Sforza 1986; Richerson and Boyd 2004).

Other models focus on quality of offspring over quantity of offspring. As an illustration, in resource-rich modern environments where individuals experience reduced

mortality, no longer does food or land acquisition serve as the strongest predictor of one's reproductive success. Countless factors impact social competition, leading to a snowballing effect on resource strategies (Brezis 2010; Hill and Reeve 2005) in order to remain competitive in one's environment. In contrast to our evolutionary past where fitness was best described as maximizing lifetime fertility, this shifting cultural landscape demands higher costs to produce equally competitive offspring. These arguments posit that humans are not inherently focused on strict maximum reproduction, but rather pursue strategies that maximize reproduction in the context of current environments. Brezis (2010) quotes Karl Marx, saying, "In fact every special historic mode of production has its own special laws of population, historically valid within its limits alone" (Marx, et al. 1887).

Many of the theoretical approaches described above are unnecessarily exclusive and may be more useful when viewed in concert. Hillard Kaplan formalized a novel hypothesis called "Embodied Capital" that combines traditional life history theory and economic theory in the study of human fertility (Kaplan 1996; Kaplan, et al. 2009). The Embodied Capital hypothesis provides a lens through which we can interpret fertility shifts in unique environments. Societal changes (e.g. growth of economic opportunity, changes in division of labor, shifting agency among previously marginalized groups) have implications for individual reproductive decisions, each potentially resulting in reproductive tradeoffs between physical growth and development as well as functional growth and development. In the Embodied Capital hypothesis, individual growth and maintenance are more appropriately viewed as investments by individuals that increase

their competitiveness. Similarly, cognitive and social investments—education, skill development, building social status—are all investments that enhance future competitiveness. Resource investment in these areas should be viewed as increasing the potential and the effectiveness of future reproduction, potentially at the expense of current reproduction. Investments in these cognitive and social domains are often at the exclusion of other types of investments, but the equation is not as simple as personal growth/maintenance versus current reproduction and offspring quality. Investments in self and in offspring quality have long-term consequences for later reproduction for mothers and fathers alike.

Embodied Capital theory provides the fundamental framework that will underlie this cross-cultural investigation of fertility, as it captures the continuum of investments that individuals make in themselves and their offspring, and accounts for a shifting equilibrium of this equation in changing environments. As economies change over space and time, individuals may identify viable paths to climb in social status that require a greater personal investment in education and training at the expense of investments in offspring. These high-status individuals may then perceive an increased optimal level of investment for the few children they have, exacerbating the perceived tradeoffs to reproduction. During our evolutionary history, populations experienced rapid diminishing returns to choosing personal investment over offspring investment. Payoffs to investment became higher with growing social mobility. During economic shifts that arise during widespread industrialization, or even among communities with

emerging access to modern markets, postponing reproduction in favor of greater engagement in personal investment becomes a less costly prospect.

1.2. Environmental Pressures Catalyzing Fertility Reduction Cross-Culturally

Summarizing earlier discussions, the changing nature of economic opportunity has caused parents to invest differently in themselves and in their children than they would have during human history. Parents in pre-industrial populations begin to experience diminishing returns to investments in offspring, whereas parents in industrialized populations have a seemingly infinite capacity to improve their own competitiveness, and the competitiveness of their children. For example, a doctoral degree from an institution of higher education has very little value when the currency of survival is food acquisition or protection against predators. In the context of a wealthy environment like the United States, however, potential lifetime earnings continue to grow with additional degrees, despite spending less time overall in gainful employment while enrolled in educational institutions. According to one study in the United States, median lifetime earnings grew by 133% with a bachelor's degree over less-than-high school education. From a bachelor's to a master's, and from a master's to a doctoral degree, median lifetime earnings grew by 18% and 22%, respectively (Carnevale, et al. 2013).

With these payoffs to embodied capital investment, parents in industrial contexts are making complex decisions about personal and professional development, many of which are highly interrelated with their reproductive choices. According to a National

Center for Health Statistics report, in 2016 the United States experienced the lowest general fertility rate in recorded history; the only slight upward trend in fertility was seen in older age categories, among women 30-49 (Martin, et al. 2018). This suggests that women are prioritizing other goals over early reproduction and beginning families at ages when reproductive viability is more tenuous, creating implications for lifetime fertility. Two of the major tradeoffs to fertility are educational attainment and labor force participation, both of which have changed significantly over the last several decades for women in the United States, and both of which will be explored here.

At present, women in the United States have surpassed men in the number of degrees earned in higher education. According to the United States Census Bureau, among those in the workforce, more women have college degrees than men. Among those in the workforce, 11% more women received bachelor's degrees than men, and 28% more women earned master's degrees than men (2017a). While a larger number of men in the workforce received doctoral degrees than women in the workforce, data from higher education shows that women have surpassed men in number of degrees awarded at all levels of educational attainment for the larger American population (Okahana and Zhou 2018).

In the United States, the reasons why women are pursuing higher degrees at higher rates are varied, but it seems clear that the gender wage gap in the workplace is a significant factor (Dwyer, et al. 2013); women pay a much higher financial penalty for a lack of degree while employed in entry-level positions than do men, although both genders are impacted by lack of education. Despite the underlying reasons for these

educational disparities, the result is that women are investing increasingly more time pursuing their educational endeavors, and therefore less time is available to invest in family and early reproduction. Education also plays a significant role in shifting reproductive behavior in less developed countries and natural-fertility populations, though these populations often have less access to the same degree of educational resources (Snopkowski, et al. 2016).

In July 2018, a National Health Statistics Report showed that increases in education lead to reduced fertility across several dimensions. For both men and women, as educational attainment increases, individuals are more likely to remain childless. For those who go on to have at least one child, age at first birth increases and the number of children ever born decreases (Martinez, et al. 2018). Some recent literature suggests that among highly educated individuals fertility rates have shown a slight uptick (Hazan and Zoabi 2015) (Testa 2017) whereby highly educated families can translate additional income into childcare at higher rates than those with lower levels of education. To date, however, there are no indications that this trend is significant enough to reverse the downward fertility trend in the United States, or that this trend among the most educated is sustainable.

Concurrent with the gender landscape in US higher education, the labor force has changed significantly over the last several decades. According to the Federal Bureau of Labor Statistics (Statistics 2017), the percentage of women participating in the workforce rose from 32% in 1950 to 54% in 2015, and these women can be expected to remain in the workforce longer as a result of gender mortality differences in old age. As

with education, the reasons for the upward trend in female participation in employment across the United States vary considerably. They range from increases in demand for labor to higher divorce rates (Engelhardt and Prskawetz 2004). The result is that fewer women are focusing exclusively on family demands and family planning compared to earlier generations. This is not to say that working women are not raising families. In fact, women over the last half century have benefitted from more pervasive commercial childcare options (Toosi 2002) that would permit a balance of professional and reproductive pursuits. However, women are juggling a greater number of demands and investing time and energy into careers that demand some exclusivity from parenthood. Childrearing and labor are not always mutually exclusive, particularly in pre-industrial populations where children may accompany or assist parents during labor responsibilities. However, as division of labor and labor specialization become more robust, children are less likely to integrate seamlessly into the workforce.

In changing environments of ostensibly infinite resources as seen in the United States, parents may choose to invest additional resources into fewer children to help those children remain competitive across a broad array of characteristics. Parents are presented with opportunities to invest in offspring via education, labor specialization, physical and mental agility, and a myriad of other skills which have heightened the "cost" of fertility. These investments necessarily lead to reductions in fertility because the resource and time constraints of high-investment parenting are too great to allocate among many children (Mahoney, et al. 2006; Mahoney and Vest 2012). On the contrary, many children in pre-industrial populations support the workload managed by

parents through foraging assistance, daily chores around the home, or childcare for younger siblings, often beginning this work early in adolescence given the absence of competing activities in which to invest time and training.

Many of the statistics we have discussed describe women in the United States, where a great deal of education and labor data is collected and reported. Women in natural-fertility populations, on the other hand, are difficult to generalize. Behavior varies considerably with environmental context, exposure to outside cultures, the rate of industrialization leading to demographic transition, and child mortality, among other factors. Families with high fertility rates (e.g. ten or more children) are not uncommon among these populations, and often, men are the majority recipients of educational attainment and access to wage labor as women invest heavily in family formation. This trend diminishes as populations modernize and as labor specialization makes way for greater economic opportunity for men and women, alike, raising the level of gender equity in the workforce and in the home.

How, then, do these cultural shifts impact the timing of reproduction? Women in all cultural contexts may opt to postpone or avoid childbirth for a variety of reasons. In additional to educational and career pursuits described above, women may be subject to decreased personal support systems, financial instability, desires of a reproductive partner, prior experience with children (or lack thereof), a lack of healthcare availability, and personal preferences for delayed reproduction. Pressures impacting women's reproductive choices vary cross-culturally as women's roles vary in the home, the labor market, and generally across social contexts. Women often juggle many of the same

economic and social pressures that men face, but with the additional requisite biological demands of reproduction.

1.3. Formation of Reproduction Ideals: Early Life Experiences

This exploration of fertility has included a great deal of discussion about environmental factors influencing the payoffs to reproduction across pre- and post-industrial contexts, but less has been said about the desires of women regarding family, or the influences leading to women's attitudes regarding offspring. Do women embark on reproductive activities with consideration for eventual lifetime fertility? Do attitudes about reproduction have any bearing on overall fertility? Are these attitudes highly susceptible to outside influences, kin or non-kin, or are they durable over time?

Colloquialisms about "ticking biological clocks" suggest that women are inherently knowledgeable about the biological stages during which they can conceive and successfully give birth. Popular media paints pictures of women fraught with anxiety about their reproductive years slipping away and making desperate considerations to have children of their own. While some women in cultures with a high level of information access make conscious decisions based on their age-specific reproductive odds, research suggests that a plurality of young educated women and men alike do so with erroneous information or without intentionality for their reproductive ideals. Women overestimate the age at which they experience declines in fertility, as well as the likelihood of success when undergoing fertility treatments (Peterson, et al. 2012). A broad misunderstanding of reproductive capability continues to contribute to

involuntary childlessness and to reproductive outcomes that differ from individual ideals. High-fertility populations may not discuss or engage in active fertility-centered decision making at the same rate as low-fertility populations, if at all (Fisher 2000).

Some research suggests that fertility motivations developed early during life accurately predict later reproductive behavior (Miller, et al. 2010), and that women can articulate childbearing desires and intentions that are strongly correlated with their later reproductive behavior (Nettle, et al. 2011). However, other research has shown that early reproductive desires are subject to change, and often have little to do with later outcomes (Régnier-Loilier and Depledge 2006). Parenting is experienced uniquely with each child born, and each experience (perhaps each day of those experiences) presents challenges, opportunities, struggles, and rewards that influence the decision whether to have subsequent children (Newman 2008). Considering a nearly universal decline in fertility across different physical and social environments, we should seek to understand what is at work shaping fertility outcomes.

In addition to an individual's life experiences, the reproductive behavior of one's parents has a strong influence on later reproductive behavior. A robust association exists between the size of one's sibling group and the number of children a woman has (Régnier-Loilier and Depledge 2006), as well as age at first birth (Barber 2001b) which is one of many proximate factors shaping lifetime fertility. Also affecting reproductive ideals are one's mother's religious affiliation, one's history of contraceptive use and beliefs, achieved parity and marital history (Barber 2000; Barber 2001a). Despite these relationships, research has shown that there exists a higher degree of fidelity in the

intergenerational transmission of fertility values than in fertility outcomes (Axinn, et al. 1994; Nettle, et al. 2011). In short, parents influence reproductive ideals, but children often deviate from these ideals as they mature into adulthood, each subject to the influence of the personal and cultural context in which they live and the fertility ideals inherent to that environment.

When attempting to identify the relationship between one's parent's behavior and one's own reproductive behavior, researchers must take care to untangle personal values from the socioeconomic contexts that are common between parents and their children. For example, educational attainment, employment opportunities, and exposure to desirable reproductive partners may be common environmental limitations affecting fertility for parents and offspring. Furthermore, high economic need may influence the time that caretakers have to "police" the reproductive behaviors of older children with idle time and little adult supervision. The same is true of divorce which has been shown to have strong effects on later reproductive behaviors among children. Children from divorced families are more likely to experience premarital childbirth, particularly women (Barber 2001a). These early life conditions can have impacts on puberty, and thus, impacts on age at first birth. Decreased care during childhood or the juvenile phase often leads to accelerated sexual maturity among women, which may be the result of biological mechanisms reacting to the individual's environment to optimize life-history strategies. Nettle, et al. (2011) found that after controlling for socioeconomic status and mother's age at first birth, four factors had the most significant impact on age at first pregnancy for daughters: duration of breastfeeding, duration of separation from mother

in first five years of life, paternal involvement in first seven years of life, and number of residential moves in the first seven years of life.

Brauner-Otto and Axinn (2010) found that early sexual debut was associated with total number of family transitions experienced during youth (e.g. marriage, divorce, remarriage, adoption of a non-parent into the home, and the emergence of a non-parent as secondary caretaker). There also appears to be variation across ethnicities in behaviors and attitudes surrounding early fertility. As evidence, these researchers found that different ethnic groups are using contraceptive technologies at disparate rates during transitions to sexual debut. In the case of early sexual debut, white women more regularly use contraception, while black and Hispanic women are less likely to prevent against pregnancy. Some of these disparities are attributed to cultural biases which hold childbirth as a measure of individual worth.

Environmental influences during childhood and adolescence are particularly interesting because they deviate from the assumption that reproductive outcomes are the result of mimicking of kin behavior, or other types of information transmission. Though the impact of stress is not in the purview of this research, these examples provide evidence that biological mechanisms can respond to environmental stresses, ultimately impacting fertility. Women's reproductive behaviors and desires are highly interrelated, each dependent upon social, environmental, and biological cues.

1.4. Formation of Reproduction Ideals: Information Transmission

In pre-industrial populations, most individuals reside close to extended family, allowing for a continuous transmission of values from one generation to the next throughout the lifespan. However, as economies become more industrialized, individuals more frequently leave their hometowns in search of employment. The distance between individuals and their natal home likely inhibits this influence, particularly for behaviors that are initiated later in life such as those surrounding reproduction. Early literature about cultural learning described these knowledge pathways as vertical (i.e. passed down from parents), or horizontal (i.e. passed along from extended family or unrelated individuals with whom one has contact) (Hewlett and Cavalli-Sforza 1986). Later research presents a more fluid model where information transmission is dependent upon factors such as the nature of the information being transmitted, age at transmission, the mode of transmission (e.g. teaching, observation and transmission), environmental stability (Hewlett, et al. 2011; McElreath and Strimling 2008), and the perceptions that learners have about the success of individuals across the cultural spectrum (Richerson and Boyd 2004). Vast differences exist between pre- and post-industrial populations regarding social learning. These differences are particularly notable for populations defined by neolocal residence, as individuals no longer have constant access to vertical transmission of cultural norms.

McElreath and Strimling (2008) posit that vertical social learning should be favored when the information being transmitted has an impact on fertility rather than survival. The selection for vertical transmission of reproductive information is strong

because the mere existence of the actor implies that the choices made by his or her parents are at least modestly successful. There is some evidence that this hypothesis is supported in indigenous populations. Among the Aka of central Africa, sexual behavior and infant care behaviors are transmitted vertically, and with a high degree of gender bias, as daughters most commonly mimic the behavior of mothers (Hewlett and Cavalli-Sforza 1986; Hewlett, et al. 2011). In addition, grandparents and other kin are found to have a more profound influence on sexual behavior than in any other type of information transmission. It is possible that this highly vertically-oriented information flow may decrease as children are exposed to other alloparents, or as they become geographically distanced from the natal unit as seen in many industrialized contexts.

Richerson and Boyd (2004) argue that influential individuals outside of the natal unit also hold sway over values that might cause individuals to delay reproduction. For example, teachers, clergy, politicians, and celebrities are often highly influential individuals and are likely to have delayed their own reproduction in order to obtain the requisite education and experience required of their craft. Because few people gain status in these selective roles, their enthusiasm and encouragement will lead to cultural variants that spread and influence others to similarly delay reproduction. Because these motivations are transmitted horizontally rather than vertically, the nature of the influence is less likely to encourage pronatal values (Richerson and Boyd 2004; (Zhang, et al. 2013).

Transmission of contraceptive knowledge has received a lot of attention from researchers interested in the spread of fertility reduction. Though contraception is often

thought to be a thorn in the side of evolutionary theorists, the reality is that women's bodies naturally mimic the effects of contraception in order to maximize reproductive outcomes, even as technological advancements have enabled widespread fertility reduction. As examples of this biological certainty, lactational or post-partum amenorrhea is well understood to be pacing mechanisms that permits sufficient and sustained nutritional care of infants during periods of high mortality risk. Contraception is not always being used as a means of continual reproductive cessation, but rather, women in certain populations are using this technology for a time and then go on to reproduce again when life outcomes are more amenable to infants (Mace and Colleran 2009). Women may seek such knowledge from kin or non-kin depending upon the group that adopted contraceptive technology the earliest. To date, evidence has not revealed which mode of transmission bears the most responsibility for adoption of contraceptive technology. Several socio-demographic characteristics are highly correlated with contraceptive adoption such as age-specific parity, wealth, and marital status, as well as significant cohort effects that imply strong cultural transmission is taking place (Mace and Colleran 2009).

1.5. Formation of Reproduction Ideals: Religious Practice

Religious socialization is among the most powerful sources of cultural information transmission. Religious ideals impact beliefs about family size, gender roles, marriage structures, contraceptive use, and a variety of other domains that ultimately influence lifetime fertility. Parents and close kin are typically responsible for

introducing young children to religious beliefs and customs. However, religious dogmas and religious institutions reinforce those beliefs throughout one's life without the constant intervention of parents or kin. How broadly religious belief impacts later reproductive choices is difficult to quantify, but we know that mother's religious affiliation has profound effects on childbearing preferences and cohabitation attitudes (Pearce and Thornton 2007). Pearce (2002) notes, "The effect of [women's] mother's religious service attendance operates through the young adults' own religious participation and the importance they place on religion. The consistent effects of early life religious exposure on subsequent childbearing dispositions outweigh the effects of socioeconomic factors and point to religion as an influential institution in the formation of child-bearing preferences" (page 325). Zhang et al (2013) find that fertility is higher among women who maintain the same religious affiliation as parents, suggesting that religion reinforces the vertical transmission of values from parent to child. The reproductive ideologies influenced by early religious socialization have been found to maintain salience well into one's 30's with regard to premarital sexual behavior, cohabitation decisions, beliefs about abortion, marriage and divorce ideals, and gender roles, all of which have profound influences on reproductive choices (Pearce and Thornton 2007).

1.6. Reflections on Demographic Transition Theories

Existing literature described herein relies on shifts in modern culture that have led to drastic changes in reproductive outcomes. However, these models often simplify

the complexity of our adaptive biological and cultural responses during modernization. As an example, economic models fail to account for the cultural and social contexts that are dynamic reflections of changing environmental pressures. They also underestimate the fidelity of early or articulated pronatal ideologies that are highly influenced by kin, religious affiliation, environmental characteristics, changing opportunities and trade-offs during reproductive years, as well as the momentum of social change in shifting reproductive ideals.

Social explanations are useful in the discussion, but they suffer from the failures common among economic explanations; namely that women are not simply pawns of their social organization. Women engage in young adulthood with wisdom and beliefs that guide their later reproductive behaviors in ways that transcend convenience. Allomaternal care has played an important role in our evolutionary history, but today in developed countries, women benefit greatly from the pervasiveness of available childcare. Families call upon allomaternal care, and perhaps employ nannies and babysitters that make strong emotional connections to children and parents. While the help may not be free, these caretakers represent an alternative solution created in response to the relative lack of support available from family or partners.

Evolutionary explanations are also useful as we understand how our behavioral tendencies have exacerbated a reduction in reproduction during modernization, but existing theories lack sufficient attention to social organization and economic considerations, and they also undermine the importance of rationality among women of reproductive age. They fail to account for the richness of the human experience over

time. Achieved parity has real impacts on later reproductive desires, but the nature of the effect may not be immediately obvious and is highly context dependent.

Throughout time, women have shared in the workload needed to rear offspring while also trying to tackle the demands of daily life. Small early societies were not without conflict, but survival was made possible through the unification of independent human actors, honing their cooperative abilities to master skills necessary to thrive in their environment. During modernization, women have been largely removed from these social groups and from the constant support of kin; they are now navigating much of their "shared" experience in isolation without the support of allomaternal care. This has shielded women from the social transmission of knowledge regarding pregnancy, birth, and parenting, all potentially impacting later success as parents. At the same time that women are less prepared to engage in their reproductive experiences, trends during modernization have led to a seemingly infinite number of demands on parents, mothers and fathers alike, to invest heavily in the quality of offspring. Smaller families may represent trade-offs resulting from snowballing resource strategies among parents; these new environments command highly competitive individuals and highly competitive offspring.

On top of the demands for offspring investment, shifts in cultural norms have led to a requisite amount of investment in self before attending to reproduction. Economic demands following all levels of industrialization have led to record numbers of women in the workforce. In many societies, it has become difficult for families to thrive on a single income. Now that women have become major contributors to economic stability

both inside and outside of their homes, the educational demands of the workforce have also led to significant enrollment shifts in higher education, favoring women as the majority recipients of college degrees. Women continue to suffer from gender compensation disparities in the workforce, and these disparities demand that women obtain higher educational outcomes to compete for the same wages. Between time and resources that women must invest in themselves and their offspring, reproductive activities are often delayed until late in the reproductive phase, and this trend is responsible for growing involuntary childlessness among parents in industrialized countries.

Further development of theory is necessary to understand how these social, economic and evolutionary constraints have led to demographic trends experienced during modernization. The U.S. total fertility rate has dropped from 2.5 in 1970 to 1.8 in 2018 (Kaneda, et al. 2018). Considering these trends, it is not enough to speculate about why birth rates remain low amid the resource booms found during industrialization; we must first ask 'how and why does this pattern of reduced reproduction begin, and how is it sustained over time?'

Reproductive women are highly influenced by their mother's reproductive behaviors. However, it could be argued that the relationship between large families and the persistence of high rates of reproduction among those offspring is spurious. Arguments suggest that women receive normative behaviors from their close kin, but it is also plausible that women from large families instead recognize high rates of reproduction because early and constant reproduction was institutionalized in their

families. Women who have early significant exposure to infants may be at ease within large nuclear family groups, while reproductive activities were made more accessible through extensive prior knowledge of pregnancy and birth activities as well as more extensive exposure to child rearing activities.

In an era where biological certainties have become gray areas thanks to modern medicine and modern science, is it possible that women are no longer using realistic information about the flexibility of their reproductive abilities? Is it possible that exposure to reproduction at an early age acts as an important catalyst to "kick start" our propensities for reproduction? Maybe we are not simply weighing decisions about the tradeoffs from various investments in embodied capital, but that we are shielded from reproduction as an institution, and that has led to a shift in normative behavior. It may be that the desire for offspring exists, but it is age at reproduction and the operationalizing of childbirth and rearing that is a critical part of parental knowledge transmission. Perhaps all these experiential shifts occur early during industrialization when market fluctuations are driving differential decision-making, slowly exacerbated over time as low fertility becomes culturally normalized.

