THREE ESSAYS ON THE SOCIAL, ECONOMIC, AND DEMOGRAPHIC CAUSES AND CONSEQUENCES OF LOW FERTILITY

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ABSTRACT

THREE ESSAYS ON THE SOCIAL, ECONOMIC, AND DEMOGRAPHIC CAUSES AND CONSEQUENCES OF LOW FERTILITY

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The demographic phenomenon of "low fertility" has received considerable attention over the last three decades within academic, political, and public spheres. While a large body of research has led to a deeper understanding of the underlying social and economic dimensions of low fertility, current theoretical and empirical approaches fail to explain puzzles pertaining to within and across population heterogeneity in fertility rates. This dissertation is comprised of three papers that investigate the social, economic, and demographic causes and consequences of low fertility. Chapter 1 sets forth a new theoretical approach to examining the interrelations between low fertility, socioeconomic development, and gender equity among developed countries. The main findings of this chapter are that 1) the pace and onset of socioeconomic development explain a significant proportion of the variation in fertility among developed countries, 2) low fertility may facilitate changes in gender norms through a "gender-equity dividend", and 3) contrary to Second Demographic Transition theory, low fertility may be a transitory phase of the demographic transition. Whereas the Chapter 1 looks cross-nationally at gender and fertility dynamics, Chapter 2 takes a micro-level approach by exploring the relationship between fertility and gender norms in the United States. Using the National

Longitudinal Survey of Youth (NLSY 79), I find that both men and women with progressive views on gender equity have lower fertility than their traditional counterparts, though these results were stronger, more consistent, and more significant across models for women. In Chapter 3 I argue that the rising costs of childrearing through "shadow education" have become a key fertility-reducing force across high, medium, and low-income countries. To investigate this hypothesis, I use data from the Programme for International Student Assessment (PISA) and find evidence of a "quality-quantity tradeoff" both within and across populations due to costly shadow education. Collectively, the findings of this dissertation signal that the causes and consequences of low fertility are multifaceted and evolving across time and space.

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Preface

August, 2014.

Within just weeks of each other, during the time of this writing (August 20, 2014), two very different population projections made newspaper headlines.

The first was set forth by an assembly of social scientists commissioned by the South Korean government, which predicted the country would "go extinct" by 2750. Extrapolating demographic trends from the first decade of the 21st century, the government created a stir by predicting the peninsular country's demise. Although criticized for myopically assuming past trends will hold indefinitely, South Korea's government highlighted the demographic consequence of ultra-low fertility in the absence of in-migration—population implosion.

The second projection was featured in a UNICEF report on African population growth. According to the report, the continent will swell up to 1 billion people by 2050 and house nearly 40% of the world's children. UNICEF warns that the "pace of population growth could potentially undermine attempts to eradicate poverty and increase disparities" if the continent fails to build the immense educational and health infrastructure needed to galvanize economic development.

While the two aforementioned scenarios represent the extreme demographic consequences of low and high fertility – one of extinction and the other of overpopulation – their juxtaposition illustrates the influential role human fertility plays on the maintenance and well-being of society. In an era where the vast majority of the world's

population no longer practices natural fertility, social scientists focus on social and economic factors to understand heterogeneity in fertility levels across and within populations. In the spirit of this ever evolving research endeavor, this dissertation seeks to provide a deeper, more nuanced, and clearer understanding of the causes and consequences of fertility trends within and across populations.

Chapter 1: Demographic Transition Revisited: Low Fertility, Socioeconomic Development, and Gender Equity[1]

1.1 Introduction

The relationship between human development and fertility has recently received considerable attention, with some studies claiming that the established negative correlation between fertility and measures of human development, such as HDI, has fundamentally changed among the most advanced countries (Myrskylä et al. 2009; Harknett et al. 2014; Testa 2014; Luci-Greulich and Thévenon 2014). A limitation of this research, however, has been the relatively short-term focus, with analyses focusing on development and fertility trends beginning in the last decades of the 20th century. In this paper we argue that a more long-term perspective to this question is in order. Encompassing a broader time horizon beginning in the early 20th century, this paper combines novel empirical evidence with a wide body of social science literature to provide new theoretical insights into the interrelations among low fertility, socioeconomic development, and gender equity. Specifically, we argue that the onset and long-term pace of socioeconomic development are inherently linked with a key driver of fertility variation within developed countries: differing *gender equity regimes*. Moreover, we argue that these gender equity regimes are not static, but instead, dynamic and closely tied to changes in fertility through a demographic feedback mechanism: a *gender-equity dividend*. This gender-equity dividend is the result of the following process: below-