Given the drastic changes in reproductive outcomes experienced during demographic transitions, we know that other factors are at work, and we know that the values and beliefs of individual actors are not static. They are moving targets responding to the complex calculus of life experience in a given context. We will explore what other possibilities exist throughout the three articles in this document. I explore this question in Section 2 with a study of fertility among the indigenous

Mayangna and Miskito of northeastern Nicaragua. Data examined in Section 2 investigate the impacts of education, female agency, and access to wage labor on desired family size in two communities experiencing fertility reduction. These communities have recently gained access to contraception through governmental programs intended to support indigenous communities. This research will also work to understand adoption of contraceptive technology given the changes in economic, social and behavioral dimensions taking place in these communities, each of which are shifting the tradeoffs and opportunity costs of high fertility.

In Section 3, I explore fertility ideals among women in the United States where a demographic transition has taken place and the total fertility rate has dropped below replacement rate. In this section, I discuss ways that changes in social organization and domestic residences have distanced women from exposure to reproduction, pregnancy, childbirth and childrearing. I then investigate the impact of reduced early exposure on various aspects of fertility and parenting. This section presents a contrast to Section 2 where the fertility reduction component of a demographic transition is only beginning. In the United States, access to education and employment cause women to experience significant tradeoffs to high fertility.

In Section 4, I further explore tradeoffs women and men experience when engaging in family formation, but I do so among faculty and staff working in a highly educated academic environment at an institution of higher education in the United States. Research has shown repeatedly that education has a diminishing effect on fertility; this investigation attempts to reveal ways that these reductions are

operationalized. I explore the varied nature of these reductions: the reductions imposed by investing significant time and resources into obtaining additional degrees, the tradeoffs that men and women experience as they invest additional resources into their own embodied capital, and the penalties imposed on parents by those who believe parenting and professional success are mutually exclusive, as well as the genuine time constraints of raising children.

Each of these sections will clarify our understanding of fertility reduction cross-culturally. Reproductive ideals are influenced by the unique contexts in which people live, and they are shaped by the perceived benefits, costs, and tradeoffs of each additional child to the individuals engaging in family formation. The three studies I describe in the sections to come provide us a window through which to view the dynamics of fertility change as populations transform.

2. MAYANGNA AND MISKITO

2.1. Introduction and Overview

Fertility transitions that define the later stages of demographic transition are important components of social change which lead to significant reductions in population size (Bongaarts 2009; Davis 1963; Notestein 1945; Thompson 1929). Modernization and industrialization transform social and economic pressures that alter the tradeoffs between competing life goals. These changes result in a steady fertility decline leading to balanced rates of lowered fertility and mortality, followed by continued reductions in fertility, ultimately leading to below-replacement fertility as seen in many European and Asian countries. To date, there is no record of a population reversing the trend toward below-replacement fertility, though some scholars argue that these trends may be reversible given sufficient scale and environmental context (Burger and DeLong 2016). This is especially the case when fertility rates drop to a TFR of around 1.6 or less. Demographers refer to the "low fertility trap" as the situation when fertility drops to low levels and does not climb to previous levels again.

Anthropologists have long studied fertility among preindustrial populations, but less often do researchers have opportunities to gather ethnographic information early during the initial stages of fertility transition (Gibson and Sear 2010; Snopkowski and Kaplan 2014). This is the time during which social, environmental, and economic pressures are catalyzing changes in subsistence-based high-fertility populations with a small degree of outside influence. Among the indigenous Mayangna and Miskito

populations of Nicaragua, a fertility transition is underway. Winking and Koster (2015) reported that early reductions in fertility were observed in two Mayangna/Miskito villages in the Bosawás Biosphere Reserve in northeastern Nicaragua between the years 2000 and 2013. These villages remain fairly secluded from their neighbors outside the Bosawás Biosphere Reserve, and yet some byproducts of industrialization have spilled into the lives of people in these communities, giving them moderate access to commodities and healthcare from larger communities outside of the Bosawás. Despite their exposure to outside resources, this shift in fertility is unusual in that it precedes industrialization and widespread access to the market economy. We argue here that this transition appears to be motivated by governmental reproductive support programs, development work impacting social perceptions of reproductive norms, changing female agency to influence reproduction, and other social influences such as education, wage labor participation, and material goods. Research among these populations will enlighten our understanding of the competing internal and external forces affecting fertility, as well as the cultural changes shaping ideals and behaviors.

2.1.1. Existing Literature

Scholars have cited the need for more work that can help bridge the gap between demography and anthropological work, specifically evolutionary demography (Sear, et al. 2016). Demography has long described the contexts that motivate lower fertility, but rarely has this framework been tested in populations that are in the infancy of a major demographic shift toward reduced fertility. Even rarer are case studies involving natural-

fertility populations where commonly collected national data are unavailable or collected on an infrequent basis. Micro-analytic approaches are essential in the study of fertility, as investigations at the level of nations or states provide little insight into individual motivations or contextual pressures that influence reproductive decisions. Because reproductive choices are made by individuals in response to their unique beliefs, preferences, and social contexts, testing hypotheses is most appropriately accomplished by investigating behavior within societies rather than across complex societies (Bledsoe 2002; Sear, et al. 2016).

Research attempting to understand individual fertility and reproductive ideals can be perplexing, as women and men weigh (consciously or unconsciously) physiological, environmental, social, and behavioral factors to determine if, when, and how often to have children. Research has shown that increased educational opportunities, overall human capital growth among women, and increasing wealth are strongly associated with reduced fertility (Kaplan, et al. 2009; Kaplan, et al. 2010; Poston and Micklin 2005; Snopkowski and Kaplan 2014). However, the effects of each variable fluctuate widely across studies with the exception of education, which has a consistent diminishing effect on fertility (Colleran and Snopkowski 2018). We still have a great deal to learn regarding developing economies (Snopkowski, et al. 2016) where additional resources are invested in additional fertility for a time, but ultimately later shift to lower fertility. Status and wealth may create opposing effects depending upon local payoffs to fertility and individual strategies to maximize fitness currencies (Colleran, et al. 2015). To this end, there is a need for evolutionarily oriented research focusing on modern and

modernizing populations where these payoffs are fluid and where early reductions in fertility are evident. Recognizing that few, if any, cultures are untouched by some degree of modernization, research should focus on the proximate determinants of fertility in cultures where demographic transitions are underway. As women and men in these contexts gain increasing access to education, wage labor, economic opportunity and industrial goods, the benefits, costs, and tradeoffs of reproduction are quickly shifting, offering powerful opportunities to reveal the catalysts of fertility reduction in real time.

In these transitioning populations, we can examine how the adoption of goods and technology alter behavior and influence reproduction. One obvious example is contraceptive technology. As contraception becomes more pervasive throughout the world, women and men have greater opportunity to influence their reproductive outcomes, and thus, greater motivation to discuss reproductive desires within their partnership. Individuals have long used contraception, including natural contraception, such as spermicides and the rhythm method, as a means to better control the timing and spacing of reproduction rather than a means of reducing total lifetime fertility (Bledsoe, et al. 1998; Bledsoe, et al. 1994; Himes 1936; Snopkowski, et al. 2016), but intentionality in reproductive behavior is not always the norm. Increased access to contraceptives, however, does not always impact fertility in a consistent direction (Colleran and Snopkowski 2018).

Some of this uncertainly remains because the explicit planning of fertility is not universal; researchers should not assume that everyone has considered what their ideal

family size should be. Some individuals actively engage in discussions about reproductive decisions with their partner(s), while others lack planning, viewing childbearing as opportunistic, beyond their control, or altogether haphazard. Some individuals in reproductive partnerships give so little thought to reproductive goals that they must provide post hoc rationalizations for reproductive and contraceptive behavior (Fisher 2000). Individuals may cite supernatural reasons for family formation (e.g. "God will grant us with the number of children we are blessed to have"), and such perspectives vary considerably depending upon religious affiliation, education, family influence, and other demographic factors. As women continue to gain more agency cross-culturally, and as maternal condition changes, women play a greater role in dictating reproductive choice no matter their reproductive strategy or lack thereof (Anker, et al. 2012; McAllister, et al. 2012; Mitra 2008; Shorter 1973).

Given the variability in deliberate family planning, what are some of the factors that influence reproductive ideals, and who or what is transmitting normative behaviors about fertility? Research has shown that fertility desires of individuals are highly correlated with that of their parents (Booth and Kee 2006; Kolk 2014; Kotte and Ludwig 2011), often perpetuated via cultural institutions such as religion (Zhang, et al. 2013) and potentially through significant early exposure to reproduction and parenting norms, as will be explored in this and other sections. Reproductive desires are thought to remain relatively consistent over the life course (Miller, et al. 2010; Nettle, et al. 2010; Tan and Tey 1994). However, such studies are often performed in the highly educated industrial contexts where populations are not undergoing massive shifts in fertility as is the case

during early states of a demographic transition. In reality, rapid recalibration of behavior, often facilitated through shifts in cultural norms, is a hallmark of human cultural and behavioral patterns. Studies have shown that social influence from peers is often stronger than influence of kin (Snopkowski, et al. 2016) when making reproductive decisions. Evolutionary theory would predict that high fertility ideals (i.e. value placed on many children versus few) are more likely to be transmitted and reinforced by kin than non-kin, and therefore non-family influences can exacerbate and perpetuate fertility reduction. Demographic transitions are evidence that reproductive desires can significantly stray from those of one's parents given significant shifts in economic and social pressures. As evidence, from 1970 to 2018, a span of less than 50 years, total fertility rates in India have dropped from 5.5 to 2.3 as India industrialized (Kaneda, et al. 2018). Brazil has dropped from 5.0 to 1.7 during that same period, and Kenya has dropped from 8.1 to 3.9. These reflect a mere three examples from three different continents, but the message is undeniable: fertility is highly susceptible to rapid fluctuation in a short span of time given the appropriate social and environmental pressures.

Justifiably, research on the formation of ideal family size beliefs often focuses on women given their requisite roles in reproduction and parenting. However, prior literature in traditional anthropology and demography suffer from a dearth of data on men's attitudes and behaviors regarding reproduction. This is puzzling given that resource acquisition often falls heavily on the backs of men in high fertility populations where women have limited mobility and temporal freedom after the birth of a child.

Therefore, accounting for male perspectives is vital to understand the impact of economic shifts on fertility desire. Men, particularly those in preindustrial populations without access to contraception, hold tremendous influence over fertility outcomes and should not be excluded from analysis (Sear, et al. 2016). As changes in a population's labor economy (e.g. division of labor, labor specialization) begin to impact fertility, men and women have greater incentive to weigh family planning and labor opportunities as a partnership.

Given the complexity of inputs that determine fertility outcomes, future research should place more focus on the causal influences of social and environmental pressures on directional shifts in reproductive desire, particularly among transitioning populations. Individuals' perceptions of the tradeoffs to parenthood influence desires; how these desires influence behavioral outcomes remains the engine of demographic change over time. Reproductive ideals, behaviors, and attitudes each inform population change over time, making them worthy subjects of research across a variety of cultures and contexts (Mattison and Sear 2016; Stulp, et al. 2016). These factors are important complements completed fertility, which has long been used as a measure of Darwinian fitness. This research seeks to better understand such a shift in one preindustrial population currently moving through the early stages of fertility transition. Data analyses will reveal the impact of a shifting economy, increasing opportunities for women to engage in education and wage labor, and the influence of access to contraceptive technology on a near-natural-fertility population.

2.1.2. Fertility Pressures Among the Mayangna and Miskito

The Mayangna and Miskito are two indigenous populations that live in the eastern region of modern-day Nicaragua and Honduras. Data collection took place during April and May of 2016 among two neighboring communities nestled among the tributaries of the Rio Coco in the interior of the Bosawás Biosphere Reserve; the larger of the two is culturally Mayangna and is inhabited by upwards of 350 people. The smaller of the two is culturally Miskito and is inhabited by just under 150 people. Nationally, the indigenous Mayangna are fewer in number and have experienced a lower degree of reproductive and cultural admixture with other western or Mesoamerican cultures relative to the Miskito (Winking and Koster 2015). Despite strong cultural loyalties and some mutual distrust, the two groups intermarry, share many cultural norms, trade, live and work alongside one another. Though heavily isolated from other communities, these communities enjoy a modest amount of access to more populated communities near the borders of the Reserve, and thus have some access to commodities such as processed food, clothing, and tools. Despite this, the Mayangna and Miskito in these villages rely on their environment for most of their needs, using the lush forests and modified lands around them to hunt, grow crops, raise livestock and acquire the resources they need to build and maintain community life.

Family organization is centered largely around the nuclear family. Nuclear families among the Mayangna and Miskito in these villages tend to be large, with total fertility rates greater than eight (McSweeney 2002), and only recently showing signs of decline (Winking and Koster 2015). Mayangna and Miskito women have a fair degree

of autonomy to choose their husbands, and to determine if they wish to stay with their husbands. In addition, single motherhood is not uncommon and holds minimal stigma (Koster 2011; Koster, et al. 2013; Winking and Koster 2015). These cultural characteristics suggest that Mayangna and Miskito women do hold some agency to influence their own reproductive outcomes.

The Mayangna and Miskito are swidden horticulturalists, and thus men and women spend considerable time away from the home preparing fields for planting, sowing, and harvesting crops. Other subsistence labor includes fishing, hunting, and foraging. While barter and trade are common, both men and women have access to occasional wage labor, and both periodically pan for gold, tasks for which they gain income in the form of Nicaraguan currency (Koster 2011). While women have influence over community decisions, it is more common to see men teaching, in leadership roles in the community, and in guiding religious and ceremonial activities.

Within community life, divisions of labor exist between men and women that are common of natural fertility populations. Women bear the biological burdens of pregnancy and lactation, requiring near-constant proximity to children. Women and their children, therefore, are often responsible for daily chores around the home including, cooking, cleaning, washing laundry in the river, gathering eggs from poultry livestock, and collecting water from the river. Women also have access to many wage labor activities including sewing and harvesting crops in nearby fields, panning for gold in the river that runs through the communities, cooking specialty items like sweet bread, performing daily tasks for others in the community, or cleaning crops. The work

performed by women in the community does not always preclude mothers from caring for children while engaging in wage-labor. Therefore, impacts of employment may not have the same direction or magnitude of impact on lifetime fertility as is seen in industrial contexts. While the work of women is often confined to more traditional gendered roles, women are active in the life of the community and have influence in matters impacting the community at large.

Men are engaged in childrearing to a large extent, particularly before they become adults, as they are expected to care for younger siblings or family members while parents are working in agricultural fields or hunting and gathering resources in the surrounding forests. For example, when asked, 57% of men said that they cared for siblings or other young children daily during their youth, and another 29% did so sometimes. These men would describe the need to care for and protect young children while in the surrounding forest and near the river, or to care for their siblings for much of the day while their mother and father were working in the fields.

Individuals in these communities engage in reproductive partnerships best described as serial monogamy. Formal partnership and marriage are common, generally entered after a period of cohabitation, often after couples already have children (Koster 2011). While no formal post-marital marriage rules exist, young men frequently co-reside with the woman's family early during a relationship, contributing to family subsistence and household chores, and ultimately building homes near the homes of the woman's parents (Koster 2011). Approximately 50% of couples experience marriage dissolution within 10 years (Winking, et al. 2018).

The Nicaraguan government has made some medicine, including contraceptive technology, available to these communities through their national Ministry of Health, the Ministerio de Salud de Nicaragua (MINSA). At the time of this study, a nurse travelled to these remote communities once per month to administer basic health examinations for individuals in need and to provide basic treatments for common illnesses. In addition, MINSA makes contraceptive injections available which are also administered monthly. For more extensive medical problems, individuals in these communities can travel several hours by canoe to a small hospital in Raiti, Nicaragua. Raiti is also home to a Casa Materna, a temporary home for women who are preparing to give birth, as well as the site of a military outpost for the Nicaraguan government.

Many women have begun to take advantage of the governmental health programs, resulting in an increase in contraceptive use over the past several years. Additionally, where women historically gave birth in the community, some women now choose to make the lengthy trip to Raiti several weeks prior to birth, allowing them to eat and rest well prior to labor, as well as to give birth near healthcare facilities in the event of emergency. Many in the community believe that they are required to do so by MINSA, though we find no evidence of such a mandate. MINSA nurses travelling to the villages discuss reproductive practice beyond basic medical approaches to wellness. For example, when asked about his knowledge of contraception, one respondent stated, "There are many different types of methods. The doctors, they tell us about family planning, so we won't have many children. They tell us to try to have only 2 or 3 children. They tell this to everyone, but to women more than men."

In addition to the influence of MINSA workers in the community, there has been significant religious influence from missionaries in the Bosawás Biosphere Reserve. As a result, the larger of the two communities has a large, well-attended church, and the smaller of the two communities has three churches, each with small congregations. This religious presence and the faith traditions of these churches have influenced community members' perceptions of reproductive limitation, influencing the rate of contraceptive adoption in the community. Strong religious beliefs are evident in daily conversations among many community members, but not all community members regularly attend religious services. Despite this inconsistent observance of faith across the community, the church is physically located near the center of the community, serving as the site of community organization. For example, all secular community meetings are held in the church or the ante-structures nearby. Families, regardless of actual attendance at religious ceremonies, appear to contribute to work done in support of the church. One example is the collection of dirt from the surrounding lands to repair the church floor during data collection in the community during the summer of 2016. All families in the community were expected to contribute manual labor to the project organizers, with public acknowledgement of those yet to contribute their household share.

Access to education is growing in these communities, creating a stark contrast between educational attainment of older community members and young adults interviewed during data collection. As evidence, individuals aged 15-29 report a mean educational attainment of 7.7 years, while individuals aged 51-89 report a mean attainment of 0.4 years. Men and women have similar access to education, though men

exhibit higher attainment across age groups. Among 15-29-year-old men and women, mean educational attainment is 8.5 years and 7.2 years, respectively. The Nicaraguan government has provided funding to support the construction of educational facilities in the Bosawás Biosphere Reserve, and therefore some resources exist to support wages for a small number of teachers who provide educational access to children in the community. Families make individual decisions about whether to send children to school or enlist their support in family production. Some individuals even voice a desire for higher levels of education that could only be obtained outside of the Reserve at a university.

2.1.3. Hypotheses

Considering existing literature, and with the aim of more fully understanding pressures leading to fertility reduction among these communities, several hypotheses are explored here. This study investigates male and female reproductive desires as proxies for fertility rate change during demographic transition. Desired family size is a strong indicator of fertility outcomes because individuals in these communities have a great degree of freedom to pursue family size ideals as they choose. We test the directional impact of female autonomy or agency, education, economic potential, and early exposure to reproduction and child-rearing on desired family size and contraceptive use. Changes in the positive social perceptions of high fertility should be evident across these measurable domains of behavior, and will enlighten the impact of social, economic and cultural change on reproductive ideals and the continued fertility transition underway.

First, we hypothesize that reductions in desired family size are due, in part, to growing autonomy among women to influence reproductive goals within reproductive partnerships (H1). Specifically, these predictions suggest that that women will translate increased agency into lower fertility desires (H1a), that increased female partner agency will result in lower desired family size among men (H1b), and that women who have greater agency will be more likely to use contraception (H1c).

As gender roles in these communities change due to incremental changes in female opportunity for social mobility, we hypothesize that increases in education (H2) and greater levels of economic potential (defined by presence of wage labor) (H3) among women will have a negative impact on desired family size, as each of these factors shift the tradeoffs to reproduction and influence that women have over their future.

Last, given the positive association between early exposure to reproduction and child-rearing and higher family size desires in post-demographic transition populations, we test whether this occurs here as well. In low-fertility populations, such exposure familiarizes men and women with expectations of parenthood. In higher fertility populations, however, such knowledge may be ubiquitous and have little impact on fertility desires if high fertility norms overpower the impact of individual experience. Considering the recent downward trend in the total fertility rate, we will hypothesize that increased early exposure will positively influence fertility (H4), resulting in increased desired family size. Early exposure to reproduction and child-rearing is measured as the amount of time individuals spent caring for young children and siblings during their

youth, prior to beginning a family. Early exposure to children and the demands of parenthood, we hypothesize, normalizes men's and women's expectations about the presence of children in daily life, who will therefore translate high early exposure into higher family size desires.

2.2. Data Collection and Methods

2.2.1. Ethnographic Interview and Demographic Data Collection

To explore causal reasons for observed trends in fertility decline among this population, semi-structured interviews were conducted among women and men in the two communities described. Interview questions were written in Spanish and then translated from Spanish into the local Mayangna and Miskitu languages. To ensure that the intent of the questions remain accurate, a second translator then back translated the Mayangna and Miskitu questions into Spanish, after which discussion of any irregularities took place and translation issues were corrected.

All reproductive-aged individuals in the villages, including roughly 50 partnered couples, were invited to participate in the study through an open meeting with the community at a time chosen by community elders and leaders. Interviews were voluntary and took place at a central community meeting place. Two structures near the community church serve as a community cooking site for religious ceremonies and secular festivals; these structures were a central location at which to hold interviews. Participants came to these interviews as time and interest permitted. Couples were

interviewed separately to obtain honest opinions without the influence of their reproductive partner. A translator was used during the interviews. The investigator (JK) asked interview questions in Spanish, the translator would read questions to the participants in Mayangna or Miskitu, and the translators would then back translate the responses in Spanish. Several trial interviews were conducted to train the translator and to calibrate the translator's expectations for the interviews.

Interview questions (Appendix A & B) explored participants' current and desired fertility, along with follow up questions clarifying motivations for fertility limitation or additional fertility desires. In order to test hypotheses H1a and H1b, interview questions explored the degree to which individuals discussed family formation ideals and whether couples came to a shared decision about the number of children they would have during their partnership. To test H1c, participants were asked about knowledge of contraceptive technology and personal use history. To test H2, educational history was collected, as was participation in wage labor data to test H3. To test H4, participants were asked about early exposure to reproduction and child-rearing, as well as their confidence to enter parenthood when starting their own family. Though not used in these analyses, participants were asked about their perceived ideal family size given the current social, economic, and cultural landscape. Ideal family size and desired family size are uniquely different metrics in high-fertility populations; desired family size has been found to be a more reliable metric and therefore used in this study (McAllister, et al. 2012).

To supplement these data and to maintain appropriate controls for confounding variables, basic demographic data were incorporated into the study. Demographic data are collected across these populations approximately every two to three years, including date and year of birth, reproductive partnership history, detailed pregnancy, birth and lactation information, as well as survival and mortality information about offspring. These data were validated during ethnographic interviews to the extent possible.

2.3. Construction of Variables and Data Analysis

This investigation utilized two primary statistical models to understand reproductive beliefs and behavioral shifts across age groups, sex, contraceptive use, degree of female agency to influence reproduction, and other economic factors such as educational attainment, and economic earning potential. To test hypotheses H1A, H1B, H2 and H3, ordinary least squares regression was used to quantify the impact of female agency, education, economic potential, early exposure, and age on desired family size. Hypothesis H1C used binomial logistic regression to quantify the impact of female agency, education, and age on women's contraceptive use.