[1] This chapter is co-authored by Hans-Peter Kohler (University of Pennsylvania).

replacement fertility brought about by work-family conflicts yields age-structures at young adulthood that are characterized by a relative scarcity of women relative to men (given the prevailing gender-differences in the age at marriage), which in turn facilitates changes in gender norms and the rise of greater gender equity. Greater gender equity is then likely to help raise or stabilize fertility in low-fertility high-income countries. In this process, therefore, the emergence of below-replacement fertility implies a *homeostatic mechanism* that over the medium/long-term can contribute to increasing fertility, such as has been documented in some advanced countries with high levels of gender equity. We argue that this theory also helps explain the fertility pattern in countries such as S. Korea, where a rapid decline in fertility during the demographic transition has resulted in very low contemporary fertility levels associated with relatively high levels of household gender inequity. Moreover, given current age structures at young adult ages, we argue that changes in gender norms should be imminent in such contexts, contributing to a reversal of the lowest-low fertility patterns. Drawing on these insights, we propose a variant of the demographic transition that incorporates an interplay between changes in fertility and gender equity.

1.2 Background

Most country-level studies on the relationship between socioeconomic development and low fertility compare the development and fertility trajectories in high-income countries after the 2nd half of the 20th century. During this period, most high-income countries already had near or below replacement fertility. These studies therefore

ignore the process through which low fertility initially emerged during the demographic transition. We argue that an understanding of the development-fertility interrelations requires a distinction based on the pace of development during the fertility transition. In *first-wave developers*, as we will argue below, socioeconomic development occurred more gradually during much of the late 19th and 20th century; in *second-wave developers*, in contrast, socioeconomic development was concentrated in the 2nd half of the 20th century, and economic growth rates were often significantly faster than those experienced by first-wave developers. In both cases, fertility decline was associated with the development process. And yet, despite both sets of countries attaining high income and generally low fertility levels, contemporary gender norms and levels of gender equity differ between first- and second-wave developers. These differences have far-reaching implications for current and future fertility trends and family dynamics, helping to explain why fertility has stabilized at moderately below-replacement levels in some, while dropping to very low and lowest-low fertility level in other countries. We develop this reasoning in more detail below.

First-Wave Developers:

The late 19th to early 20th century was an era of profound economic, social, and demographic change for countries in Northern and Western Europe, as well as the English-speaking countries.[2] Because these countries were at the forefront of

[2] These include the other English-speaking non-European countries Australia, New Zealand, the US, and Canada.

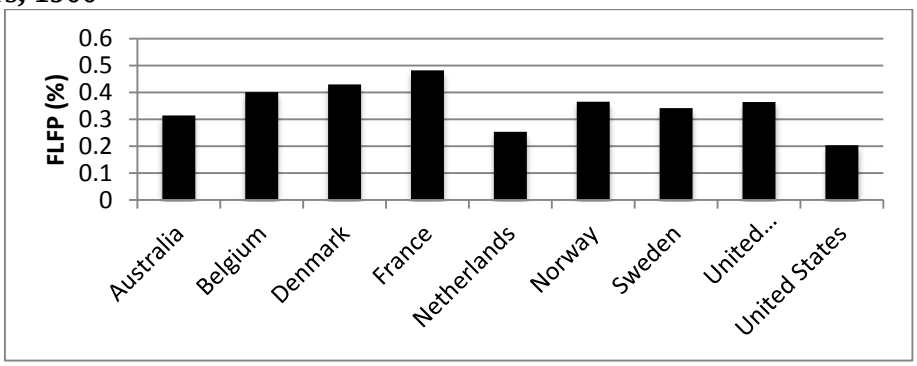
industrialization and socioeconomic development, they are referred to hereinafter as "*first-wave developers*" (see Appendix I). Economic growth spurred a rise in living standards, educational and occupational opportunities for men and women flourished, and novelties like kitchen appliances and cars became available to a growing share of the population. While material change quickly swept across industrializing countries, societies found themselves in a flux of old and new ways of thinking. Traditional norms clashed with a new wave of progressive attitudes in several social domains. Observing these "clashes", Ogburn (1922) theorized that a "maladjustment" period occurs during which individuals fail to synchronize behavior and attitudes to new material change. He called this delay between material and behavioral change a "cultural lag." Ogburn's emphasis on a cultural lag period is also reflected in the recently proposed *theory of conjunctural action* (TCA) (Johnson-Hank et al. 2011) to explain how fertility/family change arise through individual behaviors during periods of material change. In this TCA framework, for example, a cultural lag between material and behavioral change emerges because social action occurs in conjunctures, that is, short-term and contingent configurations of social structure. In such conjunctures, individuals employ familiar schemas and materials to make sense of what is happening. This framework emphasizes the importance of existing internalized schemas that act as prisms through which individuals make life decisions, such as having children. Because such schema are individually-learned and slow to change, the TCA framework argues that behavioral change is most likely to occur in contexts when schemas for different behavioral domains start to contradict each other: for example, when schemas regarding an increasing