Female Agency is a dichotomous categorial measure, relying on participant responses to two questions. These questions ask men and women whether respondents 1) talk with their partner about family planning, and if so, do they 2) share ideas about how many children they would like to have. Female Agency is coded as 1 for those who answered positively to one or both questions, while it is coded as 0 for those who answered negatively to both.

Early Exposure is a categorical variable, where respondents were asked how frequently they cared for siblings or young children in their home in their youth. Respondents answered “daily,” “sometimes” or “never.” These responses are treated as categorical rather than ordinal because of the difficulty in qualifying the incremental distance from one category to the next.

Education is a continuous variable. Individuals in the community have access to both primary and secondary education. Six years of primary education and five years of secondary education are offered in the community for a total of eleven years. Despite this local limitation, two individuals in the sample left the community for a time and obtained additional education outside of the Bosawás Reserve. In both cases, individuals enrolled in educational programs for a time of two years, creating a maximum of 13 years of education attainment in the sample population.

The variables for Economic Potential and Contraceptive Use are each dichotomous. Economic Potential is a measure of presence or lack of wage labor at the time of interview. Contraceptive Use is a measure of whether respondents have ever used contraceptive technology regardless of current use status. Individuals in high fertility populations often use contraception to space, rather than to necessarily reduce or limit births, so the directional impact of contraception will be explored. Each of these characteristics can be treated as dynamic measurements as behavior ebbs and flows over one’s life, but are treated as static for these analyses.

2.3.1. Results

Table 2-1 presents the descriptive statistics of both desired and completed fertility as of 2016, the time of this data collection. The impact of age across these variables is evident, as desired fertility grows considerably for each older age category (for women, R^2=.384, p=<.001, N=46; for men, R^2=.305, p=.003, N=35). As would be expected, completed fertility also increases with age (for women, R^2=.506, p<.001, N=59; for men, R^2=.696, p<.001, N=47).

Table 2-1 Completed and Desired Fertility by Age and Sex

	Desired Fertility					Completed Fertility				
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Female Respondents										
15-29	27	5.5	1.8	3	10	32	3	1.7	0	8
30-49	15	8.3	2.5	5	13	20	8.2	3.0	3	13
50-89	4	9.8	1.3	8	11	7	8.6	4.6	1	13
Male Respondents										
15-29	15	5.3	1.6	2	8	17	1.6	1.2	0	3
30-49	16	7.1	2.0	5	10	22	6.7	2.3	3	11
50-89	4	8.6	1.1	8	10	8	10	3.0	4	13

Descriptive statistics for independent variables in the population sample are provided in Table 2-2 below, along with evidence in Table 2-3 indicating that desired

fertility, education and age are all highly correlated. Age has a positive impact on desired fertility and a negative impact on education, while education has a negative impact on desired fertility.

Table 2-2 Descriptive Statistics for Independent Variables

		Reported Female Agency	Currently Work for Wages		Educational Attainment in Years				
	N	Yes	N	Yes	N	Mean	SD	Min	Max
Female Respondents									
15-29	30	90%	31	39%	32	7.2	3.0	1	11
30-49	19	74%	19	74%	20	2.9	2.9	0	11
50-89	6	33%	7	86%	7	0.3	.8	0	2
Male Respondents									
15-29	17	94%	16	100%	17	8.5	2.4	4	13
30-49	22	91%	22	91%	22	6.8	3.8	0	13
50-89	8	75%	8	100%	8	0.5	1.1	0	3

Table 2-3 Correlations Among Desired Fertility, Education, and Age

	Female Respondents (N=46)		Male Respondents (N=35)	
	Education	Desired Fertility	Education	Desired Fertility
Age	-0.611	0.679	-0.668	0.596
	(p<.001)	(p<.001)	(p<.001)	(p<.001)
Education		-0.630		-0.384
		(p<.001)		(p=.021)

2.3.1.1. Measures of Female Agency, Opportunity, and Fertility Desires

Table 2-4 presents the results of the OLS regression models used to investigate the impact of female agency, economic potential, early exposure, and education on desired family size for women and men controlling for age. Model I represents the full model for male respondents, where partner agency and presence of wage labor were found to be significant predictors of desired family size. Model I included two highly influential outliers. One of the two reported a desired family size of 24 children, and another reported a desired family size of 13 children. These two were also the only individuals who reported a lack of female agency for their reproductive partners. Because these two had such influential effects on our model, a second model (Model II) was necessary which limits the male population sample to desired fertility of 12 children or less, which reduced any statistical significance of partner agency on desired family size. This analysis for Model II found that only age has a significant and positive effect

on desired family size. Because our two outliers were removed, there are no statistics available for female agency.

The full female model, Model III, includes all women, also with a maximum desired fertility of 12 children because that was the highest reported desired fertility, not because any outliers were removed from the model. In the female model, education was found to have a significant and negative impact on desired family size consistent with prior research and the hypothesized direction in this study. Similarly, age was found to have a significant and positive impact on desired fertility as anticipated. Other variables, however, returned unanticipated results. Both female agency and economic potential had significant and positive impacts on desired family size, though the significance of economic potential was only at the 90% confidence level. This finding suggests that while Mayangna and Miskito women in these communities are experiencing early stages of a fertility transition, growing female agency and economic potential is still being translated into more children consistent with pre-transition, natural-fertility populations. Fertility reductions experienced by women in the community are being influenced by other pressures, education among them. Figures 2-1 and 2-2 illustrate the relationship between predicted versus actual desired family size for Models II and III. In order to demonstrate the prevalence of wage labor and education among these communities, Table 2-2 has been presented above. Men tend to report higher presence of wage labor and educational attainment, though educational attainment is a relatively new phenomenon in these communities. Men and women 51 and older report less than half a year of educational attainment between them.

Table 2-4 OLS Regression of Desired Fertility

	Male Respondents *(N=34)*						Female Respondents *(N=41)*		
	Model I *(p=.0364)*			Model II *(p=.0413)*			Model III *(p<.0001)*		
	β	S.E.	P	β	S.E.	P	B	S.E.	P
Intercept	4.12	2.62	0.127	3.23	2.04	0.124	5.24	1.38	***<0.001***
Age	0.08	0.04	0.102	0.09	0.03	***0.012***	0.08	0.03	***0.013***
Early Exp									
(Daily)	0.28	0.60	0.639	0.31	0.47	0.513	-0.13	0.50	0.799
(Sometimes)	-0.46	0.68	0.504	-0.42	0.52	0.426	0.08	0.61	0.896
Education	-0.06	0.13	0.650	-0.02	0.10	0.785	-0.24	0.10	***0.020***
Female									
Agency	-5.33	0.98	***<.001***	N/A	N/A	N/A	0.97	0.39	***0.018***
Wage	5.58	1.69	***0.003***	0.25	1.04	0.811	0.54	0.32	***0.010***

Model I - Full model using all male respondents and all variables

Model II - Limits desired fertility to 12 children, removing 2 users; Female Agency excluded due to lack of variance

Model III - Full model using all female respondents and all variables

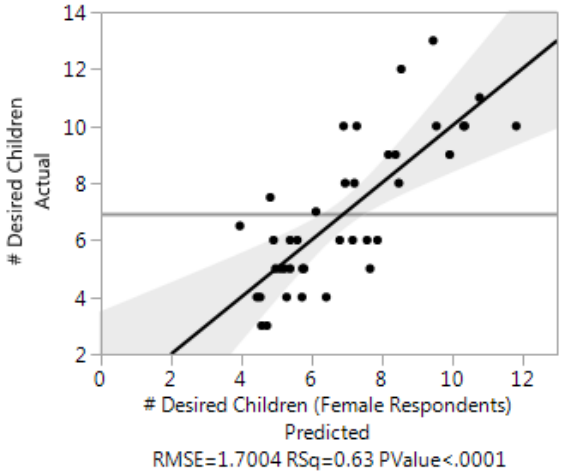

Figure 2-1 Actual vs Predicted Child Desires, Female Respondents

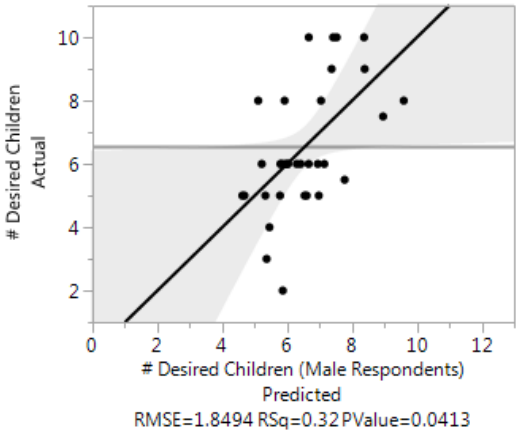

Figure 2-2 Actual vs Predicted Child Desires, Male Respondents

2.3.1.2. Early Exposure and Desired Fertility

Table 2-4, above, also explores the impact of early exposure to reproduction and child-rearing. It was predicted that early exposure would have a positive impact on desired fertility, but the results for early exposure in Models II and III are mixed in their

directional effect and they do not appear to be important predictors. This is likely because so little variance exists among early levels of exposure to children among individuals in the community, and because of the relatively small number of cases in the sample. To illustrate the issues of variance, only 14% of 49 men and 8% of 62 women indicated that they never cared for siblings or other young children in their households, many of whom did not have the opportunity because they were the youngest in their families. Conversely, 57% of men and 71% of women indicated that daily care of children was customary in their family. These results stand in stark contrast to post-industrial populations like the United States where 46% report having no experience with children in their homes, and a full 8% report having no experience with any children whatsoever prior to becoming parents themselves (Section 3, this volume). The impact of this categorical variable was a non-significant predictor of the number of children desired.

2.3.1.3. Female Agency and Contraceptive Use

Individuals in the community are more likely to have knowledge of contraception than to have ever used contraception, with knowledge of contraception more common among women than men, and among younger rather than older individuals. Two tables are presented below to illustrate the impact of age and sex on contraceptive knowledge and use. The first, Table 2-5 shares descriptive statistics concerning both knowledge of, and usage of, contraception along with female agency. Table 2-6 presents the results of a logistic regression model testing the impact of female agency on the likelihood of

using contraception, controlling for age, education and presence of wage labor. Findings suggest that despite our hypothesis concerning increased contraceptive use as female agency grows, no significant relationship exists between these variables. However, presence of wage labor has a significant negative impact on the likelihood of using contraception, and education has a significant negative effect on contraceptive use. As above, women appear to be translating their increased agency into higher family size desires, while additional access to education is mediating these effects, increasing the likelihood that women will use contraception.

Table 2-5 Descriptive Statistics for Female Agency, Contraceptive Knowledge and Use by Age and Sex

	Reported Female Agency (Self or Partner)		Knowledge of Contraception		Ever Used Contraception	
	N	Yes	N	Yes	N	Yes
Female Respondents						
15-29	30	90%	32	94%	32	75%
30-49	19	74%	20	85%	20	30%
50-89	6	33%	7	57%	7	14%
Male Respondents						
15-29	17	94%	17	82%	17	35%
30-49	22	91%	22	86%	22	36%
50-89	8	75%	8	50%	8	13%

Table 2-6 Logistic Regression Predicting Women's Contraceptive Use with Education, Agency, and Wage Labor

	B	S.E.	P
Intercept	-1.37	1.71	0.423
Age	-0.01	0.04	0.822
Education	0.31	0.14	***0.027***
Female Agency	0.22	0.46	0.634
Wage	-1.00	0.37	***0.007***

N=53, McFadden's R^2=0.35, P<.0001

To more fully understand these findings, a post-hoc analysis was performed to explore the impact of increased family size desires on contraceptive use. A logistic regression equation was estimated, using desired family size, years of education, and age on the likelihood that women have used contraception. Education was added as a control, because it is widely known to influence both contraceptive use and fertility. As shown in table 2-7, this model found that for every additional child desired, the odds of women using contraception are reduced by a factor of .67 (p=.084). For every additional year of education, the odds that women use contraception increase by a factor of 1.4 (p=.036). Age was also included in the model as a control variable, but was found to be non-significant. This is not surprising, as young women may not yet be using contraception as they begin family formation, and older women may not have had an opportunity to use contraception because it was not available while they were engaged in family formation.

Table 2-7 Logistic Regression Predicting Women's Contraceptive Use with Desired Family Size

	β	S.E.	P
Intercept	1.16	2.0	.563
Age	0.01	0.05	.846
Education	0.31	0.15	***.036***
Fam Size Desires	-0.40	0.23	.084

N=46, R^2=0.38, P<.0001

2.4. Discussion/Conclusion

The indigenous Mayangna and Miskito living in these remote communities in Nicaragua are uniquely positioned with one foot in two worlds. While the individuals participating in this research are still largely shielded from the forces of industrialization, the impacts of communities outside of these remote villages are increasingly spilling into the Bosawás Biosphere Reserve. Community members now have access to contraceptive technology, they rely on clothing and other goods from outside the community, and they can seek obstetric support in larger communities. Results presented in this section found that women continue to hold reproductive ideals more common among natural fertility populations. Although young adults desire smaller families than older adults, they still desire more than five children. Additional resources, in the form of wage labor and female agency, appear to translate into increased fertility desires. In fact, presence of wage labor leads to lower contraceptive use among women

despite growing access to contraceptive technology and growing normalization of use across these communities.

The results for men interviewed in the communities show similar directional trends, with access to wage labor increasing desired fertility, though the effect was not significant. Men were consistent in reporting that household reproductive decisions were determined in partnership, indicating that their wives held some agency. This lack of variability prevented the use of female agency as a predictor in our statistical models analyzing men's reproductive ideals. Women appear to disagree, reporting lower levels of agency than their reproductive partners ascribed to them. Age was the single predictive factor of fertility desires among men.

During the qualitative interviews conducted among the Mayangna and Miskito, a majority of men and women in the communities cite economic concerns as a major factor for limiting the size of their family. Many of the resources needed for daily life in the Reserve are gained through hard work and ingenuity, while other industrial goods such as textiles and cookware are purchased using funds gained through wage labor. A lack of consistent access to wage labor changes the perceived cost of material goods when making decisions about family size. As these communities normalize access to clothing, shoes, cookware, tools, textiles and other goods used in daily life, access to these goods becomes a proxy for wealth and status for both parents and the children they raise. Expectations on parents grow, causing the real and perceived costs of children to grow, which in turn raises the opportunity costs of children. This sentiment was evident in the number of individuals who noted the cost of clothing, necessities, and other goods

as reasons to limit fertility: 54% of respondents offered cost as a prohibitive factor in their family size desires, particularly the cost of clothing and food. When describing why he and his partner would like to limit fertility, one man noted, "Maintaining [our children] makes it difficult for us. It costs too much, and we live a life of the poor…At least we can feed our children, but the clothes, they are very expensive. This is why we've decided not to have more children…seeing the need and the difficulty, I'd say it's better that [we] don't." Where individuals live exclusively under the provision of the resources around them, access to basic necessities can be experienced more equitably through labor and cooperation.

Another individual described this changing material dynamic in the Reserve more directly, stating, "We, the indigenous people, are used to having a great many children, but poverty forces us [to not have many children]. We don't have enough to cover for all those children - for their clothes, when they are sick, or for their education." In addition to economic costs for material goods, the costs of embodied capital investments such as education are increasing expectations placed on parents attempting to optimize their overall wellbeing. Parents must balance a desire for large families with the growing costs of maintaining and investing in those children. In a span of only three decades, mean educational attainment has grown from approximately half a year for both men and women, to 8.5 years for men and 7.2 for women. This change in the education landscape spills into nearly every aspect of daily life for the Mayangna and Miskito. As children and adolescents spend more time in school, they are less available to contribute to family production or to care for infants and children.

Consistent with cross-cultural trends, education in these communities lowers family size desires and increase the likelihood of using contraception among women. Education often leads women to delay entry into marriage and family formation and increases the tradeoffs to reproduction as women have increased access to economic security through wage labor. Not only does education shift investment strategies for parents, but it also has a diminishing effect on desired fertility for parents, particularly women.

In addition to shifts in embodied capital and material investments throughout these communities, several external factors are changing the way that couples perceive reproductive opportunity and burden. Among them are indigenous access to health services through MINSA, the influence of MINSA healthcare workers on socially accepted fertility outcomes, and knowledge of contraception. Given the evidence of a fertility transition, there may be a disconnect whereby men and women reduce fertility without premeditated intention, or that they only pursue smaller family size than desired when they do not feel that they can meet the needs and expectations of additional children. We can see that participants report a desire for sustained high fertility as seen in fully natural fertility populations, but at the mercy of a changing environment, they are actually reducing fertility. Considering their quickly changing economy, the tradeoffs that accompany increasing demands for education, the growing demands to maintain status with access to material wealth, and the required skills that accompany growing access to wage labor, men and women may see no choice but to limit family size.

Results of this study confirm the pervasive diffusion of contraceptive knowledge, and the growing reliance on contraception in these communities. Religious stigma surrounding contraceptive use mediates some of the effects of contraception on fertility reduction among respondents. This study would have benefitted from a reliable measure of individual religious observance, but these data were not available at the time of analysis. To illustrate the importance of religious ideals among these communities, 18% of individuals interviewed were reluctant to describe family size desires because they believed that fertility outcomes are dependent upon God's will, with a few refusing to answer the question altogether. This is a study limitation, as family size desire is the primary dependent variable of interest in our models. We might predict that those who hold the most conservative religious beliefs would also be those with the highest family size desires, and thus removing some of the tails of our sample. One woman in the community whose husband is involved in religious ceremonies suggested that God has blessed them with children because her partner follows Biblical principles. The dominant religious affiliation in these communities is Catholicism, resulting in a belief that contraceptive use contradicts the laws of a divine creator. Individuals ascribing to this idea maintain higher fertility despite the growing cultural reliance on contraception, though not quantifiable at the time of this study. The influence of contraceptive practices among the community is intensified by MINSA's prescriptive ideals concerning fertility reduction.

Future investigations will include development of quantitative measures for qualitative descriptions of pressures leading to family size limitation. Economic costs,

work required to maintain children, and illness were frequently cited as reasons for limiting fertility desires. We need to better understand how these factors are initiating fertility reduction despite a continued desire for high fertility among these communities. Future research will include a wealth indicator, capturing the complexity of economic stability in this community where assigning value to material goods is difficult, and where economic potential and wage labor stability is ever-changing. Wealth is particularly difficult to quantify in these communities. Livestock, modest homes and some material goods are relatively straightforward, but reliance on shared agricultural land and sporadic access to wage labor and material markets leads to significant fluctuation in access to resources. Translating these material goods into quantifiable currency is challenging and subject to uncertainty.

To conclude, we reiterate the importance of fertility reductions that define the later stages of demographic transition. These reductions are important catalysts of social change, often having significant and lasting impacts on cultures by shifting the very population structure on which social organization is based. This study allowed us the rare opportunity to gather ethnographic information during the earliest stages of one fertility transition among the Mayangna and Miskito when social and economic pressures are catalyzing cultural and behavioral changes related to reproduction, even preceding widespread participation in an industrialized economy. This work has shown that early fertility transition is complex and context dependent. Reproductive limitation in these communities is driven by individual beliefs and family circumstances, the external influence of prescriptive governmental reproductive support programs

impacting social perceptions of reproductive norms, and changing gender status in the form of household agency to influence reproduction, education, and wage labor participation. To uncover the mechanisms of fertility reduction in this community is to peer into the broader struggle that women and men face as they balance status improvement with their culturally calibrated desire to maintain high fertility.

3. WESTERN STUDY

3.1. Introduction and Overview

Researchers have long sought to understand trends during demographic transition, wherein as societies become industrialized, populations experience shifts from high mortality and high fertility to low mortality and low fertility. In the United States, the total fertility rate (TFR) has dropped from 2.5 in 1970 to 1.8 in 2018 (Kaneda, et al. 2018), a rate below the rate of population replacement of 2.1. Nearly one half of the world population lives in countries with below-replacement fertility; among the lowest are South Korea, Taiwan, Greece, and Italy, each with TFRs at or below 1.3 in 2018 (Bureau 2018). The existence of very low fertility poses significant problems for population stability, often leading governments to incentivize reproduction to sustain economic and social structures on which societies thrive. In addition to real and measurable impacts on societies, these trends also create philosophical challenges for evolutionary approaches to human behavior. Namely, how can low fertility evolve given that it is a defining mechanism of evolution?

Existing research on fertility reduction emphasizes economic, social, and evolutionary pressures that lead men and women to shift reproductive behavior (Blackburn and Cipriani 2005; Caldwell 2005; Caldwell 2007; Colleran and Snopkowski 2018; Hill and Reeve 2005; Kohler 2001; Newson, et al. 2005; Richerson and Boyd 2004), but little research has made critical connections illustrating the tangled web of social, cultural, familial, economic, and reproductive inputs influencing lifetime fertility.

Embodied Capital Theory helps us conceptualize the shifting returns to personal and offspring investment during industrialization (Kaplan, et al. 2009; Kaplan, et al. 2000). As economies change over time, individuals identify viable paths to climb in social status, often requiring greater personal investment in education and training at the expense of investments in children. When payoffs to additional personal investment increase, men and women may choose to delay or scale down family size. These delays change the trajectory of family formation and fertility outcomes, an effect that is amplified by motivations to leave the natal home in pursuit of education, skill attainment, or employment. Separation from kin further decreases the supports and resources individuals rely on while raising children.

This growing pressure to reduce fertility is intensified by the concomitant increase in the returns to investing in the competitiveness of children. Parents must be sensitive to a dynamic social landscape where quality education, attainment of skill, and a host of personal investments have heightened the investment "costs" of children, requiring parents to reduce fertility. The resource and time constraints of parenting in this environment are too great to allocate among many children, and failure to invest heavily in children has real costs threatening later success (Mahoney, et al. 2006; Mahoney and Vest 2012).

These shifting social pressures for parents and children, combined with the incentive and freedom to move away from the natal family following industrialization, have led to massive restructuring of living arrangements and the social networks we rely on. This reorganization has shifted the social and cultural connections that have long

served to inform women's reproductive and parenting behaviors. For most of human history, individuals were raised around siblings and kin, each directly influencing ideals about reproduction, pregnancy, lactation and childcare. In these settings, the vast majority of individuals had experienced caring for children early in life, as family subsistence and home keeping is shared throughout the family and community (Hrdy 2005; Hrdy 2009). This trend is illustrated by the Mayangna data described in Section 2 where 89% of respondents cared for young children daily or sometimes during their youth, and only 11% reported never caring for young children, most often because they were the youngest member of their large extended family. Older children are among the primary caregivers for young siblings while parents are engaged in subsistence labor within or around the community, or as parents are caring for other needs within the family (e.g. care of younger infants, cooking, cleaning, preparing food, maintaining the home). In industrialized populations where fertility rates are low, a young child might be one of few children in the family (possibly the only child), live in isolation from extended kin, and never hold a child until they begin their own families. These disparate environments each create feedback loops dictating normative behavior, shaping ideals about family formation.

In a stunning deviation from our evolutionary past, not only are young women isolated from pregnancy, birth and childrearing practices that were essential to survival during our evolutionary past, but they are no longer afforded the support and guidance historically afforded by kin and other allomaternal parents once they begin reproduction. Offspring who become physically distanced from kin may also distance themselves from

religious institutions and other groups that help reinforce normative behaviors, thereby promoting lower fertility (Pearce 2002; Pearce and Thornton 2007; Zhang, et al. 2013). The transmission of information about reproductive ideals may shift to other mentors or individuals who promote status-seeking at the cost of low fertility (Richerson and Boyd 2004).

Using data for U.S. women, this research will fill theoretical gaps by describing the impact of early experiences on later reproductive outcomes. We will explore specific mechanisms that contribute to reduced fertility during industrialization, as well as the feedback loops continuing to perpetuate low fertility. This research will investigate the impact that early exposure to pregnancy, birth, and childrearing has on confidence and preparedness to have children prior to family formation, age at first birth, family size desires and stability of those desires over time, and ultimately, completed fertility. Does early exposure act as a critical part of parental knowledge transmission that is lost in industrial contexts, thereby impacting these proximate determinants of fertility? In an era when biological certainties have become gray areas thanks to modern medicine and science, perhaps women no longer base decisions on realistic expectations regarding individual fecundity. Does exposure to reproduction at an early age act as an important catalyst to earlier reproduction? Are women shielded from pregnancy and childrearing to the degree that the perceived normative behavior is maladaptive, perhaps even despite individual desires for high fertility? These questions will be explored, attempting to reveal the impact of disconnection from early exposure to pregnancy, birth and childrearing practices in developed, low-fertility contexts.

3.1.1. Research Hypotheses

If we are to predict that early exposure has significant impacts on the female experience in such a way that it impacts later reproductive attitudes and behaviors, we must also predict the specific mechanisms by which exposure could impact a woman's lifetime reproductive outcomes. For example, how might reductions in early exposure serve to influence attitudes and behaviors that cause women to reduce lifetime fertility? There are two primary predictions this study will test, both resting on the hypothesis that higher early exposure to pregnancy, childbirth and childrearing will lead to higher reproductive outcomes, and thus, higher lifetime fertility.

As in most activities, people are more likely to engage in activities for which they feel qualified, whether they are competent or simply confident. The first hypothesis is that women with more robust early exposure will have gained important experience regarding reproductive outcomes, giving them greater self-reported preparedness to raise children at the onset of family formation (H1a), and greater confidence during times of potential crisis in the early stages of parenting (H1b).

The second hypothesis of this research is that robust early exposure to reproduction and child-rearing will promote fertility in adulthood through several mediating behaviors. An important predictor of lifetime fertility is age at first birth which sets the tempo for lifetime reproduction by lengthening or shortening the time during which women can have additional children. On average, a woman has only 400 days during which she can become pregnant, and even fewer with contraception (Tallack 2006). The probability of conceiving a child declines over a woman’s reproductive life,

though research has shown that common misconceptions exist about how quickly these probabilities decrease (Peterson, et al. 2012). An earlier age at first birth also demands earlier investment in children, reducing the likelihood that parents will invest exclusively in personal embodied capital that would lead to further reductions in fertility. Here, we hypothesize that increased early exposure to reproduction and parenting will result in earlier age at first birth (H2a), in turn permitting higher lifetime fertility.

As a component of our second hypothesis, this study will test the prediction that women with more robust exposure to childbirth and child-rearing would desire larger families than those with limited exposure to reproduction and parenting, yet similar sibship sizes and other demographic factors (H2b). By including sibship size, we are controlling for the confounding effect of the heritability of fertility trends. That is, those who come from large families are likely to both report more exposure to small children early in their lives and desire larger families. However, even within large sibship groups, some siblings (typically those born earlier) have had more exposure than others caring for small children early on. Higher desired fertility prior to family formation will serve as a predictor of lifetime fertility.

Despite early assumptions about the stability of family size desires over time, research has shown that in post-industrial or developing contexts, individuals recalibrate family size desires over the life course (Hayford 2009; Iacovou and Tavares 2011), and specifically that families recalibrate reproductive attitudes and behaviors following the birth of each child (Miller and Pasta 1995). We know of no research suggesting an impact of early exposure on the durability of family size desires over time. Does

increased exposure to reproduction cause women's desires to remain more constant over time, even with the ebb and flow of family size desires over one's lifetime? This research predicts that women with a high amount of early exposure would experience more stable desires over time, defined as a smaller absolute value change in their desired family size over time (H2c).

The last prediction for the second hypothesis focuses on fertility outcomes. The predictions made above suggest that women who have increased early exposure will exhibit behaviors and attitudes that are conducive to higher lifetime fertility. This research predicts that completed fertility at the time of the study will increase with increased exposure to reproduction and parenting (H2d).

Generally, this research hypothesizes that decreased exposure to pregnancy and infants during post-industrial childhoods has caused a gap in the intergenerational transmission of knowledge that is critical to individual reproduction. This lack of information transmission has created barriers to reproduction in the form of lost knowledge, lack of preparation and confidence, and loss of support systems upon entry to parenthood, each helping to maintain a cycle of reduced fertility. These hypotheses suggest that high rates of fertility prior to industrialization are, in part, institutionalized and maintained due to a high degree of familiarity with pregnancy, birth, and childrearing activities gained from early and frequent exposure to children.

3.2. Methods

The means of collecting data for this research were twofold. The research sought to collect a large quantitative data set that could be used to test hypotheses through statistical models. In addition, a smaller set of qualitative data was collected to further explore themes emerging over the course of the study. These data were collected over two distinct phases between summer 2013 and summer 2015, resulting in a rich collection of quantitative and qualitative data to test the hypotheses stated above.

3.2.1. Survey Collection

To gather quantitative data, a survey instrument was developed during spring 2013, and launched during summer 2013 using a snowball recruitment strategy. Preliminary analyses suggested that the respondents lacked diversity in the areas of ethnicity and education. Therefore, a second, identical survey was lunched using Amazon's Mechanical Turk human intelligence marketplace during summer 2015. Phase one of the survey yielded 137 responses and phase two yielded 146 responses, for a total of 283 responses.

The survey included five primary components. Section one collected demographic information. Section two gathered data regarding respondents' childbearing timing and history, including factors influencing timing/spacing, family size desires over time, and current expectations regarding lifetime fertility. Section three gauged confidence and competence prior to becoming a mother, as well as activities and resources relied upon during preparation for parenthood. Section four measured

exposure to young children prior to pregnancy and birth activities within and outside of the respondent's household. Section five gathered information about the primary parental influences in a respondent's life, which likely influenced later reproductive attitudes, choices and behaviors.

To protect anonymity, the web-based survey was administered through a single link to the survey collection tool Qualtrics, and therefore could not be used to tie any response back to an individual participant. There was no way to know who did and did not participate in the survey from the individuals recruited.

3.2.2. Interviews

To further explore themes emerging in the survey data, five semi-structured qualitative interviews were conducted with women who had engaged in the web-based survey. Interview questions explored a range of topics common among parenthood. Women were asked to share their desired family size as it changed over time, primary parental influences, early experience with children and the impact of that lived parenting experience on their own family formation. Participants were recruited by including a short survey link at the close of the web-based survey where women could indicate interest in a follow up study. The interest survey was not linked to the quantitative data collection survey, and thus survey responses remained confidential.

3.3. Data Analysis

Of the 137 respondents in phase one and the 146 in phase two, 250 individuals provided enough information to be included in most analyses. Table 3-1 below provides sample characteristics.

Table 3-1 Sample Characteristics

Age Range	N	White N (%)	Non-White N (%)	Less Than College N (%)	College Degree N (%)	Graduate Degree N (%)	Religious Affiliation N (%)	Single / Divorced N (%)	Married / Dom. Partner N (%)
20-29	35	21 (60)	14 (40)	13 (37)	16 (46)	6 (17)	24 (69)	6 (17)	29 (83)
30-39	117	100 (85)	17 (15)	23 (20)	58 (50)	36 (31)	98 (84)	9 (7)	108 (93)
40-49	47	43 (91)	4 (9)	13 (28)	17 (36)	17 (36)	39 (83)	6 (13)	46 (87)
50-59	22	20 (91)	2 (9)	7 (36)	10 (45)	4 (18)	19 (86)	4 (19)	18 (81)
60-79	4	3 (75)	1 (25)	3 (75)	1 (25)	0 (0)	4 (100)	2 (50)	2 (50)
Unknown	25	18 (72)	7 (28)	10 (40)	11 (44)	4 (16)	22 (88)	8 (32)	17 (68)

To test our hypotheses using early exposure as a predictive variable, an Exposure Score was calculated for each respondent. The Exposure Score represents the overall level of exposure to reproduction and parenting each person had at an early age. To borrow from Miller et al (2010), this is the time during which women form their motivational substrate that informs later reproductive motivations, desires and behaviors.

The Exposure Score was developed to quantify early experience with infants and children across three domains: 1) presence of infants and young children in one's family, 2) breadth of care the respondent contributed to infants and young children in one's family, and 3) care given to infants and young children outside of the home. For each respondent across each domain, a percentile rank was calculated to illustrate their early exposure relative to others in the sample. Those percentiles were summed to develop an overall Exposure Score. Each domain was given equal weight, as there is no known research suggesting that any one of the three has a greater influence on reproductive choice than another. The overall Exposure Score, therefore, is a numerical illustration of each respondent's experience with young children relative to the larger survey population and was used to predict later reproductive attitudes and behaviors.

The first domain, presence of infants and young children in one's family, was calculated by assigning a value for the number of years of experience with one or more infants in the home three years of age or younger while the sibling was five years of age or older. This distinction was made to ensure that respondents were significantly familiar with, and impacted by, the requisite care demanded of infants and toddlers. Respondents provided detailed data regarding the difference in age between themselves and other siblings/children living in the home, making this calculation possible. If respondents were age 18 or greater at the time that young children lived in the home, no score was assigned, as conservative estimates should assume that individuals 18 or older are of age to attend college, work outside of the home, or work in service of the military,

and thus likely to live independently. This assumption is appropriate for a moderately educated sample as is captured in this research.

The second and third domains were calculated using self-reported data across a Likert scale. For sibling care, individuals reported their involvement in feeding/nutritional care, bathing/diapering, entertaining/teaching, and administration of first aid. For care outside of the home, respondents reported their involvement in nursery, preschool or daycare programs, babysitting services, public or private school programs (K-6), pediatric or prenatal healthcare, and labor and delivery healthcare.

In addition to the independent variable Exposure Score, several other variables are used in our regression models, described here. Family size desires, absolute value change in family size desires over time, completed fertility, age, age at first birth, number of dependents, household income, sibship size, and self-reported preparedness are all continuous values. Current marital status and ethnicity are categorical variables. Education was reported as a categorical variable, then converted to a continuous variable using standard years of educational attainment for various credentials common among institutions of higher education in the United States (e.g. bachelor's degree was assigned four years, while an associate's degree was assigned two years). Religious affiliation was reported as a categorical variable, then converted to a binary variable (i.e. respondent reports a religious affiliation vs. respondent does not report a religious affiliation) for ease of data analysis. While parenting crises take many shapes in every family, for this study, non-routine visits to a pediatrician were used as proxies for crisis. Women were asked to report the number of times they went to see a doctor with their

firstborn child and were instructed by the pediatrician to wait to see if the condition worsened before requiring treatment. Confidence in crisis, therefore, is a continuous variable developed from these data.

For each of the six hypothesis tests, a multiple regression equation was estimated using early exposure as a primary independent variable, testing the impact of early exposure on the dependent variable. The full model including early exposure and the various control variables was estimated to be able to ascertain which variables were statistically significant predictors. Variables not theoretically significant or statistically significant at $\alpha=0.10$ were excluded from the final reduced model via backward stepwise regression. Education and sibship size were included in all models regardless of significance, as these are important theoretical underpinnings of this work.

Interview data were transcribed to glean the motivations and influences on interview participants' attitudes and behaviors regarding reproduction and parenting. No formal statistical analysis was performed on these data given the small sample size, but the information was coded to better understand themes that emerged during the study. Quotes from several interviews are included throughout the results section below to provide additional depth for quantitative analyses.

3.4. Results

The Exposure Score used for our statistical models is a quantitative representation of early interaction women have had with young children both inside and outside their natal or extended family homes. The score is the sum of three distinct

percentile calculations relative to other women in the sample. As shown in figure 3-1 below, the women in this study are grouped in the lower end of this scale, indicating that the majority of women have limited early exposure to infants or young children prior to starting their own families. Our Exposure Score ranges from a minimum score of 0 (no early exposure) to a maximum score of 2.37 (the highest reported exposure among the 250 women in this sample).

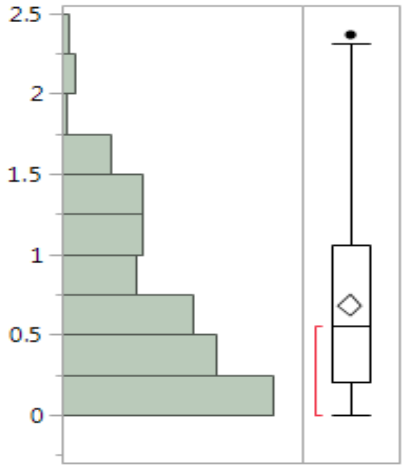

Figure 3-1 Exposure Score Distribution for Study Sample (N=250)

Before presenting the results of the hypothesis tests, we present Table 3-2, a correlation matrix for the continuous variables of interest in our regression models. Our main variable of interest, early exposure, is significantly correlated with age at first birth, number of dependents, and sibship size.

Table 3-2 Correlations Among Continuous Variables of Interest

	Exposure Score	Age	Age, 1st Birth	Dependents	Education
Age	-0.071	-	-	-	-
(p, N)	(p=.292, N=225)	-	-	-	-
Age, 1st Birth	-0.230	0.082	-	-	-
(p, N)	(**p<.001**, N=250)	(p=.220, N=225)	-	-	-
Dependents	0.158	0.141	-0.165	-	-
(p, N)	(**p<.001**, N=250)	(**p=.035**, N=225)	(**p=.009**, N=250)	-	-
Education	-0.074	-0.066	0.374	-0.046	-
(p, N)	(p=.242, N=250)	(p=.343, N=225)	(**p<.001**, N=250)	(p=.469, N=250)	-
Sibship Size	0.325	0.096	-0.087	0.112	0.012
(p, N)	(**p<.001**, N=250)	(p=.149, N=225)	(p=.170, N=250)	(p=.077, N=250)	(p=.849, N=250)

Hypothesis one predicts that women who have had opportunities to gain more robust experience with infants and young children early in life (related or unrelated) will feel more prepared (H1a) and more confident in crisis (H1b) as they embark on parenthood. To test H1a, a multiple regression equation was estimated using early exposure (via the Exposure Score) to predict self-reported preparedness for parenthood prior to beginning one's family. Religion, ethnicity, education, age at first birth, sibship size, and household income were included as controls in the full model. Because

ethnicity and household income were non-significant, they were removed from the reduced model. The resulting analysis found this model to be highly significant (N=235, R^2=.13, p<.001) with early exposure (β=1.84, p<.001), religion (β=.58, p=.017), and age at first birth (β=.06, p=.047) as significant predictors of preparedness. As hypothesized, increasing exposure has a positive association on feelings of preparedness to engage in parenthood, with religious affiliation and higher age at first birth also positively associated with a greater sense of preparedness.

To test H1b, a second multiple regression model was developed using early exposure to predict confidence in times of parental crisis. To test the prediction, a multivariate regression model was estimated predicting the number of such visits using early exposure, operationalized as the Exposure Score. Religious affiliation, ethnicity, education, age at first birth, sibship size, and household income were also included as controls in the full model. Because religion, ethnicity, and household income were non-significant, they were removed from the reduced model. The resulting analysis was highly significant (N=249, R^2=.09, p<.001), with early exposure (β=-1.02, p<.001) and age at first birth (β=-.06, p=.006) as significant predictors of confidence. The negative coefficients imply greater confidence during crisis, as this implies fewer visits to the doctor that were unwarranted. As hypothesized, increasing exposure is positively associated with greater confidence to handle crises early in parenthood, with age at first birth also associated with greater confidence. Individuals with more exposure and who were older at the time of their first birth were less likely to seek a doctor's advice during

perceived crises for which they were turned away and asked to wait until symptoms worsened.

The second hypothesis predicted that women with robust early exposure would engage in behaviors that promote fertility. Specifically, that these women would begin their reproductive careers earlier than those with less experience, as measured by age at first birth (H2a), they would report higher family size desires prior to starting a family (H2b), more stable family size desires over time (H2c), and ultimately, higher lifetime fertility (H2d). H2a was tested via multiple regression, using early exposure to predict age at first birth. Religious affiliation, ethnicity, education, age, sibship size, and household income were included as controls in the full model. Because religion and household income were non-significant, they were removed from the reduced model. The resulting analysis found this model to be highly significant ($N=230$, $R^2=.22$, $p<.001$), with early exposure ($\beta=-1.64$, $p<.001$) and education ($\beta=.89$, $p<.001$) serving as significant predictors of age at first birth. As hypothesized, higher early exposure is associated with earlier age at first birth, while education has a delaying effect on age at first birth. Though ethnicity was not significant in total, the variable was left in the model due to an effect among African American women relative to their white peers. African American women are significantly more likely to start families earlier than white women in the sample ($\beta=-4.03$, $p=.022$).

H2b was tested via OLS multiple regression, using early exposure to predict a respondent's desired family size prior to beginning family formation. Religious affiliation, ethnicity, education, age, age at first birth, sibship size, and household

income were included as controls in the full model. Because ethnicity, age at first birth, and household income were non-significant, they were removed from the reduced model. The resulting analysis found this model to be highly significant (N=229, R^2=.10, p<.001), with early exposure (β=.57, p=.017) and religion (β=.46, p=.004) serving as significant predictors of prior family size desires. As hypothesized, higher early exposure is associated with larger family size desires prior to family formation, as is religious affiliation. Higher sibship size had a positive effect on family size desires, but only with 91% confidence.

H2c was tested via multiple regression, using early exposure to predict the absolute value of the change in desired fertility over time. Religious affiliation, ethnicity, education, age, age at first birth, sibship size, current marital status, total number of dependents, and household income were included as controls in the full model. Because religion, ethnicity, age at first birth, sibship size, current marital status, and household income were non-significant, they were removed from the reduced model. The resulting analysis found this model to be moderately significant with low explanatory power (N=224, R^2=.05, p=.069). Counter to the hypothesis for this model, early exposure had no significant impact on the absolute value change in child desires over time. A higher number of dependents is associated with higher fluctuation over time (β=.13, p=.023), possibly because individuals shift notions of ideal family size toward their achieved family size as they have additional children (e.g. respondents with five children may are unlikely to say that they prefer only four), or because individuals

who have more children see greater impacts of those children and recalibrate their desires to a greater degree.

H2d was tested via multiple regression, using early exposure to predict total fertility. Religious affiliation, ethnicity, education, age, age at first birth, sibship size, current marital status, and household income were included as controls in the full model. Because ethnicity and household income were non-significant, they were removed from the reduced model. The resulting analysis found this model to be highly significant (N=230, R^2=.11, p=.003, with religion (β=.23, p=.034) and current marital status (β has mixed effects based on status, p=.005) serving as significant predictors of achieved fertility. Specifically, those who are married are more likely to have higher completed fertility than those who are single (β=.56, p,.001). Counter to the hypothesis for this model, early exposure had no significant impact on achieved fertility. To test the effect of early exposure on women who are likely to be past reproductive age (and therefore have completed lifetime fertility) a second analysis was run (H2d.II) which included only respondents 50 years of age and older (N=26). While this sample size is small and may not be generalizable to a broader population, the model was significant (N=26, R^2=.59, p=.011), and findings showed that early exposure impacted completed fertility in the positive and predicted direction, but not with statistical significance. Ethnicity was statistically significant in increasing the likelihood of additional fertility, with African American women more likely to have higher completed fertility than white women (β=2.91, p=.009). Age at first birth and religious affiliation impacted completed

fertility in the expected direction, but only with 90% confidence level. All statistical results are presented in Table 3-3, below.

Table 3-3 Regression Results for Statistical Models, H1A-H2D

	Preparedness (H1A, N=235, **p<.001**)		Confidence (H1B, N=249, **p<.001**)		Age, First Birth (H2A, N=230, **p<.001**)		Prior Fam Size Desires (H2B, N=229, **p<.001**)		Abs. Change Desires (H2C, N=224, p=.069)		Completed Fertility (H2D, N=230, **p=.003**)		Completed Fertility ≥50 (H2D.II, N=26, **p=.011**)	
	β	S.E.	β	S.E.	β	S.E.	β	S.E.	B	S.E.	B	S.E.	B	S.E.
Exposure Score	1.84 **P<.001**	0.36	-1.02 **P<.001**	0.27	-1.65 **P=.026**	0.73	0.57 **P=.017**	0.24	0.16 P=.291	0.15	0.04 P=.806	0.16	0.56 P=.323	0.55
Age	- -	-	- -	-	0.07 P=.124	0.04	0.00 P=.956	0.01	0.01 P=.457	0.01	0.02 P=.113	0.01	- -	-
Age, First Birth	0.06 **P=.047**	0.03	-0.06 P=.006	0.02	- -	-	- -	-	- -	-	-0.03 P=.051	0.01	0.07 P=.076	0.04
Current Marital Status	- -	-	- -	-	- -	-	- -	-	- -	-	M.E. **P=.005**	M.E.	- -	-
Dependents	- -	-	- -	-	- -	-	- -	-	0.13 **P=.023**	0.06	- -	-	- -	-
Education	-0.01 P=.873	0.08	-0.06 P=.304	0.06	0.89 **P<.001**	0.15	-0.04 P=.407	0.05	-0.04 P=.216	0.03	-0.01 P=.764	0.03	-0.03 P=.793	0.11
Ethnicity	- -	-	- -	-	M.E. P=.087	M.E.	- -	-	- -	-	- -	-	M.E. **P=.009**	M.E
Religious Affiliation	0.58 **P=.017**	0.24	- -	-	- -	-	0.46 **P=.004**	0.16	- -	-	0.23 **P=.034**	0.11	0.99 P=.058	0.49
Sibship Size	-0.18 P=.107	0.11	0.07 P=.417	0.08	-0.15 P=.500	0.22	0.13 P=.083	0.07	-0.05 P=.248	0.05	0.03 P=.509	0.05	-0.08 P=.722	0.21
Model R^2	.13		.09		.22		.10		.05		.11		.59	

"M.E." denotes categorical variables for which the effects are mixed

Analyses confirm that early exposure creates many of the conditions necessary to achieve higher fertility. Early exposure leads to greater confidence, greater preparedness in times of crisis, earlier age at first birth, and higher family size desires prior to family formation. Findings suggest, however, that women shift course after transitioning to parenthood, deviating from their path toward higher fertility. Women are recalibrating family size desires over time, with presence of dependents playing significant roles in the magnitude of those recalibrations over time. A higher number of dependents leads to a larger magnitude of change, possibly because individuals recalibrate desires toward the number of children they have. Aside from presence of dependents, what pressures cause women to recalibrate desires and ultimately reduce fertility from their initial reproductive ideals?