participation of women in the labor force start conflicting with schemas about fertility, childrearing, and marriage. Because this conflict between schemas usually unfolds gradually over time, changes in schemas and the behaviors regulated by schemas, tend to follow changes in the social and institutional contexts with a cultural lag.

One area in which cultural lag was especially pronounced during the early 20th century was with respect to gender norms and women's roles within the household, the economy and society. For example, technological progress and capital accumulation in the early stages of the Industrial Revolution complemented mentally intensive tasks more than physically intensive tasks, thereby raising the return to the former relative to the latter (Galor and Weil 1996; Galor 2011). Because women arguably had a *comparative* advantage in mentally intensive tasks requiring less physical strength, the demand for women's labor increased as a result and the gender wage gap narrowed (Galor 2011). In similar vein, Goldin (1990) suggests that a greater demand for office and clerical work from information technologies propelled a surge in the demand for female labor. Moreover, the type of work women engaged in before and during the industrial revolution was transformed. Before industrialization, the economic participation of women largely occurred within a familial context (e.g., in agriculture or a family business), while during (and after) the industrial revolution, employment increasingly involved contractual agreements between employers and the individual (Ruggles 2015). The combination of women's increasing labor force participation and the growing prevalence of employer-individual labor contracts strengthened women's independence.

Occupational opportunities for women and female labor force participation clearly rose during the industrialization in first-wave developers during the early part of the 20th century. However, female labor force participation was often already widespread, ranging for example from 20% in the US to nearly 50% in France in 1900 (see Figure 1.1 below). In addition, there was a substantial extent of female economic activities on family farms and in family businesses (Ruggles 2015). Despite these relatively large levels of economic participation in the early 20th century, however, traditional male breadwinner/female housewife norms prevailed because women's work often did not significantly increase their status or bargaining power, in part because family farms and businesses were often patriarchal in nature (Goldin 1990; Ruggles 2015). As a result, a substantial stigma against working wives outside the home existed at the time, leaving women with a "clear choice between family and career" (Goldin 2004, p. 23).

Figure 1.1: Female Labor Force Participation Rates for Select First-Wave Developers, 1900[3]



Source: Olivetti (2013)

[3] For the United States, these rates undercount people working as boardinghouse keepers, unpaid family farm workers and manufacturing workers in homes and in factories (Olivetti 2013). Additionally, Olivetti calls for caution when analyzing historical FLFPR, as country-wide differences in the definition of "economically active" exist. The rates presented largely reflect the proportion of the female population (both married and unmarried) that "receives a wage".

This observation about work-family conflicts in the early 20th century is important because a strong work-family conflict—or, in McDonald's words "a conflict or inconsistency between high levels of gender equity in individual-oriented social institutions and sustained gender inequity in family-oriented social institutions" (McDonald 2000, p. 427)—contributes importantly to the rise and persistence of very low fertility in high-income countries.[4] In other words, where traditional norms regarding childrearing, household work, and male breadwinner roles prevail while institutional gender equity and female labor force participation increases, women are more likely to view having a family as being at odds with pursuing career aspirations (hence, "work-family conflict"), and fertility falls to low levels.