To help us answer this question, we will look at two sets of data. The first is a series of questions from our survey inquiring about shifts in family size desires over time. For women who reported a shift in fertility desires after beginning their family, a question read, "Which of the following factors or experiences influenced the number of children you want?". Participants responded to potential influences in one of three ways: (1) Caused me to want more children, (2) No influence, or (3) Caused me to want fewer children. Table 3-4 below reveals those results.

Table 3-4 Influences Causing Women to Desire Fewer/More Children

	Fewer	More	No Influence
Maternal Age	36%	12%	52%
Financial Stability	37%	9%	54%
Familiarity w/ Parenthood	10%	23%	66%
Age of Other Dependents	18%	15%	68%
Relationship Stability	14%	18%	68%
Employment	23%	2%	75%
Personal Support Network	16%	9%	75%
Childcare Options	19%	3%	78%
Health Insurance	12%	5%	83%
Religious Belief	4%	10%	86%
Educational Pursuits	8%	2%	90%

Table 3-4 supports one of our findings from model H2C. Women report that existing dependents' ages lead to some recalibration of family size desires in both positive and negative directions. Women were not asked to provide any further information about the nature of these directional changes. Other influential factors causing women to shift desires over time (in order of magnitude) include maternal age, financial stability, familiarity with parenthood, and relationship stability. In terms of a purely negative effect on family size, women report financial stability, maternal age, and employment as motivators to have fewer children. Other than maternal age, each of these influences speak to the inherent tradeoffs young parents make as they weigh the heightened opportunity costs of children against the potential for financial stability and

professional pursuits. Childcare options are also at the top of the list, which we would expect given what we know about family organization following industrialization and the toll that young parents take in the area of allomaternal care as they are physically separated from parents and other kin. One woman in the study noted, “I wanted four children until I understood the true costs of raising children in modern society. My husband and I did not have family around us and the cost of childcare, both daytime and evenings/weekends is quite high. And with no family around to watch the children, my husband and I were never able to go away without them. That prevented us from wanting more.”

Interestingly, though early exposure was not a significant predictor of absolute value change in family size desires over time, familiarity with parenthood was named as an influential factor in women’s recalibration over time. As one woman in the study stated, “I didn't want kiddos because I wanted to work, and I didn't know much about motherhood. But after learning more about child rearing and the blessing they can be, I decided I'd like more.” As women with little early exposure to children engage in parenthood, the experiences they have with their own children lead them to a better understanding of the challenges and rewards of raising children.

Theoretical foundations of this research look to shifts in social organization following industrialization as an influential factor in fertility reduction. As we have explored above, as men and women move away from natal and extended family, young parents lose the support of allomaternal care early during parenthood when children require the highest levels of care. Where do women seek information and advice

regarding infant/childcare for their firstborn in these new social arrangements? To answer this question, we look to survey responses asking women how often they relied on various individuals and resources during parenthood. In preindustrial contexts, women would have been integrated into the daily life of parents and kin who were actively raising children, often expected to contribute high levels of care, creating confidence and familiarity with which to navigate parenthood. And yet, as illustrated in Table 3-5 below, the 250 respondents to this study rely more heavily on parents, non-parent kin, friends and pediatricians than they do their own experience. They also lean more heavily on parenting reference books and resource websites than their own experiences.

Table 3-5 Resources Used for Infant/child Care for Respondents' Firstborn

	Never	Seldom	Occasionally	Often
Parenting Support Group(s)	55%	18%	19%	8%
Parenting Blog(s)	39%	19%	23%	18%
Personal Experience	19%	20%	23%	39%
Resource Website(s)	16%	17%	28%	39%
Family Member(s) (Non-parent)	10%	22%	39%	29%
Pediatrician(s)	6%	16%	44%	33%
Parenting Reference Book(s)	8%	14%	34%	44%
Friend(s)	6%	15%	41%	38%
Parent(s)	4%	13%	32%	51%

3.5. Discussion/Conclusion

Men and women have long relied on others in the environment to describe and model normative behaviors. We use these social and cultural contexts to guide our decisions about personal and offspring wellbeing as well as appropriate timing and magnitude of reproductive outcomes. As industrialization spreads, nearly every aspect of this traditional social learning is altered. Individuals leave their natal homes in search of opportunity, education, employment, and reproductive partners. And in their new social environments, now-distant kin who are more likely to transmit ideals favoring high fertility have little direct influence over daily decision-making. This social organization has broken the feedback loops that encourage high fertility, replacing mentors and advisors with other sources of information transmission that promote status seeking and personal investments over high fertility.

As fertility declines within families and the broader social group, women no longer benefit from constant and substantial experience with pregnancy, birth, and childrearing prior to becoming parents themselves. As evidence, we find that 8% of the women in this study raising families have absolutely no prior experience with infants or young children before starting a family - not even children outside of their home. These women are navigating every bit of their childcare narrative for the first time. A majority of women in the study report only limited experience with children outside of their home babysitting or working in an educational environment and no experience with children in their natal or extended family homes where significant learning occurs in most societies. Reorganization of our social networks has divorced young women (and men) from these

formational experiences; the result is a far steeper learning curve for parents and higher perceived barriers for entry into parenthood. As one woman in the study stated, “I am an only child and I never babysat or had exposure to children. I was the first of my friends to have kids. I was clueless and without help when my first child was born. I was living in a new place without community, and my existing community was unable to help.” Another said, “Being the baby of my family, I had absolutely no experience with babies whatsoever. I felt totally inadequate with my first child.”

To illustrate the toll this takes on preparedness prior to parenting, nearly 40% of women in the study report that they seldom or never draw on their own experiences after having their first child. This is a startling deviation from human history where people relied on the cooperation and protection of their social group. Every facet of human life was shared within the social group because the demands of subsistence-living require cooperation, particularly when children are young, and parents are engaged in high levels of contact and constant care demanding some exclusivity from labor. We find that women are more likely to rely on parenting books and websites than on their own experience. They seek help from websites, pediatricians, and friends more than non-parent kin. One respondent described this reliance on outside expertise well: “When I had my last child, I had access to the internet, so I spent countless hours on medical websites and parenting blogs and websites, learning from experts and others' experiences.” High rates of participation in childbirth classes among women in this study (67%), while practical and valuable, are evidence that preparation for this universally human experience is no longer gained through a shared/lived experience.

Our research predictions stated that women with more early exposure would exhibit behaviors predictive of high fertility. We found that, indeed, women with higher levels of exposure to infants and children early in life exhibit behavior predicting higher fertility than their counterparts with less experience. They show emotional readiness in the form of self-reported preparedness, confidence in times of parenting crises, they have an earlier age at first birth, and they report a greater desire for more children than those with less early experience. And yet, the significance of this early experience disappears as women recalibrate their family size desires following entry into parenthood. In this moderately sized sample population, we find no evidence that more early exposure leads to more stable family size desires over time, nor do we find that it leads to higher completed fertility.

In both of our completed fertility models, religion was one of three variables that helped predict completed fertility at a significant level. Interestingly, women who belong to a religious institution often share cultural values consistent with their parents who may have indoctrinated children into those same institutions early in life. We know that religious affiliation is associated with higher fertility, potentially acting as a proxy for values that would normally be reinforced through close and consistent contact with kin.

This study reveals several important narratives about women's reproductive decisions in industrialized contexts. Reductions in the amount of early exposure women have to infants and young children lead women to shift many of the proximate determinates of fertility in directions that would predict lower lifetime fertility. This

lack of experience appears to contribute to feedback loops that sustain reductions in fertility following transition. Reduced fertility is exacerbated by a lack of allomaternal care and a disconnection from information sources likely to promote high fertility. One woman in the study describes the toll of these simultaneous pressures on young parents, and the need to rely on outside resources to compensate for her lack of experience: "I felt very unprepared to raise my firstborn child once he arrived, and I had been very naive about how complicated it would be prior to his arrival. As the youngest person among my siblings, and someone not very interested in children prior to having my own, I had very little exposure to infants, so everything was very new and scary. I was interested in breastfeeding yet had difficulties with getting my firstborn to latch on. I think we both cried often during the first two weeks of his life, but then I connected with a local breastfeeding support group which made a tremendous difference. By the time my second arrived, I was quite confident in taking care of him." Her lack of early experience was exacerbated by a lack of knowledgeable mentorship and support, forcing her to rely on outside support during times of perceived crisis.

We find that the effect of early experience diminishes once women transition to parenthood. Recalibration of family size desires is a common feature of all societies, and in this western context, desires are statistically influenced by age and one's number of dependents. Women self-report financial stability, employment, familiarity with parenthood, and relationship stability as other influences shifting their desires over time. This study addresses a gap in literature by illustrating that the degree of early exposure to pregnancy, birth and childrearing has a measured impact on women's fertility ideals

and behaviors. Future work should gather more detailed information about women's incremental shifts in fertility goals following the transition to parenthood.

4. EDUCATION STUDY

4.1. Overview

Education and employment have long been understood to reduce fertility in industrialized contexts (Becker 1960; Notestein 1953), but it is the causal pathways of these relationships that often remain elusive, varying greatly on multifaceted economic, social, and familial pressures. In pre-industrial populations where job specialization is marginal, individuals investing in professional success through education and skill development may quickly find that high levels of training fail to pay off. In contrast, additional investments in education and training in industrial populations continue to deliver returns across a range of employment opportunities. Individuals willing to invest in professional status are rewarded well beyond the return curves seen in pre-industrial populations. This shift in equilibrium influences parent choice regarding the timing of family formation and desired family size, as the time requirements of parenting often tradeoff against professional responsibilities. These tradeoffs tend to be experienced more sharply among women than men due to cultural expectations for women to excel in both professional and familial realms, but also due to biological certainties such as childbirth and lactation that demand more of mothers than fathers, particularly early in parenthood.

These personal and professional trade-offs appear to be at a record high in the United States, as women are more present in the labor market now than ever before and are seeking higher levels of education and training than any other time in history. The

percentage of eligible women in the labor force has grown significantly from 34% in 1950 to 57% in 2017 (2018). Within institutions of higher education, women have surpassed men in the number of undergraduate, master's, and doctoral degrees earned (Okahana and Zhou 2018). The gender wage gap in the workplace and a lack of equal opportunities seem to be significant factors in motivating women to invest more heavily in educational capital, as women often pay higher wage penalties for lack of educational credentials (Dwyer, et al. 2013). The percentage of women with full time jobs continues to grow along with growing gender equity in pay, as well as the percentage of households where women contribute more to household income than men (2017b). Women are making a more substantial contribution to national labor than ever before, bringing greater awareness to the tension women experience as they seek balance between family and professional investments.

This tension between these competing pursuits is complex. In addition to the internal motivation women may have to invest more time in family and personal activities as they begin family formation, women are also socially and professionally dis-incentivized from seeking both professional pursuits and high fertility through two major mechanisms. In the first, women seeking professional advancement may delay and/or reduce fertility to avoid the opportunity costs of postponing professional pursuits, including education, training and experience. In the second, achieved fertility among reproductive-aged women can result in a professional penalty whereby women are disadvantaged for seeking balance between work and family life. This professional penalty might be imposed by colleagues or supervisors who believe that women do not

have the capacity for both family and career, or because workplace culture reinforces the belief that family formation and career success are mutually exclusive. Women may feel obligated to forgo one for the other.

As evidence of these complexities, we can look to women's employment trends across the age of children in one's home. Per the United States Bureau of Labor Statistics report "Women in the labor force: a databook" (2018), as the age of children grow in a household, so does the percentage of mothers working in the labor market. The lowest rates of female employment exist among women with children under the age of three; these rates grow substantially as the age of children in the home grows. In addition, unmarried and divorced mothers are also represented in the labor force at a much higher rate than their married counterparts despite child age. This suggests that married mothers are more likely to have freedom to support family and personal activities at the cost of professional pursuits, while single mothers may be more financially constrained and redirect time investments toward employment. When child age is introduced, both married and unmarried women increase labor force participation as child age grows, suggesting that even women who may have the financial stability to stay home make the decision to engage in professional pursuits. These data reveal that women experience a tension between personal and professional pursuits in ways that men may not, and that parenting requires some exclusivity from the labor market, particularly during infancy and early childhood when the physical and emotional demands of parenting are highest, particularly among women.

As these employment opportunities swell, women experience greater tradeoffs to reproduction and family formation. These tradeoffs confront women at the same moment when couples have traditionally begun family formation. Even within a supportive network of partners, family, friends and other paid caretakers, women often retain the requisite demands of pregnancy, lactation and childcare during the first years of life, creating more strain on women to seek physical and emotional balance. In fact, time allocation research has shown that as women's representation across the labor market has grown, women continue to shoulder more of the responsibility of childcare and do not reduce their time in paid work to compensate following the transition to parenthood (Yavorsky, et al. 2015). To exacerbate matters, in heterosexual partnerships where both individuals work, women are more likely to quit their jobs to support a time-intensive professional pursuit for their partner, particularly when they are raising children (Cha 2010). It is clear that the work associated with parenthood continues to disproportionately fall to mothers (Craig 2006). Given the physical and emotional demands of parenthood, the social pressure placed on mothers to be present and active in the lives of children, and the disparate impact of children on mothers, it is no surprise that women may opt to postpone or avoid childbirth altogether in pursuit of educational and career success. Following a study of working women in Australia, Lyn Craig (2006) shared a powerful summary of the tension between motherhood and professional pursuits: "While on average all Australian women shoulder a greater domestic burden and have a smaller proportion of their total work time that is remunerated than do men, becoming a mother markedly increases and cements the difference between the

sexes….Avoiding motherhood is also a way to avoid the most extreme consequences of gender inequity."

We have explored one half of the bi-directional tension between professional pursuits and fertility for women. But what of the second, whereby women are penalized in the workplace for seeking balance between family and profession? To support this claim, we find that despite the educational gains women have made, and despite the gains in female representation in the workforce, women continue to be underrepresented in the highest ranks of leadership across nearly every industry (Lyness and Grotto 2018). Despite some income convergence during the second half of the twentieth century, women continue to experience wage inequality relative to their male peers, and they work in part-time or unpaid roles at higher rates than men (Ponthieux and Meurs 2015). Mothers are also disproportionate targets for workplace discrimination against parents. Although men and women both suffer from perceived lack of dependability and professional drive, mothers are uniquely believed to be less competent in their work as a result of their transition into parenthood (Heilman and Okimoto 2008). In the eyes of colleagues, mothers trade competence for maternal warmth, resulting in a lower likelihood that they will be trained and promoted in the workplace (Cuddy, et al. 2004). Salaries reflect this perceived parent incompetence toward mothers, but not for fathers (Correll, et al. 2007).

4.1.1. A Unique Educational and Professional Context

To further explore women's conflict between the high educational attainment, professional pursuits, and family formation, we look to a unique professional environment: faculty and staff in an institution of higher education. In this setting, high educational attainment is the norm rather than the exception. Statistics have shown that the number of women in tenured faculty positions in academia, specifically at research-intensive universities, remains highly skewed toward men with a few exceptions including teacher preparation and education-related disciplines, as well as some disciplines within the humanities (Li and Koedel 2017; White, et al. 2014; Winking, et al. 2019). One study analyzing data from the National Center for Education Statistics (NCES) found that representation by women in academia has grown to 49% of all faculty positions, but only 38% of tenured jobs. Those numbers are even more exaggerated among non-white minority groups (Finkelstein, et al. 2016; McFarland, et al. 2018). The reasons for these continued disparities include gender inequity in the tenure evaluation process across a breadth of disciplines (Weisshaar 2017), including disparities in the way that co-authorship and collaboration are considered during the tenure process (Sarsons 2017).

There is significant evidence that this lack of gender equity extends beyond professional success into familial outcomes. Not only do tenured and tenure-track women benefit professionally from forgoing or delaying marriage and childbirth (Mason and Goulden 2004), they are also less likely to marry and have children, and more likely to divorce. Among those women in tenure-track positions who have children, women

show slower advancement through faculty hierarchy and lower work satisfaction relative to their male colleagues. In addition, these women are more likely to leak out of the tenure-track pipeline due to a lack of parent-friendly workplace climate and policies permitting the flexibility required of parenthood (Ahmad 2017).

These trends have led researchers to seek programs and policies permitting women in academic settings to balance family outcomes along with the rigors of academic scholarship (Bracken, et al. 2006; Evans and Grant 2008; Mason and Goulden 2004). Despite evidence that family leave policies result in greater satisfaction and productivity among women, those in administrative positions in the academy often fail to make women aware of policies that support them, frame family leave as a personal (rather than institutional) issue, or implement parental leave inconsistently or based on social networks (Castañeda, et al. 2015; Gunn, et al. 2014). These practices inherently lead to greater professional stigma for families seeking balance and serve to further disadvantage underrepresented women who do not rely on the same networks to make decisions about fertility and professional pursuit.

By using data from an R1 (research intensive) institution of higher education, this study will explore time constraints for women and men who pursue family outcomes while juggling careers in academic environments, comparing data to their peers who do not have children. The Carnegie Classification of Institutions of Higher Education uses the R1 category to indicate colleges and universities in the United States engaged in the highest level of research activity. This classification is relevant here because it implies a unique level of educational attainment, and a rigorous level of professional pursuit. This

research seeks to understand how high educational attainment and high professional pursuits impact family formation outcomes, how family engagement impacts professional pursuits through time allocation, and how partner support impacts work-life conflict for both men and women. Due to a slow, but steady, narrowing in the division of labor between men and women, and with men taking on more childcare responsibilities in the United States, both men and women are included in this study.

4.1.2. Research Hypotheses

In order to understand the impact of professional pursuits on parents, we must reveal some of the tradeoffs that parents experience in the workplace. This research predicts that high educational attainment and high professional status will result in antagonistic relationships between professional pursuits and family engagement, but that some of this conflict can be mediated by strong partner support. Several specific hypotheses will be explored below using research data from a major research-intensive university.

As we have already explored above, family formation is at odds with high educational attainment. Not only is high educational attainment typically pursued during years when fecundity is highest among women, but the educational investments that women make generally lead to additional career opportunities that conflict with family formation. Given these competing pressures between high educational attainment and family engagement, our first hypothesis is that individuals with higher educational

attainment will experience lower-than-desired fertility as measured by men's and women's responses that they have fewer children than originally planned (H1).

Similar to our prediction for H1, we would expect that greater investment in career success would lead to lower levels of family engagement. As men and women invest their time, energy, and resources into higher professional status, there are greater opportunity costs for leaving the workforce. Not only are there financial costs for leaving the workforce but breaks from a professional role might lead to a loss of opportunity, or even penalties that individuals pay for a perceived lack of commitment among employers. In addition, higher levels of engagement in a profession may imply a greater sense of personal pride and personal identity, deeply entwined with the role they play in their career. Therefore, hypothesis two posits that higher rank among respondents will result in lower than desired fertility as measured by reporting fewer children than planned (H2).

As any parent can attest, children demand a great deal of physical and emotional energy, particularly among young children who do not yet have the capacity to care for themselves. From nighttime feedings for an infant to out-of-town tournaments for active teenagers, family engagement requires that parents tradeoff time that could be spent on personal or professional success in favor of parenting investment. Our third hypothesis posits that professional achievement will tradeoff against parental responsibilities (H3), particularly among those with high professional rank or status.

As we explored in H3, children require time and energy of parents that could otherwise be invested in personal and professional pursuits. Those demands, however,

can be alleviated by a network of support, including spouses, families, friends, or even paid helpers such as nannies, housekeepers, and even the diaper delivery service available via Amazon Prime. To understand how spouses and other reproductive partners impact these tradeoffs, we will explore the impact of partner support on parents' professional pursuits. Our fourth hypothesis is that increased partner support will mediate the tradeoffs between professional pursuits and fertility as measured by less antagonistic relationships in the workplace (H4) for those with high levels of partner support.

We will test each of these hypotheses and hope to reveal the nature of family and professional tradeoffs that individuals make in a setting where high educational investment is the norm rather than the exception. While a number of other career environments require high levels of educational investment in order to be successful (e.g. lawyers, doctors), testing these data from an institute of higher education will give us some insight into the ways in which parents balance the competing demands of high status-seeking behavior relative to their peers who have fewer family responsibilities to balance.

4.2. Data Collection and Methods

4.2.1. Survey Design and Ethnographic Interview Collection

The data used to test these hypotheses were collected between April 2016 and July 2018. The first of these was a broad survey sent to all faculty and staff in a large

academic college at a major research University. The survey included demographic questions, measures of achieved and continued investment in professional success, perspectives on work-life balance, and the nature of individual supports for individuals who currently or previously participated in family engagement as a caretaker. As an additional component of this research, the survey incorporated a 24-hour recall technique to reveal the time constraints/investments for individuals with family responsibilities relative to their peers without dependents, and the influence of their employment role in the university environment. Participation in the study was voluntary, and all information from respondents was collected anonymously. Reponses to the survey were collected in the web-based research software Qualtrics.

To collect valuable longitudinal qualitative data that would further explore questions asked in the survey, an additional component of the study included qualitative interviews with a small subset of women respondents across employee rank (i.e. faculty vs. staff, tenured/tenure-track (T/TT) vs. non-tenure-track (non-TT)) as they made the transition from nulliparous to parous (i.e. from childless to having children). These individuals were interviewed at multiple points in time in order to track changes in attitudes and behaviors regarding family engagement and personal/professional pursuits over time. Questions sought to understand the impact of parental responsibilities across multiple levels of education and achievement, as well as the supports women and their partners employ in order to mediate the tension between fertility and professional achievement.

Data collection resulted in 104 respondents whose characteristics presented below in Table 4-1.

Table 4-1 Respondent Characteristics

Age Range	N	Female	White	PhD	T/TT Faculty	Non-TT Faculty	Staff	Married/ Dom Partner
20-39	24	21	20	9	5	4	15	18
40-59	29	17	26	21	19	5	5	25
60-79	22	4	20	18	18	0	4	20
Not Reported	29	17	23	17	14	3	12	23

4.2.2. Construction of Variables and Data Analysis

The statistical models that were estimated include binomial logistic regression and ordinary least squares regression. As applicable, the control variables included gender, education, professional rank, sex, age, and partner support.

Due to the relatively small population in this study, and the large proportion of respondents with a doctorate (63 % of the total sample, representing 45% of women and 84% of men), the variable for education was simplified to those who have a doctorate degree, and those with less than a doctorate degree.

To explore the impact of job rank and achievement, as well as the impact of high professional status on family outcomes, participants were divided among three separate categories: those who hold T/TT faculty positions, those who hold non-TT faculty positions (e.g. lecturers, clinical faculty), and those who are in staff roles. This split is 53%, 12%, and 35%, respectively.

Parental responsibilities used to predict personal and professional success in H3 required some measure of varying parental responsibility. Each respondent was coded in one of three categories: those with any dependent children who are less than 10 years of age, those with dependent children who are all 10 years of age or greater, and those without dependent children (which includes those who have non-resident children).

A measure of parents' work-life conflict was necessary for H4, which would reflect parents' perceptions of the toll parenthood takes on their professional career. A composite score was developed using two questions in the survey. Parents were asked whether they believed that, as parents, they had to work harder to attain professional success (e.g. fulfillment, wealth, job security, and job autonomy) than they would had they not had children, and furthermore, whether they believe they have been just as successful in their professional pursuits as they would had they not had children. Each response was on a continuous 10-point scale, for a possible 20 points. The higher the value, the higher the perception of work-life conflict. This model also included two variables that reflect the amount of partner support available to the working parent that might mediate the impact of work-life conflict. The first of these is a measure of whether the respondent reports a stay-at-home spouse. Because this variable is likely

dynamic rather than static over the course of time (e.g. parents move in and out of employment as life demands), a second variable was included. The second is a self-reported variable indicating whether the respondent's partner or spouse made "personal or professional sacrifices to preserve work-life balance" in the family.

4.3. Results

To test hypothesis one, a binomial logistic regression model was estimated using educational attainment to predict whether individuals would report having fewer children than planned. Table 4-2 presents the results for all analyses described below. The full model included gender and age as control variables. However, due to the non-significant effect of age on the explanatory power of the model, and due to the large number of respondents who did not report age (thereby reducing the sample size and degrees of freedom considerably), age was left out of the reduced model. Results suggest that a doctoral level education affects fertility in the expected direction (β=1.04, N=78, P=0.063). The overall model is significant at p=.033, but the percentage explained variance is relatively low (R^2=0.09).

To test hypothesis two, a second binomial logistic regression model was estimated using professional rank to predict whether individuals would report having fewer children than planned. The full model included gender and age as control variables. However, as above, due to the non-significant effect of age on the model and the high number of respondents who did not report age, age was removed from the reduced model. The effect is in the predicted direction, but non-significant (β=0.57 for

T/TT vs Staff, and T/TT vs Non-TT, N=78, P=.260). The overall model is also non-significant (R^2=.04, P=.335).

To test hypothesis three, we investigated the impact of dependent age on the amount of time individuals spend on professional pursuits. We estimated an ordinary least squares regression model using dependent age to predict hours spent in professional attainment activities, while controlling for professional rank, gender and age. The full model was not significant (R^2=.21, P=.121), nor was our categorical variable representing dependent age. However, the professional rank variable was significantly associated with time spent in professional pursuits. Specifically, those in T/TT positions spend larger amounts of time on professional pursuits than those in either non-tenure-track faculty or staff roles, controlling for dependent age, age, and gender (β=1.64, N=48, P=.041).

Figure 4-1 provides a visual representation of mean daily professional pursuits across each of our three professional rank categories by dependent age. Interestingly, the mean time in professional pursuit across all ranks is nearly identical for those with dependents age <10, implying that perhaps young children diminish the influence of professional rank on professional investments, shifting the work-life balance strategies that parents generally employ. It is worth noting that we lost a great deal of power in our model by controlling for age, as 29 individuals in our sample failed to report their age. In addition, these data were collected for one 24-hour time period per respondent. Data collection would be improved considerably by using a longitudinal survey that captured

several points in time (e.g. weekends, weekdays, and various academic terms) across a broader sample in order to have stronger inferential ability.

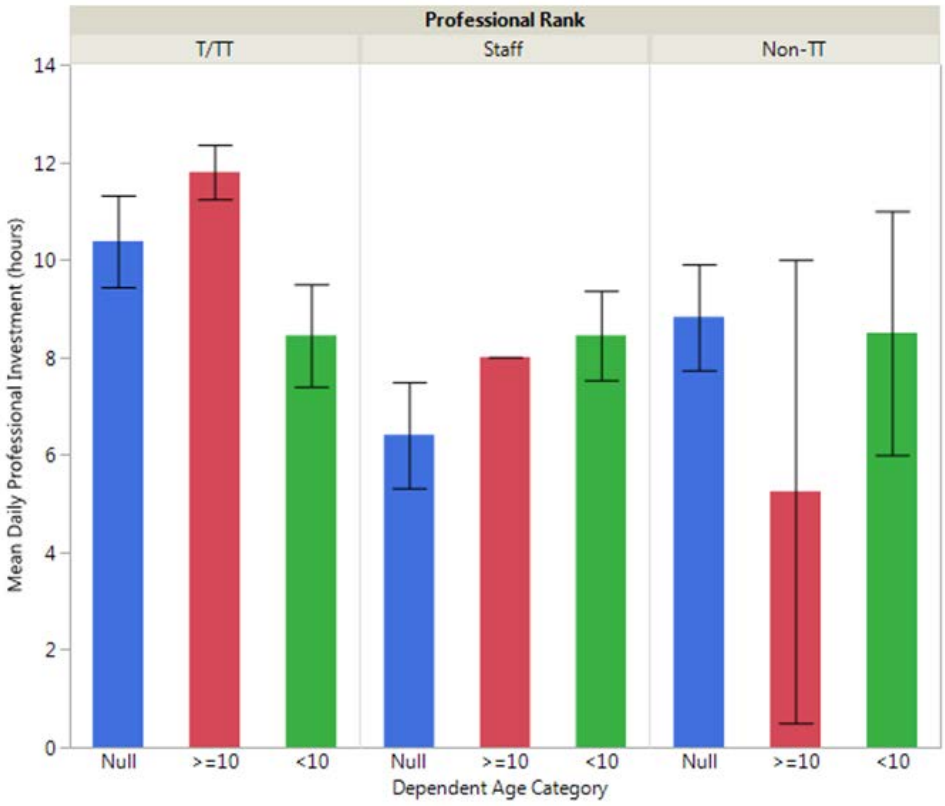

Figure 4-1 Mean Professional Investment by Professional Rank and Dependent Age

Figure 4-2 gives us a small window into the ways that childcare trades off against other activities, or put another way, how parents might reallocate time from other activities in order to care for children. For comparison, Figure 4-2 includes only those with the highest anticipated family commitments (those with dependents below the age of 10), and those with the lowest anticipated family commitments (those with no

dependents at present). Additionally, the figure includes only T/TT faculty and staff, as the total non-TT population represents only 13 people in the sample. For individuals with young dependents, sleep, relaxation and leisure time are reduced relative to those with no dependents across every professional rank category. Among T/TT individuals, time invested in professional pursuits is higher for those without dependents and those with older children relative to those with young children; among staff, the opposite is true.

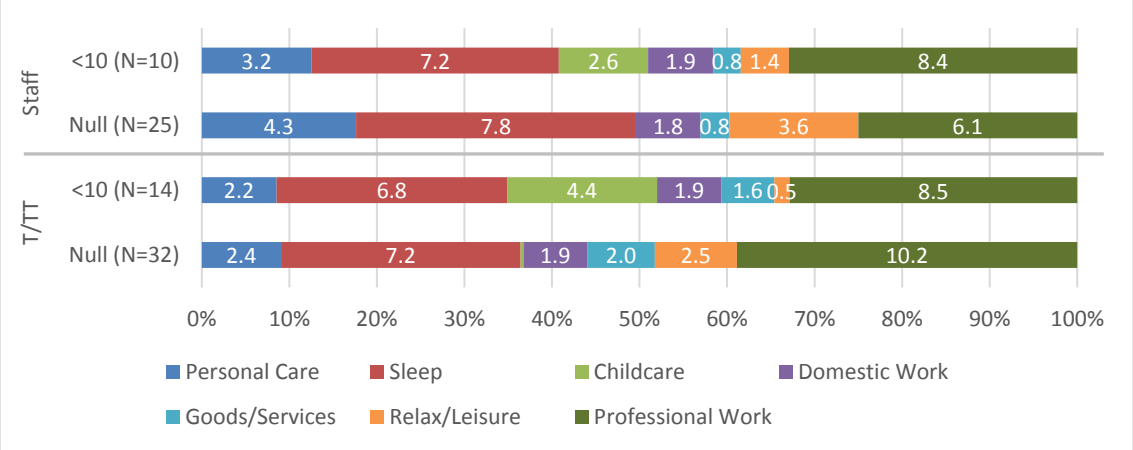

Figure 4-2 Mean Daily Time Allocation by Professional Rank and Dependent Age

Reasons that professional pursuits actually increase among staff with young children (as well as non-TT faculty, not represented in Figure 4-2) may be that respondents in these job ranks have 1) lower salaries relative to T/TT faculty, demanding greater investment in professional pursuits to support childcare costs, 2) less schedule flexibility, demanding lengthy childcare commitments that result in greater professional

investments in order to support childcare costs, or 3) those with older children are in a different stage of life and therefore financially stable such that they can decrease professional investments in favor of other activities.

To test hypothesis four, we estimated an ordinary least squares regression model to investigate the impact of partner support on parent perceptions of work-life conflict, controlling for sex and professional rank. Two variables were included to represent a range of partner support, specifically whether a partner or spouse stayed home to care for activities in the home, as well as a variable that indicated whether respondents felt that the partner made "personal or professional sacrifices to preserve work-life balance" in the family. Findings show that neither partner support nor perceptions of partner sacrifice play a significant role in parental work life conflict among individuals in this sample. Instead, sex eclipsed the statistical impact of either form of partner support on conflict. In short, the most predictive factor in parent perceptions of work-life conflict is whether one is a man or a woman. Across a twenty-point scale, women show a nearly 2.5-point increase over their male counterparts, indicating that women feel that they must work harder and risk greater loss of professional success when becoming parents than do men ($p=.001$). The overall model is highly significant ($p<.001$, $R^{2=}.29$).

Table 4-2 Results

	Fwr Children than Planned (H1, N=78, **P=.033**)		Fwr Children than Planned (H2, N=78, P=.335)		Profession. Pursuits (H3, N=48, P=.121)		Parent WL Conflict (H4, N=70, **P<.001**)	
	β	S.E.	B	S.E.	β	S.E.	B	S.E.
Age	-	-	-	-	0.05	0.06	-	-
(Continuous)								
	-		-		P=.470		-	
Dependent Age	-	-	-	-	-	-	-	-
(Baseline: <10)	-		-		-		-	
	-	-	-	-	0.05	1.00	-	-
(>=10)	-		-		P=.957		-	
	-	-	-	-	0.59	.75	-	-
(Null, or No Depend.)	-		-		P=.433		-	
Education	1.04	0.56	-	-	-	-	-	-
(PhD=1)	P=.063		-		-		-	
Gender	-0.07	0.33	-0.20	0.35	-0.42	0.63	2.57	0.73
(Female=1)	P=.830		P=.567		P=.514		**P<.001**	
Perceived Partner	-	-	-	-	-	-	0.60	0.58
Sacrifice *(Y=1)*	-		-		-		P=.307	
Partner Stay Home	-	-	-	-	-	-	-0.79	0.70
(Y=1)	-		-		-		P=.265	
Professional Rank	-	-	-	-	-	-	-	-
(Baseline: Staff)	-		-		-		-	
	-	-	0.57	0.51	-1.39	0.94	0.37	0.87
(Non-TT Faculty)	-		P=.260		P=.146		P=.677	
	-	-	-0.13	0.79	1.64	0.78	0.65	1.29
(T/TT Faculty)	-		P=.865		**P=.041**		P=.616	
Model R^2	.09		.04		.21		.29	

4.4. Discussion/Conclusion

Our findings from this research provide insight into the often-adversarial relationship between education, professional investment, and fertility. We investigated the impact of education and professional pursuit on ultimate fertility outcomes and learned that high educational attainment is a moderate predictor of having fewer children than planned, but only with marginal significance. Professional achievement, on the other hand, is a non-significant predictor of having fewer children than planned. Further investigations should engage a larger sample across a broader disciplinary group.
We investigated the impact of dependent age and professional rank on professional pursuits and found that T/TT faculty spend significantly more time on professional pursuits than do staff or non-tenure-track faculty, but dependent age does not have consistent effects across different professional rank groups. Our descriptive statistics suggest that young children decrease the amount of time that T/TT faculty spend on professional pursuits, while the opposite is true for other ranks. In fact, mean time spent on professional pursuits for those with young children (<10 years of age) was roughly equivalent across all three rank categories. This may imply that those with lower rank positions actually increase professional investments when children are young in order to support high costs of childcare given the lower amount of flexibility in non-TT positions in the academy. One participant in the study addressed this point during the qualitative interviews, noting, “There’s more of a drive now because I have this little person to take care of.”

We analyzed time allocation to see how parents redirect time allocation to accommodate childcare and found that relaxation and leisure time is reduced among those with dependents relative to those without. One participant in the study described the impact of children on time allocation saying, “You'll sacrifice something. I chose sleep.” Among staff and T/TT faculty, sleep is diminished for those with dependent care responsibilities. Interestingly, the presence of young dependents appears to reduce professional pursuits among T/TT faculty, while increasing professional pursuits among other ranks.

Finally, we predicted that partner support during parenting would decrease parents’ perceptions of work-life conflict. While neither variable capturing partner support was found to be a significant predictor of perceived conflict, sex is a highly significant predictor of perceived parent work-life conflict. Mothers feel the tension between work and family to a greater degree than fathers, possibly due to the social and cultural expectations societies place on mothers to be fully present in the home and in the workplace. One woman in the study shared that her employer gave conflicting signals regarding her choice to be a mother. She was encouraged to bring her newborn to a faculty meeting, and then later learned that the same colleagues who encouraged her to bring the child made remarks about people treating the office as a daycare. She felt “supported, but guilt-tripped”, sensing that others seemed to pay closer attention to her work activities following the birth of her child. This despite the fact that many of her nights at home were spent working late after putting her child to bed. When asked how to be successful as a mother and faculty member, she replied, “Do I think I’ll have to

work harder, no, but I do think I'm going to have to work smarter." Only 5% of women in the study have a partner who stays at home full time (N=3), while 45% of men report a partner who stays at home full time (N=20). The presence of traditional family roles among the study population may contribute to this sex-related bias.

Despite these revelations, the sample sizes for subpopulations within this study are quite small in some cases, making it difficult to generalize findings across larger populations. In addition, the time allocation portion of this study utilized 24-hour recall and may reflect lack of perfect recounting of events. For example, parents may have a harder time recalling time investments due to the inconsistent nature of time allocation in a home with young children. Often children demand sporadic care amid other pursuits, where multi-tasking creates challenges for time allocation estimates, particularly upon recalling events the following day. Future investigations should expand this study to a broader sample across discipline areas in order to be more generalizable across the academy. Future time allocation studies, rather than capturing a single day in time, should capture multiple days in a row with a more nuanced time tracking mechanism without being overly invasive. This technology improvement would permit researchers to understand how multiple tasks are often performed simultaneously, revealing how parents and non-parents each juggle activities throughout the day.

Despite these constraints and areas of potential improvement, this study sheds important light on the mechanisms of low fertility in high educational contexts. Among them, women engaged in high professional investment roles are deeply aware of the unique social and professional demands placed on mothers. Mothers and fathers both

make tradeoffs in order to care for children, generally diminishing their own self-care in the form of sleep and leisure or relaxation time. T/TT individuals decrease their professional investments during the early stages of parenting, yet increase these activities as children age, even beyond levels of those with no dependents. Among individuals not in T/TT roles, professional investments actually increase during early years of parenting, perhaps in order to support the costs of childcare and to improve their own status to keep pace with the costs of children. Parents in this study are quietly strengthening the labor market even while parents are paying social and professional penalties for perceived inability to juggle career and family. Future research should seek to replicate these results and understand what motivates parents of dependent children to invest more heavily in work as they transition to parenthood and as children age.

5. CONCLUSION

5.1. Discussion and Explanation of Results

5.1.1. Overview

The three preceding sections sought to understand one broad question: what catalyzes and sustains fertility reduction cross-culturally? In Section 1 we described several aspects of this question that remain uncertain. Specifically, how and why does a pattern of reduced reproduction begin among pre-transitional societies? How does exposure to reproduction and childrearing at an early age act upon fertility ideation? How does high professional investment in the form of education and employment tradeoff against fertility?

Each section explored the reproductive tradeoffs and opportunity costs experienced by individuals in three unique environmental and cultural contexts. We examined men and women in a preindustrial, indigenous population where early stages of a fertility transition are underway, a group of women in the United States where decreases in fertility have caused women to report little experience with pregnancy, birth and childrearing early in their lives, and men and women in an institution of higher education where high educational and professional investment is pervasive.

Throughout these three sections we have explored several aspects of an individual's experience on later reproductive behavior. The first study investigated the impact of female agency, access to education, and wage labor on fertility desires and

outcomes. In the second study, we sought to understand how early experience with infants and childrearing impacts later fertility motivations, desires and outcomes. In the third study, we attempted to reveal the mechanisms of fertility reduction among those with high educational and professional investments by analyzing time allocation, reproductive outcomes, and perceptions of conflict. These studies unpack the motivations and pressures individuals face as they engage in family formation, each of which is highly dependent on environmental and cultural contexts.

5.1.2. Section Two Reflections

Among the Mayangna and Miskito, we found that despite increasing exposure to industrialization and pervasive access to contraception, individuals in these communities continue to translate additional resources and agency into higher fertility desires than their peers with less access to wage labor and less female agency. This is consistent with our expectations of a traditional natural fertility population, but was surprising given that there is a fertility transition underway. A limitation of the study is our inability to capture complex economic factors such as total household income, ease of access to material markets, and employment stability over time. Each of these are important drivers of the perceived cost of children, and yet each metric is dynamic in these developing communities, constantly changing as modernization begins to permeate even the most remote communities in the Reserve.

Despite a continued cultural preference for high fertility, age has a reducing effect on fertility desires - strong evidence that the communities are in the early stages of

a demographic transition. Additionally, and consistent with previous research, education leads to lower fertility desires in these communities. Interviews revealed that the primary drivers motivating fertility reduction are economic and/or pertaining to quality of life, though education also has a strong statistical impact. Interestingly, in Section 3, education also held strong statistical significance in fertility reduction. However, participants in neither of these studies named education as a major influential factor in reproductive decision-making. The friction between traditional subsistence living and growing access to material markets in the Bosawás creates strain on parents, exacerbated by the opportunity costs of educational attainment. Mothers and fathers must secure material goods for children in an increasingly expensive environment without the stability of widespread industrialization.

The story of fertility reduction among the Mayangna and Miskito is one of moral and social tension in a rapidly changing environment. These communities are at a demographic crossroads, recalibrating reproductive ideals and behaviors as natural fertility is replaced with reproductive choice. Women translate female agency and access to wage labor into higher family size desires, and yet this desire for a large family is untenable for many in these communities. Some influential factors cited by parents include the physical stress of raising many children in often harsh environmental circumstances, the high degree of poverty among these communities, and the social pressure to maintain a higher standard of living for offspring.

Pervasive access to contraception delivered by nurses preaching the gospel of low fertility in the Bosawás creates further tension for men and women making

reproductive decisions. Trent MacNamara (2018) writes of contraceptive adoption in the United States, "Few domains of human experience escaped the attention of citizen-moralists pondering reproductive ethics. Money, time, divinity, nature, health, self-fulfillment – these topics and many others continually bubbled to the surface. Boundaries between them were indistinct…For all that, a definite core of ideas concerning economic self-interest, spiritual alignment with divinity or nature, and self-placement in cosmic and historical time underpinned Americans' gradual justification of ever-greater family limitation." In this same vein, family limitation in these communities is that of ideological discord. Growing access to material markets paired with increasing opportunity costs of education and employment have raised the perceived costs of children. These perceptions have generated growing concern for parents and community members about the moral and ethical obligation borne by parents. Interviews revealed a growing sense that families should bear only those children whom they can afford. Meanwhile, personal circumstance, ideological conviction, and moral responsibility serve as guideposts for individual actors as decisions are made about desired family size.

5.1.3. Section Three Reflections

Among women in the United States, the nature of fertility reduction remains somewhat elusive, with individual women achieving fertility rates that seem more consistent with normative trends than with individual preferences. This study has revealed the power of social and cultural momentum in normalizing low fertility, as well

as the impact of opportunity costs in our increasingly competitive environment. We sought to understand how women respond to early and sustained experience with infants and children as they develop their own fertility ideals, controlling for the known effects of sibship size and other predictive influences such as educational attainment and professional pursuits. We found that these women show several predictive signs of higher lifetime fertility including emotional preparedness, higher family size desires, and earlier age at first birth. Yet their outcomes suggest little difference from their peers who have had little in the way of early experience. While desires do not always change, life circumstances can place pressure on parents to limit fertility. Mothers describe the financial burden of children, the limited capacity parents feel to juggle education and career with parenting, the concerns of childbearing into advanced maternal age, as well as health or other physical concerns for parents and existing children that demand exclusivity from high fertility.

Women in this study describe a lack of obligation to realize their own family size goals when life takes unexpected turns, and even less attention to cultural ideals that favor high fertility. As an example, one woman wrote, “we put off having children until our careers were stable, our age now has impacted our desire for a third child (i.e., we feel a bit too old to do it one more time). We had always wanted two or three children so are content with our decision, but if we were younger, I think we'd have three. We waited to begin however, until we were extremely comfortable with our careers.” Another says, “I put off having another child because I had my first so young, now I'm pursuing further education (PhD) and don't want to have a child in the middle of it. Now

I am 27 and am looking to have another child in the next year or two. I don't want to have kids after 30 thus this next will be my last instead of having three." Women in these environments have vague goals for family formation, but they permit themselves the freedom to deviate from these plans as circumstances demand without the enormity of cultural expectation looming over them. This kind of pre-determined, yet laissez-faire approach to reproductive outcomes may be unique to post-industrial, low-fertility societies who have previously undergone demographic transition. This degree of premeditated action is largely lacking among the Mayangna and Miskito from Section 2, as is the social and emotional freedom to have only a few children. While the Mayangna and Miskito often stumble haphazardly into fertility outcomes, there remains social value and personal fulfillment associated with high fertility. For example, when asked whether one respondent believed he would be a good parent before starting his family, he replied, "People who live here do not think of that. We don't worry about it. We are only looking for a relationship…. Our economy is very poor, but being able to have children, we are rich." Social and cultural value placed on children looks quite different in the United States. Our respondents' comments speak to a degree of complacency about reproductive outcomes, ultimately giving way to the social norm favoring low fertility.

5.1.4. Section Four Reflections

Our study of fertility behavior within the academy reveals the conflict between high status-seeking behavior and high fertility. In Section 3 among women in western

contexts, we found discrepancies between early family size desires and ultimate fertility outcomes, implying that women's early fertility goals are impacted during the life course. Here we sought to understand if and how status-seeking in western contexts leads to lower-than-desired fertility. In exploring the impact of education and professional rank on fertility outcomes, we found that education helps predict whether individuals will have fewer children than planned, but professional rank does not have the same predictive power in our relatively small population. Parents invest considerable time and resources into high levels of education, exacerbated by the fact that academic career paths for individuals with a doctorate demand considerable early and sustained professional investment. This investment is often at the expense of personal pursuits such as family. Parents push family formation into later years, creating age-related risks to fertility, and increasing the potential for individuals to recalibrate family desires toward a smaller ideal. We see these sentiments among women in the study who give voice to the tension that exists between professional outcomes and family goals. One woman responded, "My career is very important to me and I did not see a time when I would not need to work about 6-6.5 days a week to keep up. Thus, I decided that as much as I wanted a child, that if I were to have one it would be for selfish reasons and I could not do that to a kid." Another said, "I work about 60 hours a week...that is definitely a barrier to having children. I am concerned that I will not have time, or not be able to take time, for pregnancy and the younger years of my child."