Figure 1.2 illustrates how differential levels of institutional gender equity and household (or "family-oriented") gender equity lead to varying degrees of the work-family conflict. The top-left quadrant echoes McDonald's theory: high levels of both institutional and household gender equity concur with higher fertility than equally high institutional but lower household gender equity in the bottom-left quadrant. Expectedly, the bottom-right quadrant indicates that low institutional gender equity is associated with a weak work-family conflict. The top-right quadrant is left blank in Figure 1.2, as both empirically and theoretically, it is unlikely that men share household tasks evenly in a society where women do not (desire to) work outside of the home. The bottom-right

[4] McDonald (2013) distinguishes between "gender equity" and "gender equality" by stating that "gender equity is about perceptions of fairness and opportunity rather than strict equality of outcome", and argues that the former is more important than the latter concerning fertility decision-making.

quadrant may provide insight into the gender dynamics during the mid-century baby boom, an aspect on which we elaborate in our concluding discussion.

Figure 1.2: Female Labor Force Participation and Household Gender Equity Relationship

Household Gender Equity	Institutional Gender Equity: High	Institutional Gender Equity: Low
High	Weak Work-Family Conflict (Near) Desired Fertility	
Low	Strong Work-Family Conflict Low Fertility	Weak Work-Family Conflict (Near) Desired Fertility

While McDonald's theory of gender equity and fertility was developed for contemporary high-income countries within the post-baby boom context, it is also applicable to the social and demographic context of the early 20th century. In particular, several recent studies have argued that one consequence of the work-family conflict during the early 20th century was sub-replacement fertility (Van Bavel 2010; Tolnay and Guest 1982).[5] But this attribution of low fertility during the first part of the 20th century to work-family conflict is not necessarily a new insight. Many social scientists of the early 20th century, including Edin (1932), Myrdal (1941), Tandler (1927), Charles (1934),

[5] Among contemporary demographers, low fertility during the early half of the 20th century in Western Europe is frequently attributed as a consequence of economic and political instability during the interbellum period (e.g., Lesthaeghe and Surkyn 1988; Sobotka 2008; Frejka and Sardon 2004). In recent years, however, this claim has been empirically refuted. Van Bavel (2010), for example, argues that low fertility during the interwar period was due to processes now associated with the Second Demographic Transition rather than economic hardships. In initial disbelief to Van Bavels findings, Goldstein (2012) modestly exclaimed that after "torturing the data", he was not able to find any effect of the great depression on fertility rates, and conceded to Van Bavel's argument.

Darwin (1919), von Ungern-Sternberg (1937), and Wieth-Knudsen (1937), all came to a similar conclusion and directly discussed the negative associations between fertility and female educational attainment/labor market participation, speculating about the causal link between the two.[6] In Sweden, a country now championed for its family friendly environment, both contemporary and current scholars have argued that very low fertility was driven partly by female laborers who found it difficult to combine childcare with a career (Van Bavel 2010; Edin 1932). In the United States and Australia, nearly half of female university graduates in the early 20th century remained childless, while the other half reached fertility levels well below replacement (Cookingham 1984; Mackinnon 1993; Goldin 2004). High incidences of childlessness among working women were also documented in England and Wales (Kelsall and Mitchell 1959) and Germany (von Ungern-Sternberg 1938). As Van Bavel and Kok (2010) observe: "for well-educated women in the early twentieth century, to become a mother often meant forfeiting a career."[7]

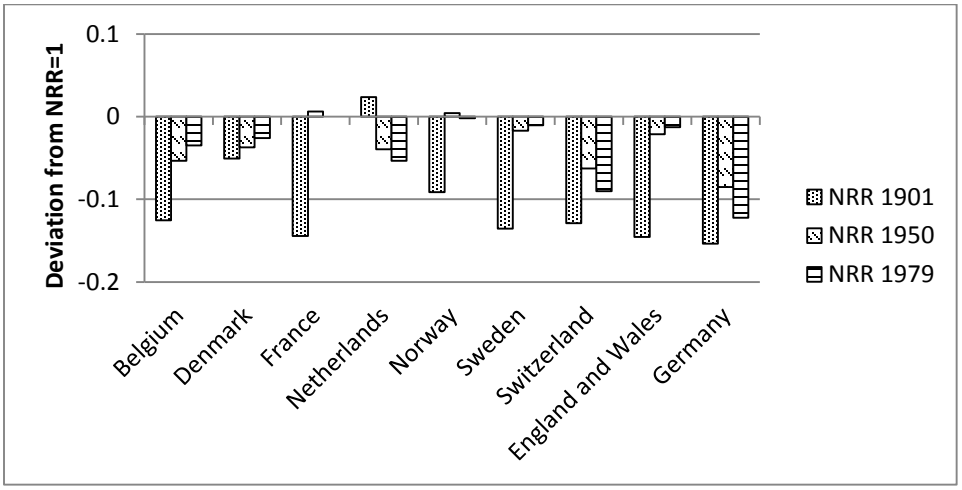
It was during this time of apparently strong family-work conflicts in the early 20th century when fertility fell substantially and population replacement levels in many first-wave developers hit their all-time lows. Figure 1.3 compares net reproduction trends for