Though professional rank was not significant in predicting lower-than-desired fertility, our study showed that professional rank is a significant predictor of time spent

in professional pursuits. While this is not a surprising finding, it is notable that professional rank becomes irrelevant in predicting time spent on professional pursuits for parents with children below the age of ten. Among those in our study with young children, those in tenured or tenure-track status and those in other employment ranks spend roughly the same amount of time in professional status-seeking activities. This may be the result of the freedom and flexibility afforded to individuals in high-status positions. Perhaps higher status permits greater flexibility in the early days of parenting, whereas those in other job ranks have less economic or professional freedom, causing them to invest more heavily in professional success to support the high costs of childcare.

Our study also revealed that as parents attempt to balance personal and professional pursuits, perceptions of work-life conflict is primarily predicted by sex. Our study attempted to show the impact of partner or allomaternal support on parental conflict. We found that partner support is far less impactful than whether one is a mother or a father. Fathers in this study were insulated from parent/employee conflict in ways that mothers were not. Across our conflict scale, mothers report, on average, 12% greater perceived conflict than fathers. This is not surprising given the breadth of literature describing the parenting penalty that mothers pay in the workplace. To find strong evidence of this impact even among women who are excelling at the highest levels of their profession (e.g. teaching, research, and service at a major research institution) tells us that educational institutions still have much work to do in leveling the playing field for women in the academy. Parenting conflict disproportionately impacts

mothers, further deepening their motivation to limit fertility, and creating barriers to professional achievement for those seeking to pursue both personal and professional goals. These themes were evident in our qualitative responses. As an example, one woman noted, “My spouse makes more personal sacrifices than I do, so that I can have more time for my professional duties. This balance is challenging for us both, since my spouse needs to feel valued as a professional as well.”

5.1.5. What it all Means

The unifying question of all three studies is the same: what catalyzes and sustains low fertility cross-culturally? Our review of existing literature in Section 1 emphasized the value of the Embodied Capital theory which looks to the shifting equilibrium of investments that individuals make between themselves and their offspring as environments shift. We have explored two unique and dynamic environments: one currently undergoing the fertility reduction stage of demographic transition, and another where a demographic transition has already taken place, the total fertility rate having already dropped below replacement. If we assume that behavior is even moderately rational, fertility data alone would suggest that the optimal investment in children is quite different between these disparate environments. We analyzed data to reveal how and why these differences exist, and we learned something about the nature of individual decision-making and cultural recalibration that begins during fertility transition. We have revealed some of the many ways in which fertility reductions are sustained through

cultural practice, individual choice, and as a result of information surpluses and deficits in an environment.

Women in one near-natural fertility population in Nicaragua still translate additional resources into higher fertility desires, even as a fertility transition is underway. Qualitative evidence suggests that fertility reduction among the Mayangna and Miskito is impacted by changing social perceptions about the ethics of raising children in a resource-scarce environment. Material goods are regularly cited as limiting factors for large families. Clothing was a frequent focal point for parents describing the unsustainable costs of raising a large family. This is not surprising, as material goods soon become status signals for parents and children looking to raise successful children. In addition to the early manifestations of industrialization in the Bosawás that are changing the material costs of raising children, nurses working remotely in the Reserve have brought a prescriptive approach for potential parents, providing contraceptive technology and suggesting that men and women should curb the trend of high fertility. We have learned that even without experiencing full-scale industrialization, individuals with access to limited material goods, pervasive access to contraceptive technology, and dogmatic fertility limitation ideals from outside influences can prompt men and women to consider their obligation to children (and occasionally to society) such that their desire for high fertility outcomes are overshadowed by personal and social responsibility. This is compounded by the diminishing impact of education on fertility. Here, fertility reduction has no single catalyst, but instead a collection of changing social and environmental pressures that favor fewer children.

While many analyses in these studies have emphasized behaviors and fertility ideals of women, men were also included in our analyses where appropriate. Embodied Capital theory acknowledges that both parents will make tradeoffs and decisions based on their unique resource landscape and support systems. The results reported in Section 4 show us that even in high achievement contexts such as higher education where 46% of women in the study have reached the highest level of educational attainment and 34% are in T/TT faculty roles, women still shoulder higher degrees of work-life conflict than their male peers. Sample characteristics tell us that only 5% of women in the study have a high degree of partner support whereas that number is a full 45% of men. One woman described this disparity saying, "With both my husband and I working full time I knew that I would not have the same support as do my male colleagues whose wives chose to stay home and raise their children. In my department when I first arrived none of my male colleagues had wives that worked outside the home. That has changed a bit over the years, but not much." These traditional gender dynamics exacerbate the stress of parenting on both sexes, and this trend will continue to grow as gender equity in the workplace continues to rise in cultures around the world.

Our literature survey in Section 1 described the importance of social and cultural information transmission in developing fertility ideals among individual actors. We sought to understand how one's source of information impacts fertility, the relationship that the transmitter has with the individual actor, as well as the impact of a lack of information transmission. Section 3, our study of women in the United States, revealed the power of early experience in shaping fertility desires. Women with greater

experience with infants and young children inside and outside of their homes desire more children, even controlling for sibship size. In addition to the pronatal messages that are more likely to be transmitted from kin and other role models, these young women are given the practical and emotional tools to engage in parenting, translating into higher fertility desires. Though greater experience leads to higher fertility desires, those desires are derailed prior to becoming reality, even despite the existence of earlier age at first birth. And thus, we have evidence of the derailing impact of life circumstances and the professional tradeoffs confronting women in post-industrial contexts. Though fertility reduction has already begun, lingering desires for high fertility are quieted in the face of low-fertility norms and the tradeoffs that continue to confront both sexes as they balance professional pursuits with reproductive ideals. We also tested the impact of this early experience in the Bosawás, but found that there is not sufficient variation among our respondents; the vast majority of individuals in pre-industrial, near-natural fertility populations have early and sustained experience with young children within the nuclear family home and among extended kin.

To explain this phenomenon, we can make some suppositions about what may be taking place among young families as they make fertility decisions, often recalibrated after each consecutive birth. In the first, imagine that powerful social and cultural forces are at work, creating a normative fertility range in which couples feel at least some pressure to remain. High fertility in low fertility contexts may be subject to negative social stigma that reduces fertility desires for those under the social microscope. This is not unlike the social stigma against low fertility in a high fertility context, creating

pressure for individuals to maintain moderate to high fertility. In the second, we imagine how tradeoffs to reproduction become powerful motivators to adjust plans as individuals are confronted with other opportunities (and their associated opportunity costs) in the professional realm. In Section 4, we looked to an institution of higher education and found that high educational attainment leads women and men to a greater likelihood of lower-than-desired fertility outcomes. While professional rank does not have a significant effect on the lower-than-desired fertility, it remains a strong predictor of time spent in professional pursuits in our models which has implications for time available to invest in personal pursuits.

In Section 1, we also described the impact of labor types and labor specialization on the time that parents spend caring for children. In pre-industrial populations parents may have the ability to care for children while engaged in wage labor, even obtaining help from children for age-appropriate tasks. As labor becomes more specialized, or where labor requires higher concentration, parents may not be able to perform their jobs easily while also caring for children. Additionally, job flexibility between rank varies considerably, preventing some individuals from balancing wage labor with parenthood, while permitting others the freedom to tend to both personal and professional pursuits as their needs demand. Employers may require strict time commitments (e.g. 8-5, night shift), location-specific duties (e.g. work performed in a specific location rather than from home), or rigid tasks that are mutually exclusive of parenting (e.g. customer service representatives, cashiers). Many of these requirements prevent parents from working and caring for children simultaneously.

This attention to flexibility is of value in interpreting some of our study findings regarding professional rank. Within the T/TT faculty ranks in our Section 4 study, individuals may be confined to a classroom for specified blocks of time during the week, but may otherwise have the flexibility to work from home, to complete job responsibilities during atypical hours, to work remotely as they teach online courses or conduct research, or even to delay scholarship activities (e.g. publications, presentations, grant writing) in order to care for children during formative years and then reinvigorate their scholarship as children become more independent. Some T/TT faculty may even choose to delay their tenure clock in order to secure their ability to care for their family following the birth of a child. These employment arrangements may permit T/TT faculty the freedom to juggle childcare and professional pursuits more effectively, where other roles demand constant and committed time investment in order to succeed. Indeed, in Section 4 we found that time spent in professional pursuits is impacted differently for T/TT faculty relative to staff and non-TT faculty. T/TT faculty with young dependents decrease their time spent in professional pursuits where staff and non-TT increase their professional investments when young dependents are present.

5.1.6. Future Research

The research reported in this dissertation sought to understand what catalyzes and sustains fertility reduction cross-culturally. Findings from these studies have shed light on many aspects of fertility reduction while stimulating more questions in their place. The Mayangna and Miskito are in the crosshairs of modernity, participating more fully

in trade, consumerism, and technology as they are able. Respondents repeatedly described the growing costs of material goods as deterrents to high fertility, further amplifying the strain of subsistence-based living on the swell of opportunities for trade and commerce that surround them. Given this tension and the prevalence of birth control in these communities, philosophical questions are bubbling to the surface. These are questions of moral ambiguity, weighing the prudence of raising children in poverty with existing social and cultural norms favoring high fertility. What does individual responsibility look like in this shifting parental ecosystem?

Future investigations should explore movement toward this social consciousness favoring reproductive discretion. How does ideation about fertility reduction begin, and when it begins, how do individuals transmit these questions and values to others in the community? Is this a function of the changing material economy, beginning when access to markets permit material goods to influence social status? Qualitative interviews would allow us to unearth the complexity of these changes over time.

Another area of future investigation relates to the stability of fertility desires over one's lifetime. Some studies cited in Section 1 suggest that desire remains relatively stable over time, but our findings in Section 3 do not support this argument. If early experience creates higher family size desires (even to the point that it results in earlier age at first birth) but these desires are disrupted over time, what constrains lifetime fertility? Given the continued downward trajectory of fertility in Western contexts, this area continues to demand further investigation. Longitudinal interviews would permit

researchers to track reproductive ideation over time, revealing why women recalibrate and reduce fertility desires to match cultural norms rather than individual desires.

Lastly, the educational context study presented in Section 4 has significant promise to reveal the nature of the tradeoffs that men and women make between professional pursuits and family formation. Our sample size is too small to effectively analyze subpopulations within the study, and our time allocation methodology would benefit from continual data collection over multiple points in time rather than a retrospective 24-hour recall. Future research should engage faculty across a range of disciplines over multiple days in order to smooth out any bias that results from a single 24-hour period. Future investigation should also seek to understand the unique conflicts that arise among women in academia to understand if these are institutional problems, individual circumstances, or a combination of both.

It is no coincidence that we still have much to learn about fertility reduction, even despite the gains that we have made in understanding reproductive choice cross-culturally. Few decisions in our experience rival the impact of bearing children. Beyond the physical, emotional and financial impacts of children, offspring become our link to immortality, passing on traces of values and our genes into future generations. To say that reproductive decisions are complex does not do justice to the intricacies of individual choice regarding family formation, and to the dynamic nature of these choices across different environments and different times. We should continue our search, even when answers are not easy to find.

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APPENDIX A

SECTION 2 INTERVIEW QUESTIONS (SPANISH VERSION)

1. ¿Cuántos hijos tiene?
2. ¿Cuántos hijos quieres tener?
3. ¿Por qué no quieres tener más hijos de ___? (follow up to #2)
4. ¿Se habla con su pareja acerca de planificación familiar?
5. ¿Se comunica con su pareja y comparten la idea sobre cuantos hijos quiere tener?
6. ¿Cuándo tuviste tu primer hijo, pensaste que tu ibas ser un buen padre?
7. ¿Por qué? (follow up to #6)
8. ¿Para usted, cuantos hijos es lo ideal para una familia?
9. ¿Cuándo eres joven, como cuidabas a tus hermanos o primos más pequeños?

   ¿Diario, por tiempo, o nunca?
10. ¿Sabes sobre métodos de planificación familiar?
11. ¿Cuáles métodos? (follow up to #10)
12. ¿Ustedes han usado los métodos de planificación familiar?
13. ¿Usted usando lo ahora? (follow up to #12)
14. ¿Cual grado has completado?
15. ¿Hace trabajo por sueldo?

APPENDIX B

SECTION 2 INTERVIEW QUESTIONS (ENGLISH VERSION)

1. How many children do you have?
2. How many children do you want to have?
3. Why don't you want to have more children than _____? (follow up to #2)
4. Do you talk to your partner about family planning?
5. Do you communicate with your partner and share the idea of how many children you want to have?
6. When you had your first child, did you think you were going to be a good father?
7. Why? (Follow up to #6)
8. For you, how many children is ideal for a family?
9. When you were young, did you take care of your younger siblings or cousins? Daily, sometimes or never?
10. Do you know about family planning methods?
11. What methods? (Follow up to #10)
12. Have you used family planning methods?
13. Are you using it now? (Follow up to #12)
14. Which grade have you completed?
15. Do you do work for wages?

APPENDIX C

SECTION 3 SURVEY QUESTIONS

Start of Block: Age Block

How old are you?

O 17 years of age or younger (1)

O 18 years of age or older - please specify: (2) _____

6. Skip To: End of Survey If How old are you? = 17 years of age or younger

End of Block: Age Block

Start of Block: Block 13

Start of Block: Ethnic ID Block

Ethnic Identification (check all that apply):

- ☐ African American/Black (1)
- ☐ Native American or Alaskan Native (2)
- ☐ Asian (3)
- ☐ Latina/o or Hispanic (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ White (6)
- ☐ Middle Eastern/Arab (7)
- ☐ Not listed - please specify: (8) _____
- ☐ I prefer not to respond (9)

End of Block: Ethnic ID Block

Start of Block: Marital Status Block

Current Marital Status:

- O Married (1)
- O Single (2)
- O Divorced (3)
- O Widowed (4)
- O Domestic partnership (5)
- O I prefer not to respond (6)

End of Block: Marital Status Block

Start of Block: Education Block

<u>Highest</u> level of education completed

- O Some high school (1)
- O High school graduation or GED (2)
- O Some college (3)
- O Associates degree (4)
- O Baccalaureate degree (5)
- O Some graduate school (6)
- O Master's degree (7)
- O Doctoral degree (8)

End of Block: Education Block

Start of Block: Household Income Block

Approximate Annual Household Income (<u>report in thousands of US dollars</u>):

_____ ,000.00 (1)

Please specify the total number of individuals other than a spouse or parent who are currently your dependents, or who have been (for a duration of at least 6 months) in the past:

_____ Biological children (1)
_____ Legally adopted children (3)
_____ Stepchildren (8)
_____ Related kin (4)
_____ Unrelated individuals (7)

End of Block: Household Income Block

Start of Block: Spiritual Block

What religion or spiritual belief, if any, do you identify with (check all that apply):

- [ ] Agnostic (1)
- [ ] Atheist (2)
- [ ] Buddhist (3)
- [ ] Christian - Catholic (4)
- [ ] Christian - Protestant (5)
- [ ] Hindu (6)
- [ ] Jewish (7)
- [ ] Muslim (8)
- [ ] None (9)
- [ ] Not listed - please specify: (10) _____
- [ ] I prefer not to respond (11)

End of Block: Spiritual Block

Start of Block: Childbearing Desires and History

The following questions will inquire about your childbearing timing and history.

Please provide information on the following aspects of your lifetime pregnancy and birth history:

_____ Total number of pregnancies you've experienced (including miscarried or terminated pregnancies) (1)

_____ Total number of voluntarily terminated pregnancies (2)

_____ Total number of births (3)

_____ Your age when you first gave birth (4)

_____ Your age when you last gave birth (5)

Please indicate if and how the following factors influenced the timing of your <u>FIRST</u> pregnancy and birth activity (please check all that apply):

	Sped Up Ideal Pregnancy and Birth Activities (1)	No Influence (2)	Delayed Ideal Pregnancy and Birth Activities (3)
Fertility Issues (1)	☐	☐	☐
Effectiveness of Contraception (2)	☐	☐	☐
Maternal Age (3)	☐	☐	☐
Partner's Desired Family Size (4)	☐	☐	☐
Religious Beliefs (5)	☐	☐	☐

Employment (6)	☐	☐	☐
Financial Stability (7)	☐	☐	☐
Relationship Stability (8)	☐	☐	☐
Educational Pursuits (9)	☐	☐	☐
Childcare Options (10)	☐	☐	☐
Personal Support Network (11)	☐	☐	☐
Age of Other Dependents (12)	☐	☐	☐
Health Insurance (13)	☐	☐	☐
Pressure from Family (14)	☐	☐	☐
Pressure from Non-Family (15)	☐	☐	☐
Familiarity with Parenthood (16)	☐	☐	☐

Please indicate if and how the following factors influenced the timing of your <u>SECOND and SUBSEQUENT</u> pregnancy and birth activities, as applicable (please check all that apply, even if a single factor had opposing influences on separate pregnancies):

	Sped Up Ideal Pregnancy and Birth Activities (1)	No Influence (2)	Delayed Ideal Pregnancy and Birth Activities (3)
Fertility Issues (1)	☐	☐	☐
Effectiveness of Contraception (2)	☐	☐	☐
Maternal Age (3)	☐	☐	☐
Partner's Desired Family Size (4)	☐	☐	☐
Religious Beliefs (5)	☐	☐	☐
Employment (6)	☐	☐	☐
Financial Stability (7)	☐	☐	☐
Relationship Stability (8)	☐	☐	☐
Educational Pursuits (9)	☐	☐	☐

Childcare Options (10)	☐	☐	☐
Personal Support Network (11)	☐	☐	☐
Age of Other Dependents (12)	☐	☐	☐
Health Insurance (13)	☐	☐	☐
Pressure from Family (14)	☐	☐	☐
Pressure from Non-Family (15)	☐	☐	☐
Familiarity with Parenthood (16)	☐	☐	☐

End of Block: Childbearing Desires and History

Start of Block: Block 11

The following questions will inquire about your family size.

BEFORE YOU STARTED YOUR FAMILY, how many total children did you want to have during your lifetime?
Number of Children (1)

▼ 0 (1) ... 12 or more (13)

NOW THAT YOU'VE BEGUN YOUR FAMILY, have certain factors or experiences influenced or changed the number of children you want?

- O Yes (1)
- O No (2)
- O Undecided (3)

7. Skip To: Q68 If NOW THAT YOU'VE BEGUN YOUR FAMILY, have certain factors or experiences influenced or changed the... = No

Now that you have begun your family, how many total children do you want to have during your lifetime?
Number of Children (1)

▼ 1 (1) ... 12 or more (12)

Which of the following factors or experiences influenced the number of children you want?

	Caused me to want MORE children (1)	No Influence (2)	Caused me to want FEWER children (3)
Pregnancy Experience(s) (1)	☐	☐	☐
Birth Experience(s) (2)	☐	☐	☐
Parenting Experience(s) (3)	☐	☐	☐

Fertility Issue(s) (4)	☐	☐	☐
Effectiveness of Contraception (5)	☐	☐	☐
Maternal Age (6)	☐	☐	☐
Partner's Desired Family Size (7)	☐	☐	☐
Personal Desire for Children of a Certain Gender (20)	☐	☐	☐
Partner's Desire for Children of a Certain Gender (22)	☐	☐	☐
Religious Beliefs (8)	☐	☐	☐
Employment (9)	☐	☐	☐
Financial Stability (10)	☐	☐	☐
Relationship Stability (11)	☐	☐	☐
Educational Pursuits (12)	☐	☐	☐

Childcare Options (13)	☐	☐	☐
Personal Support Network (14)	☐	☐	☐
Age of Other Dependents (15)	☐	☐	☐
Health Insurance (16)	☐	☐	☐
Pressure from Family (17)	☐	☐	☐
Pressure from Non-Family (18)	☐	☐	☐
Familiarity with Parenthood (19)	☐	☐	☐

Do you expect to be able to have the number of children that you want?

- O Yes (1)
- O No (2)
- O Undecided (3)

Display This Question:

If Do you expect to be able to have the number of children that you want? = No

Which of the following factors or experiences will affect your ability to have the number of children that you want?

	Will increase my family size (1)	No Influence (2)	Will decrease my family size (3)
Pregnancy Experience(s) (1)	O	O	O
Birth Experience(s) (2)	O	O	O
Parenting Experience(s) (3)	O	O	O
Fertility Issue(s) (4)	O	O	O
Effectiveness of Contraception (5)	O	O	O
Maternal Age (6)	O	O	O
Partner's Desired Family Size (7)	O	O	O
Personal Desire for Children of a Certain Gender (8)	O	O	O
Partner's Desire for Children of a Certain Gender (9)	O	O	O
Religious Beliefs (10)	O	O	O
Employment (11)	O	O	O
Financial Stability (12)	O	O	O

Relationship Stability (13)	O	O	O
Educational Pursuits (14)	O	O	O
Childcare Options (15)	O	O	O
Personal Support Network (16)	O	O	O
Age of Other Dependents (17)	O	O	O
Health Insurance (18)	O	O	O
Pressure from Family (19)	O	O	O
Pressure from Non-Family (20)	O	O	O
Familiarity with Parenthood (21)	O	O	O

Please feel free to further explain how your family size desires and expectations have changed over time.

_____

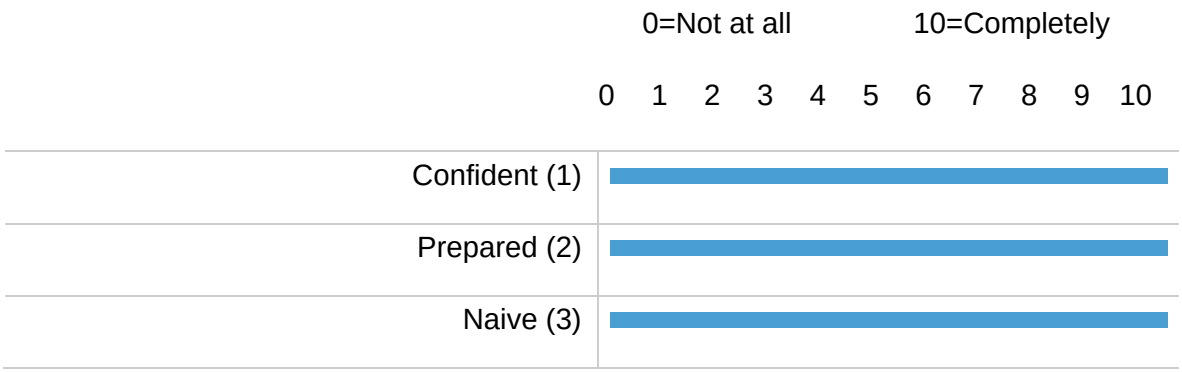
_____

End of Block: Block 11

Start of Block: Preparedness Block

The following questions will inquire about your confidence and your level of preparedness prior to becoming a mother.

Please think back on the time prior to having your first child. Knowing what you know now, how would rate your confidence, preparedness, and naivety about what was required to care for small infants and children? Click on the range below to provide your feedback.



Prior to your first childbirth, did you attend childbirth preparation class(es)?

O Yes (1)

O No (2)

8. Skip To: Q26 If Prior to your first childbirth, did you attend childbirth preparation class(es)? = Yes

Why did you decide not to attend childbirth classes (please check all that apply)?

- [ ] Financial considerations (1)
- [ ] Already confidant about birth process (2)
- [ ] Other time constraints (3)
- [ ] Other - please specify: (4) _____

Regarding infant and/or childcare for your FIRSTBORN, how often did you use the following sources for advice and information?

	Often (1)	Occasionally (2)	Seldom (3)	Never (4)
Personal Experience (1)	O	O	O	O
Parent(s) (2)	O	O	O	O
Family Member(s) (Not Parent) (3)	O	O	O	O
Friend(s) (4)	O	O	O	O
Resource Website(s) (5)	O	O	O	O
Parenting Reference Book(s) (6)	O	O	O	O
Parenting Blog(s) (7)	O	O	O	O

Parenting Support Group(s) (8)	O	O	O	O
Pediatrician(s) (9)	O	O	O	O

During the first year of your FIRSTBORN's life, estimate the number of times you took your child to the doctor and you were instructed to wait to see if the condition worsened before requiring treatment.
Number of times (1)

▼ 0 (1) ... 20 or more (21)

For your SECOND and SUBSEQUENT children, as applicable, did this occur more or less than for your firstborn?

O More (1)

O Less (2)

O No Difference (3)

During the first year of your FIRSTBORN's life, how often did you feel helpless or clueless about child-rearing?

- O Often (1)
- O Occasionally (2)
- O Seldom (3)
- O Never (4)

During the first year of your SECOND or SUBSEQUENT children's' lives, as applicable, how often did you feel helpless or clueless about child-rearing?

- O Often (1)
- O Occasionally (2)
- O Seldom (3)
- O Never (4)

Please feel free to further explain how your parenting skills and confidence changed, if at all, during your second and subsequent parenting experiences.

_____

_____

End of Block: Preparedness Block

Start of Block: Child Exposure Block

The following questions will inquire about your exposure to young children prior to your pregnancy and birth activities.

How many total siblings did you have growing up?

_____

Did you have younger siblings or other younger children living in your household growing up?

- O Yes (1)
- O No (2)

9. Skip To: Q24 If Did you have younger siblings or other younger children living in your household growing up? = No

How many younger siblings or other younger children did you have living in your household growing up?

- O 1 (1)
- O 2 (2)
- O 3 (3)
- O 4 (4)
- O 5 (5)
- O 6 (6)
- O 7 (7)
- O 8 (8)
- O 9 (9)
- O 10 (10)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 10

Please specify the difference in age between you and each of the 10 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)
_____ Age difference (years) between you and child #5 (5)
_____ Age difference (years) between you and child #6 (6)
_____ Age difference (years) between you and child #7 (7)
_____ Age difference (years) between you and child #8 (8)
_____ Age difference (years) between you and child #9 (9)
_____ Age difference (years) between you and child #10 (10)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 9

Please specify the difference in age between you and each of the 9 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)
_____ Age difference (years) between you and child #5 (5)
_____ Age difference (years) between you and child #6 (6)
_____ Age difference (years) between you and child #7 (7)
_____ Age difference (years) between you and child #8 (8)
_____ Age difference (years) between you and child #9 (9)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 8

Please specify the difference in age between you and each of the 8 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)
_____ Age difference (years) between you and child #5 (5)
_____ Age difference (years) between you and child #6 (6)
_____ Age difference (years) between you and child #7 (7)
_____ Age difference (years) between you and child #8 (8)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 7

Please specify the difference in age between you and each of the 7 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)
_____ Age difference (years) between you and child #5 (5)
_____ Age difference (years) between you and child #6 (6)
_____ Age difference (years) between you and child #7 (7)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 6

Please specify the difference in age between you and each of the 6 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)
_____ Age difference (years) between you and child #5 (5)
_____ Age difference (years) between you and child #6 (6)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 5

Please specify the difference in age between you and each of the 5 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)
_____ Age difference (years) between you and child #5 (5)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 4

Please specify the difference in age between you and each of the 4 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)
_____ Age difference (years) between you and child #4 (4)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 3

Please specify the difference in age between you and each of the 3 other young children:

_____ Age difference (years) between you and child #1 (1)
_____ Age difference (years) between you and child #2 (2)
_____ Age difference (years) between you and child #3 (3)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 2

Please specify the difference in age between you and each of the 2 other young children:

_____ Age difference (years) between you and child #1 (1)

_____ Age difference (years) between you and child #2 (2)

Display This Question:

If How many younger siblings or other younger children did you have living in your household growing... = 1

Please specify the difference in age between you and the other young child:

_____ Age difference (years) between you and the other child (1)

Were you ever asked to help care for your younger sibling(s) or other child(ren) in the following ways?

	Often (1)	Occasionally (2)	Seldom (3)	Never (4)
Feeding / Nutritional Care (1)	O	O	O	O
Bathing / Diapering (2)	O	O	O	O
Entertaining / Teaching (3)	O	O	O	O
Administration of First Aid (4)	O	O	O	O

Did you ever work in the following childcare activities either voluntarily or for money prior to starting your own family?

	Often (1)	Occasionally (2)	Seldom (3)	Never (4)
Nursery, Preschool, or Daycare	O	O	O	O

Programs (1)				
Public or Private School Programs (K-6) (3)	O	O	O	O
Babysitting Services (2)	O	O	O	O
Pediatric or Prenatal Healthcare (4)	O	O	O	O
Labor and Delivery Healthcare (5)	O	O	O	O
Other (Please Specify): (6)	O	O	O	O

End of Block: Child Exposure Block

Start of Block: Caretaker Influences Block

The following questions will inquire about influential individuals in your life.

Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged directly in parenting?)

- O Shared equal time with mother and father (3)
- O Primarily mother (even if father was present) (1)
- O Primarily father (even if mother was present) (2)
- O Grandparent(s) or Other Relatives - please specify: (5) _____
- O Unrelated Caretaker(s) - please specify: (6) _____

10. Skip To: Q63 If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged... = Primarily father (even if mother was present)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily father (even if mother was present)

Please identify your primary <u>female</u> caretaker's year of birth (estimates are acceptable).
Year of Birth (1)

▼ 1925 (1) ... 1990 (66)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily father (even if mother was present)

How many biological children does your primary <u>female</u> caretaker have?
Number of Biological Children (1)

▼ 0 (1) ... 12 or more (13)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily father (even if mother was present)

How many step or adoptive children does your primary <u>female</u> caretaker have?
Number of Step or Adoptive Children (1)

▼ 0 (1) ... 12 or more (13)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily father (even if mother was present)

How old was your primary <u>female</u> caretaker when she had her first child? Approximate age is acceptable.
Age When First Child Born (1)

▼ 13 (1) ... 70 (58)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily father (even if mother was present)

How old was your primary <u>female</u> caretaker when she had her last child? Approximate age is acceptable.
Age When Last Child Born (1)

▼ 13 (1) ... 70 (58)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily mother (even if father was present)

Please identify your primary <u>male</u> caretaker's year of birth (estimates are acceptable).
Year of Birth (1)

▼ 1925 (1) ... 1990 (66)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily mother (even if father was present)

How many biological children does your primary <u>male</u> caretaker have?
Number of Biological Children (1)

▼ 0 (1) ... 12 or more (13)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily mother (even if father was present)

How many step or adoptive children does your primary <u>male</u> caretaker have?
Number of Step or Adoptive Children (1)

▼ 0 (1) ... 12 or more (13)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily mother (even if father was present)

How old was your primary <u>male</u> caretaker when he had his first child? Approximate age is acceptable.
Age When First Child Born (1)

▼ 13 (1) ... 70 (58)

Display This Question:

If Growing up, who was (were) your primary caretaker(s)? (i.e. who spent the most time with you engaged...! = Primarily mother (even if father was present)

How old was your primary <u>male</u> caretaker when he had his last child? Approximate age is acceptable.
Age When Last Child Born (1)

▼ 13 (1) ... 70 (58)

End of Block: Caretaker Influences Block

APPENDIX D

SECTION 4 SURVEY QUESTIONS

Start of Block: Employment

Which title best approximates your current job title?

- O Non-tenure-track faculty
- O Tenure-track assistant professor
- O Tenured associate professor
- O Tenured professor
- O Staff

Display This Question:

If Which title best approximates your current job title? = Staff

How are you paid?

- O Hourly (bi-weekly)
- O Salary (monthly)

Is your position considered part-time, or full-time?

- O Part-time
- O Full-time

How many years have you worked:

O At the University?

_____

O In the College?

_____

O In your current position?

_____

Please indicate your level of agreement with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I would be happy to spend the rest of my career with the University	O	O	O	O	O
I feel a strong sense of belonging to the University	O	O	O	O	O
I have recently spent time looking for another job	O	O	O	O	O

End of Block: Employment

Start of Block: Demographic Characteristics

What is your age?

_____

Highest level of education:

- O Doctoral degree (e.g. Ph.D., M.D.)
- O Master's degree (e.g. M.S., M.A.)
- O Some graduate work
- O College degree
- O Some college education
- O High school diploma/GED

United States citizenship status:

- O U.S. citizen
- O Permanent resident
- O Not a U.S. citizen or permanent resident
- O I'm not comfortable responding

Racial/Ethnic Identification (check all that apply):

- [ ] African American/Black
- [ ] Native American or Alaskan Native
- [ ] Asian
- [ ] Latino/o or Hispanic
- [ ] Native Hawaiian or Pacific Islander
- [ ] White
- [ ] Middle Eastern/Arab
- [ ] Not listed, please specify: _____
- [ ] I prefer not to respond

Sex:

- O Male
- O Female
- O Intersex
- O Transgender
- O Not listed, please specify: _____
- O I prefer not to respond

Sexual Orientation:

- O Heterosexual
- O Bisexual
- O Asexual
- O Homosexual, lesbian or gay
- O Questioning
- O Not listed, please specify: _____
- O I prefer not to respond

Religious or Spiritual Affiliation (check all that apply):

- [ ] Agnostic
- [ ] Atheist
- [ ] Catholic
- [ ] Hindu
- [ ] Islamic
- [ ] Jewish
- [ ] Protestant
- [ ] None
- [ ] Not listed, please specify: _____
- [ ] I prefer not to respond

Display This Question:

If Religious or Spiritual Affiliation (check all that apply): = Protestant

With which Protestant denomination(s) are you affiliated?

_____

End of Block: Demographic Characteristics

Start of Block: Relationship

Current Marriage Status:

- O Married
- O Married, separated
- O Not married, living alone
- O Not married, living with a partner
- O Divorced
- O Widowed

If you are married or in a long-term relationship, does your spouse/partner work outside the home?

- O Yes, full-time
- O Yes, part-time
- O No
- O Not applicable - I'm not married or in a long-term relationship

End of Block: Relationship

Start of Block: Parenting

Have you had any biological children, or permanently taken other children into your care (e.g. adoption)?

O Yes

O No

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = No

Was this by choice, or for other reasons?

O I chose not to have children or adopt children

O I plan to have children or adopt children in the future

O I wanted to have children or adopt children, but was not able to do so

---

Display This Question:

If Was this by choice, or for other reasons? = I chose not to have children or adopt children

Or Was this by choice, or for other reasons? = I plan to have children or adopt children in the future

Did your educational or professional pursuits influence your choice to either avoid or delay childbirth or adoption?

O No

O Unsure

O Yes, please explain:

_____

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

How many, if any, biological children have been born to you?

_____

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

How many, if any, non-biological children have you adopted, or otherwise taken into your care?

_____

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

Please report the number and age of children to whom you currently provide care:

O Total number of children

_____

O Ages of children (separate with a comma)

_____

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

If you are (or were) married or in a long-term relationship while raising children, how have you and your spouse/partner shared responsibility for childcare and child rearing?

- O I am completely responsible for parenting
- O I am mostly responsible for parenting
- O We are equally responsible for parenting
- O My spouse/partner is mostly responsible for parenting
- O My spouse/partner is completely responsible for parenting
- O Not applicable - I'm not (or was not) married or in a long-term relationship while raising children

---

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

Do you want to have more children?

- O Yes
- O No

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

Do you have more children than you originally planned?

- O Yes
- O No

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

And Do you have more children than you originally planned? = No

Do you have fewer children than you originally planned?

O Yes

O No

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

As a working parent, do you believe that you've had to work harder (including professional and family responsibilities) to attain professional success (e.g. fulfillment, wealth, job security, job autonomy) than you would have, had you not had children?

	I HAVE NOT had to work harder									I HAVE had to work harder
	0	1	2	3	4	5	6	7	8	9	10
I believe that:											

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

As a working parent, do you believe that you've been just as successful as you would have, had you not had children?

	I HAVE NOT been just as successful									I HAVE been just as successful
	0	1	2	3	4	5	6	7	8	9	10

I believe that:	

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = No

If you were to have a child in the next year, do you believe that you'd have to work harder (including professional and family responsibilities) to attain professional success (e.g. fulfillment, wealth, job security, job autonomy) than you would have, had you not had children?

I WOULD NOT have to work harder if I had a child — I WOULD have to work harder if I had a child

0 1 2 3 4 5 6 7 8 9 10

I believe that:	

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = No

If you were to have a child in the next year, do you believe that you could be just as successful as you would have, had you not had children?

I COULD NOT be just as successful if I had a child — I COULD be just as successful if I had a child

0 1 2 3 4 5 6 7 8 9 10

I believe that:	

What personal and professional trade-offs did you (do you) consider when determining whether or not to have children?

_____

_____

Display This Question:

If you are (or were) married or in a long-term relationship while raising children, how have you...! = Not applicable - I'm not (or was not) married or in a long-term relationship while raising children

And Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

If you had (have) a partner/spouse while raising children, did (does) your partner/spouse make personal or professional sacrifices to preserve work-life balance in your family?

O No

O Yes, please explain:

_____

Do you currently care for other adults or elders who you consider dependents?

O No

O Yes, please explain:

_____

End of Block: Parenting

Start of Block: Leave and Support

Display This Question:

If Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

Were any of your children born or adopted during the time that you've worked at the University?

O Yes

O No

Display This Question:

If Were any of your children born or adopted during the time that you've worked at the University? = Yes

Did you take paid or unpaid maternity/paternity leave from the University?

☐ Yes, paid (includes vacation or sick leave)

☐ Yes, unpaid (includes any time off without pay)

☐ No

Display This Question:

If Did you take paid or unpaid maternity/paternity leave from the University? = Yes, paid (includes vacation or sick leave)

Or Did you take paid or unpaid maternity/paternity leave from the University? = Yes, unpaid (includes any time off without pay)

For how many weeks were you on maternity/paternity leave from the University? (separate distinct periods of leave with a comma)

_____

Display This Question:

If Did you take paid or unpaid maternity/paternity leave from the University? = Yes, paid (includes vacation or sick leave)

Or Did you take paid or unpaid maternity/paternity leave from the University? = Yes, unpaid (includes any time off without pay)

How supportive was your department about your decision to take maternity/paternity leave?

- O Very unsupportive
- O Not supportive
- O Neutral
- O Supportive
- O Very supportive
- O I don't know

Display This Question:

If Did you take paid or unpaid maternity/paternity leave from the University? = No

If you did not take maternity/paternity leave from the University, why not? (Check all that apply)

- ☐ Did not need to take leave
- ☐ Did not have vacation or sick leave available
- ☐ Could not afford to take unpaid leave
- ☐ Unaware that leave was available to me
- ☐ Other, please specify: _____

End of Block: Leave and Support

Start of Block: Tenure Clock

Display This Question:

If Which title best approximates your current job title? = Tenure-track assistant professor

Or Which title best approximates your current job title? = Tenured associate professor

Or Which title best approximates your current job title? = Tenured professor

And Have you had any biological children, or permanently taken other children into your care (e.g. ad... = Yes

If you are/were an assistant professor at the University, did you ever consider requesting to stop your tenure clock to accommodate childbirth/adoption/dependent care duties?

- O No, I never considered it
- O Yes, I considered it, but chose not to request it
- O Yes, I considered it, and made a request to stop my tenure clock
- O N/A, I was never an assistant professor at the University

---

Display This Question:

If you are/were an assistant professor at the University, did you ever consider requesting... = Yes, I considered it, and made a request to stop my tenure clock

What factors led to your decision to make a request to stop your tenure clock?

- O Childbirth
- O Adoption
- O Childcare, unrelated to birth or adoption
- O Other, please specify: _____

Display This Question:

If you are/were an assistant professor at the University, did you ever consider requesting... = Yes, I considered it, and made a request to stop my tenure clock

Was your request to stop your tenure clock successful?

- O No, my request was denied
- O Yes, my tenure clock was stopped

Display This Question:

If Was your request to stop your tenure clock successful? = Yes, my tenure clock was stopped

For how many months was your tenure clock stopped?

_____

Display This Question:

If you are/were an assistant professor at the University, did you ever consider requesting... = Yes, I considered it, but chose not to request it

Why did you choose not to make a request?

- O I feared it would be held against me
- O I didn't think I needed to stop my clock
- O I didn't think my request would be approved
- O Other, please specify:

_____

Display This Question:

If Was your request to stop your tenure clock successful? = Yes, my tenure clock was stopped

How supportive was your department about your decision to stop your tenure clock?

- O Very unsupportive
- O Not supportive
- O Neutral
- O Supportive
- O Very Supportive
- O I don't know

End of Block: Tenure Clock

Start of Block: Work Life Balance

At this point in your life, how would you rank your commitment to the following aspects of your life?
Note: Drag the options below in order, where 1 is the highest commitment, and 5 is the lowest commitment

_____ Family engagement
_____ Social engagement
_____ Professional success
_____ Personal time
_____ Health and fitness

Please indicate your level of agreement with each of the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	I Don't Know
The demands of my job do not interfere with my family activities (including childcare, elder care, time with partner, etc.)	O	O	O	O	O	O
The demands of my family activities do not interfere with my job	O	O	O	O	O	O
I am able to be just as successful as others who have fewer family commitments than me	O	O	O	O	O	O
I don’t feel the need to minimize the importance of my family in the workplace	O	O	O	O	O	O
Attending to personal needs, such as taking time off for sick children or elders, is encouraged by my supervisor(s)	O	O	O	O	O	O

My supervisor(s) gives me ample opportunity to perform both my job and my personal responsibilities well	O	O	O	O	O	O
My supervisor(s) provides equal career growth opportunities to individuals regardless of their sex or gender	O	O	O	O	O	O
My supervisor(s) provides equal employment and growth opportunities to individuals regardless of their family commitments and activities	O	O	O	O	O	O
My supervisor(s) believes that employees who are highly committed to their work can also be highly committed to their personal lives	O	O	O	O	O	O

End of Block: Work Life Balance

Start of Block: University Climate and Impacts

In what areas, if any, would you most like to see changes at the University to better facilitate work-life balance and family engagement? (Check all that apply)

- ☐ Lack of paid maternity/paternity leave
- ☐ Employer support for work-life balance
- ☐ Availability of childcare options
- ☐ Availability of lactation rooms
- ☐ Availability of leave for adult or elder care responsibilities
- ☐ Climate/perceptions regarding individuals highly invested in family activities
- ☐ Other, please specify: _____

Have any of the factors above influenced your decision not to have (more) children?

- O No
- O Yes, please explain: _____

Please use the box below to elaborate on any of your feelings regarding work-life balance and policies that support family engagement.

_____

_____

End of Block: University Climate and Impacts

Start of Block: Time Allocation

Display This Question:

If What is your age? Text Response Is Less Than or Equal to 60

Or What is your age? Text Response Is Empty

This section will ask you to provide several details about how you spent your time YESTERDAY, from the time you woke up until the time you went to bed.

Display This Question:

If What is your age? Text Response Is Less Than or Equal to 60

Or What is your age? Text Response Is Empty

What time did you wake up yesterday morning?

_____

Display This Question:

If What is your age? Text Response Is Less Than or Equal to 60

Or What is your age? Text Response Is Empty

What time did you go to bed yesterday evening?

_____

Display This Question:

If What is your age? Text Response Is Less Than or Equal to 60

Or What is your age? Text Response Is Empty

From the time that you woke up yesterday morning until noon, estimate the number of hours you spent on the following activities (including travel related to the activity)? Please don't double-count one period of time as two separate activities. Note: Round in 15-minute intervals (15 min=.25 hrs; 30 min=.5 hrs; 45 min=.75 hrs)

Personal care activities (e.g. eating, drinking, sleeping, grooming, exercise): _____

Domestic work and maintenance (e.g. food prep, cleaning, lawn care, laundry): _____

Care/help for children in your household: _____

Working and work-related activities (e.g. office work, teaching, research): _____

Acquiring goods and services (e.g. grocery shopping, banking, car repair, doctor visit): _____

Educational activities (e.g. attending class, homework, research to pursue a credential): _____

Volunteering, organizational involvement, or helping others: _____

Religious or spiritual activities: _____

Relaxing or leisure (e.g. sports, recreation, socializing, social media, entertainment): _____

Total: _____

Display This Question:

If What is your age? Text Response Is Less Than or Equal to 60

Or What is your age? Text Response Is Empty

From noon yesterday until 5 pm, estimate the number of hours you spent on the following activities (including travel related to the activity)? Please don't double-count one period of time as two separate activities. Note: Round in 15-minute intervals (15 min=.25 hrs; 30 min=.5 hrs; 45 min=.75 hrs)
Personal care activities (e.g. eating, drinking, sleeping, grooming, exercise): _____
Domestic work and maintenance (e.g. food prep, cleaning, lawn care, laundry):

_____
Care/help for children in your household: _____
Working and work-related activities (e.g. office work, teaching, research): _____
Acquiring goods and services (e.g. grocery shopping, banking, car repair, doctor visit):

_____
Educational activities (e.g. attending class, homework, research to pursue a credential):

_____
Volunteering, organizational involvement, or helping others: _____
Religious or spiritual activities: _____
Relaxing or leisure (e.g. sports, recreation, socializing, social media, entertainment):

_____
Total: _____

Display This Question:

If What is your age? Text Response Is Less Than or Equal to 60

Or What is your age? Text Response Is Empty

From 5 pm yesterday until the time that you went to bed, estimate the number of hours you spent on the following activities (including travel related to the activity)? Please don't double-count one period of time as two separate activities. Note: Round in 15-minute intervals (15 min=.25 hrs; 30 min=.5 hrs; 45 min=.75 hrs)

Personal care activities (e.g. eating, drinking, sleeping, grooming, exercise): _____

Domestic work and maintenance (e.g. food prep, cleaning, lawn care, laundry): _____

Care/help for children in your household: _____

Working and work-related activities (e.g. office work, teaching, research): _____

Acquiring goods and services (e.g. grocery shopping, banking, car repair, doctor visit): _____

Educational activities (e.g. attending class, homework, research to pursue a credential): _____

Volunteering, organizational involvement, or helping others: _____

Religious or spiritual activities: _____

Relaxing or leisure (e.g. sports, recreation, socializing, social media, entertainment): _____

Total: _____

End of Block: Time Allocation