[6] In fact, the "competition" between FLFP and fertility has dominated much of the contemporary fertility literature as well, and has been well-supported in empirical examples (e.g., Butz and Ward 1979; Engelhardt et al. 2004; Brewster and Rindfuss 2000; Kohler et al. 2006). Thus, while early scholars "speculated" about the causal relationship between FLFP and fertility, subsequent research well up into the 21st century has corroborated it with more sophisticated methodological techniques.

[7] Analyzing data from the Netherlands and United States, Hagestad and Call (2007) note that high levels of childlessness in the early 20th century served as "indications that some of these women may have been forerunners of what we consider a "modern" pattern: actively choosing childlessness and stable work engagement".

select Northern/Western European countries, and shows that *reproduction nadirs, that is, a long-term trough in fertility rates, occurred in the early 20th century*, and *that the indicator of generational reproduction, the cohort NRR, has risen, in some cases substantially, over the latter half of the 20th century.* [8]

Figure 1.3: Deviation from Cohort NRR=1 in select First-Wave Developers, 1901, 1950, and 1979 Cohorts



Source: Sardon (1991) for early 20th century cohort fertility data and Myrskylä et al. (2012) for late 20th century data[9]. Due to data constraints, Cohort NRR for Belgium and Germany in the first column represent 1906 and 1905, respectively.

While comparable cohort NRR data for the United States and Australia are not available, other indicators suggest that similarly rapid declines in fertility were taking place. For instance, period NRRs in the mid-1930s in both countries attained below the replacement rate (Van Bavel 2010), and in economically progressive areas, childlessness

[8] We compare cohort net reproduction rates rather than period NRRs because the former better reflects the actual number of children born to a birth cohort of women while the latter is a synthetic measure subject to distortive tempo effects (Bongaarts and Feeney 1998).

[9] Because cohorts born in 1979 have not yet finished their childbearing years, we use Myrskylä et al.'s (2013) recently published cohort fertility projections.

levels rose to unprecedentedly high levels (approaching 30% in the northeastern US and 25-30% in Australia) (Morgan 1991; Rowland 2007).

As the 20th century progressed, gender roles in first-wave developers became more egalitarian. Hence, while the first forty years of the early 20th century in Western/Northern Europe and the English-speaking countries were dominated by rigid gender roles and a strong work-family conflict, the latter half was characterized by a departure from these traditional gender norms, a trend towards more gender equity both within the family and in the labor market, and a greater prevalence of dual-career households.

This enormous transformation over several decades is measureable using data on the relative and absolute division of household labor. Using time-budget surveys for the UK and the US, Gershuny and Robinson (1988) for example showed that women's participation in household work declined substantially from the 1960s to 1980s, while men's participation increased (though remained much less than that of women). Their findings closely paralleled similar findings for other first-wave developers, like Canada, the Netherlands, Denmark, and Norway, indicating fairly widespread progress during this time period toward a more egalitarian division of household labor in among first-wave developers. There are some current high-income countries, such as Japan and Korea, that continue to have a less egalitarian division of household labor; but these countries are second-wave developers, and this lagging behind in gender equity is predicted by our theory. Moreover, it should be noted that these macro-level observations do not capture significant heterogeneity in gender equity change. It has been well-documented that

behavioral and attitudinal changes first emerged among the highly educated before diffusing to other educational and socioeconomic groups (Bianchi et al. 2000).

Nearly 12 years later, Bianchi et al. (2000) found the trend toward household gender equity had continued so much so that household work had nearly been cut in half for women in the US since 1965, and doubled for men during this period. An international comparison of unpaid work trends by Hook (2006) revealed similar optimistic results: over-time increases in unpaid work by men in Australia, Canada, France, Germany, the Netherlands, Norway, and the UK. Other recent studies have found similar longitudinal advances in household gender equity throughout Western countries (e.g., Sullivan and Coltrane 2008; Bianchi et al. 2007). Lastly, a comparison of OECD countries shows that by and large, Northern/Western European and English-speaking countries have the smallest gap in the number of minutes women and men perform in unpaid work, while East Asian and Southern/Eastern European countries have the largest (Miranda 2011).

Inequalities persist with regards to both the "quality" and "quantity" of household labor in "first-wave developers": women continue to bear most of the burden in the number of minutes spent on household labor, and the type of unpaid work performed by each gender varies (with men taking on more "masculine" tasks like yard work and home repair, and women more "feminine" tasks like cooking and cleaning) (Bianchi et al. 2007; England 2010; Lachance-Grzela and Bouchard 2010). Yet despite persisting inequalities, it is impressive how much these disparities have shrunk over such a short

time horizon. As Sullivan and Coltrane (2008) optimistically describe, "men and women may not be fully equal yet, but the rules of the game have been profoundly and irreversibly changed…[a]ll these trends are likely to continue for the foreseeable future."

It is worth noting that the aforementioned changes in household gender norms have contributed to shaping distinct work-family relationships across cohorts. This is particularly well documented for the United States, given the availability of detailed cohort studies, but we believe that these changes have occurred similar in other first-wave developers. Specifically, in a seminal study of the evolution of the work-family conflict over the 20th century, Goldin (2004) traces the career and family experiences of five cohorts of college-educated women in the United States. The work-family paths identified by Goldin include: "family or career" (Cohort 1, graduated 1900-1919), "job then family" (Cohort 2, graduated 1920-1945), "family then job" (Cohort 3, graduated 1946-1965), "career then family" (Cohort 4, graduated 1966-1979), and finally, "career and family" (Cohort 5, graduated 1980-1990). Goldin's concludes that "[e]ach [generation] stepped into a society and a labor market with loosened constraints and shifting barriers. The road was not only long, but it has also been winding…*only recently has a substantial group been able to grasp both [work and family] at the same time*" (Goldin 2004, p. 34; italics not in original).[10]

[10] A recent literature has started to revisit the relationship between schooling and fertility in highly developed societies, and some studies have claimed that the fertility of highly-educated women has been rising. While this is correct, there is currently no evidence that the schooling gradient in fertility has changed in fundamental ways for women. For instance, in Norway (the world's second most "prosperous" country, after Luxembourg, in terms of GDP per capita), Kravdal and Rindfuss (2008) show that more recent birth cohorts of higher educated women (born 1960-1964) have much higher fertility and lower levels of childlessness

1.3 Gender-Equity Dividend

Our discussion above highlighted that trends towards gender equity, and divergences in the pace of such trends across countries, are central to understanding contemporary fertility patterns and their cross-country variation. Yet, despite this centrality, the determinants of movements towards gender equity (or the lack thereof) continue to be somewhat poorly understood. A large body of literature stresses social, political, and economic explanations (such as the second-wave Feminist movement, structural changes in the labor market, the introduction of the pill, and the implementation of family friendly policies) as drivers of the great gender equity advances which began in the 1960s/1970s in many first-wave developers (see, for example, Esping-Andersen 2009; Bianchi et al. 2000; Bianchi et al. 2007; Sullivan and Coltrane 2008; Goldin 1990). Adding to these existing explanations, we propose a novel demographic explanation. Specifically, we believe that these changes towards gender equity during the 2nd half of the 20th century were facilitated by an age structure that fosters greater marital bargaining power for women.

In a related literature, the "demographic dividend" refers to a period during which a country's age structure provides infrastructure for economic growth (Bloom et al. 2003). According to this theory, a bulge of working age cohorts allows for high productivity while smaller older and younger cohorts minimize dependency ratios. Few

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than their older counterparts (born 1940-1955); however, higher educated women still have fewer kids than less educated Norwegian women. For other Scandinavian countries, Andersson et al. (2009) find that although fertility differentials by education in Northern Europe have begun to dissipate, highly educated women still have fewer children than their less educated counterparts.

scholars would argue that the "demographic dividend" is a primary driver of economic development. Instead, the demographic dividend refers to a favorable population age structure that can facilitate socioeconomic development by increasing savings, human capital investments and female labor force participation.

Paralleling this logic of a favorable age distribution for economic development, we argue that there also exists a population age distribution that facilitates advances in gender equity via greater spousal bargaining power as a result of changes in the "relative scarcity" of women in the marriage market. A marriage squeeze occurs when eligible females outnumber eligible males or vice-versa (Schoen 1983). While often discussed as a phenomenon in the African American community where local sex-ratios are often distorted due to high rates of incarceration and mortality among marriage-age black men, a marriage squeeze can also occur at the population level as a delayed consequence of rapid fertility declines and the resulting subsequent changes in the population age structure at young adult ages.

Theoretically, when the supply of females is greater than that of males, females experience greater competition in the marriage market amongst themselves and lose bargaining power in potential marriages (Guttentag and Secord 1983; Angrist 2002). After all, a man who wishes to marry a "traditional" or homemaker wife has better chances to do so when he has more women from which to choose. The opposite should hold true when males are in a marriage squeeze: they face greater competition in the marriage market and therefore, to succeed in the marriage market, men must be willing to

"pay a higher price" for a potential spouse (Guttentag and Secord 1983; Angrist 2002). Greater gender equity within the household is one aspect through which this "higher price" is likely to be reflected. Specifically, for women, a larger pool of men translates into more easily finding men with desirable characteristics, including men who are more supportive of equitable gender ideologies. Individuals may not make conscious decisions based on knowledge of skewed sex ratios; however, this is not important. As Guttentag and Secord explain:

> It is not a matter of directly perceiving the sex ratio. Rather, as a result of continuing experiences in encounters with the opposite sex, the average individual whose gender is in the minority occasionally has more alternatives in terms of actual or potential partners, whereas the opposite sex has fewer such alternatives. From time to time, this produces a one-up, one-down situation that leads the party whose gender is in the minority to have higher expectations for outcomes in an existing relationship and less willingness to commit oneself, while the individual of the opposite sex feels a greater dependency on the existing relationship and is willing to give more. When the sex ratio is considerably out of balance, the widespread effects increase the visibility of desirable alternatives for the scarce gender, and the injustices and exploitations undergone by the gender in oversupply become more salient." (1983:162)

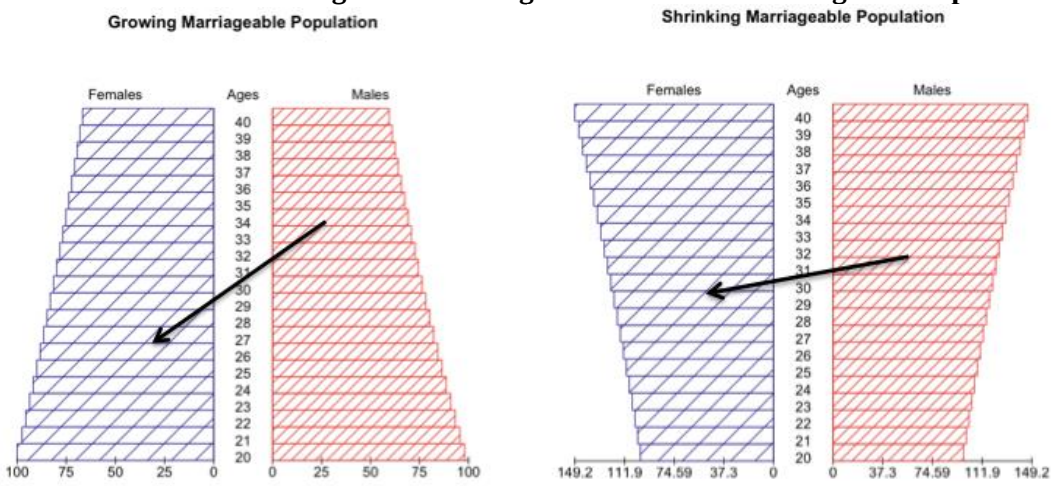
We illustrate the effects of this marriage squeeze in two scenarios:

Imagine a population closed to migration in which the NRR for time *t*-40 to *t*-20 is 1.65, yielding an annual intrinsic growth rate of 2% during this period (Figure 4a). Because men marry, on average, at older ages than women (Van Bavel 2012; Heer and Grossbard-Shechtman 1981; Angrist 2002), the age distribution in this growing marriage market in this population (ages 20-40) makes it advantageous for older men to search for younger women, as the supply of younger female cohorts is greater than that of older male cohorts.

Now imagine the reverse scenario: a population closed to migration has an annual NRR of .60 during time *t*-40 to *t*-20 and an intrinsic growth rate of -2%, rendering each

successive birth cohort smaller than the previous, like in Figure 1.4b. If women continue to marry somewhat older men, as has empirically been the case even during periods of a marriage squeeze, females in each birth cohort have a larger supply of men from which to choose.

Figure 1.4a and 1.4b: Growing and Shrinking 20-40 Year Old Marriageable Populations



We argue that the age-structure implications of the sub-replacement fertility levels (i.e., NRRs<1) experienced in the early 20th century by first-wave developers played a role in advancing gender equity at young adult ages during the mid to late half of the century. Specifically, low fertility in the early 20th century resulted in mid-20th century age structures that largely resembled scenario 2 around primary marriage and childbearing ages: cohorts of older males in the 20-40 marriage market outnumbered younger cohorts of females. These age structures coincided with a period of rising female labor force participation as well as an emergence of quantifiable changes in gender norms. In our opinion, this co-occurrence was not a coincidence. Instead, that a

gender-equity dividend has occurred as a result of the age-structure at young adult ages that implied a relative scarcity of women relative to men given the prevailing age-difference between (potential) spouses. Specifically, early 20th century periods of low fertility, brought on in part from a strong work-family conflict and low household gender equity at the time (see above), created an age structure conducive to increasing bargaining power of women and increasing household gender equity. In turn, these gains in household gender equity weakened the work-family conflict and thus contributed to a stabilization of fertility declines or even an increase in fertility in subsequent years.[11] Emphasizing this interrelationship is important, as it illustrates a homeostatic relationship of bi-directional causality between fertility and gender equity: low (household) gender equity causes persistent low fertility, and through its effect on the population age structure, with some delay, low fertility (and time) facilitates gender equity change by affecting male-female bargaining power within the household. We refer to this latter effect as the *gender-equity dividend*. But similar to the demographic dividend, the benefits of this gender-equity dividend do occur not automatically or necessarily unfold at the same pace; institutional factors, such as flexibility of labor markets, institutional restrictions to the expansion of day care, or tax disincentives for dual career couples can slow down and/or limit the unfolding of the gender-equity dividend, just as the demographic dividend can be reduced by unfavorable institutional frameworks.

[11] As part of changing gender equity, assortative mating patterns have changed, as evidenced by the widely documented pattern of increased educational homogamy.

To support the connection between age structure and gender norm changes that are postulated to occur as part of our theory, the population pyramids in Figure 1.5 illustrate the existence of the gender-equity dividend in select first-wave developers in 1955. All of these countries are characterized by a relative scarcity of women as compared to men at marriage and primary childbearing ages given the prevailing age-difference between spouses. In contrast, the population pyramids in Figure 1.6 show the age structure for select second-wave developers in that same year, none of which have an age structure that would be conducive to a gender-equity dividend. Consistent with our theory of the effect of a marriage squeeze on subsequent trends towards gender equity, the different age-patterns for first-wave developers (Figures 1.5) and second-wave developers (Figure 1.6) align with the higher levels of gender equity in the former as compared to the latter countries.

Because the mean age of marriage in first-wave developers in the mid-century was around 25 for men and 22 for women (as indicated in Table 1.1 and 1.2 below), the "gender-equity dividend" would have largely begun with marriage market imbalances between 1950-1960. Yet the increased bargaining power engendered by declining subsequent cohorts does not stop at marriage: a heightened "threat point of divorce" favorable to women presumably followed these cohorts over time. In other words, the male cohorts involved in the gender-equity dividend faced an unfavorable re-marriage market over their primary adult ages, during which decisions about fertility and childrearing are made.

Figure 1.5: Population Age Structures in Select First-Wave Developers (1955).

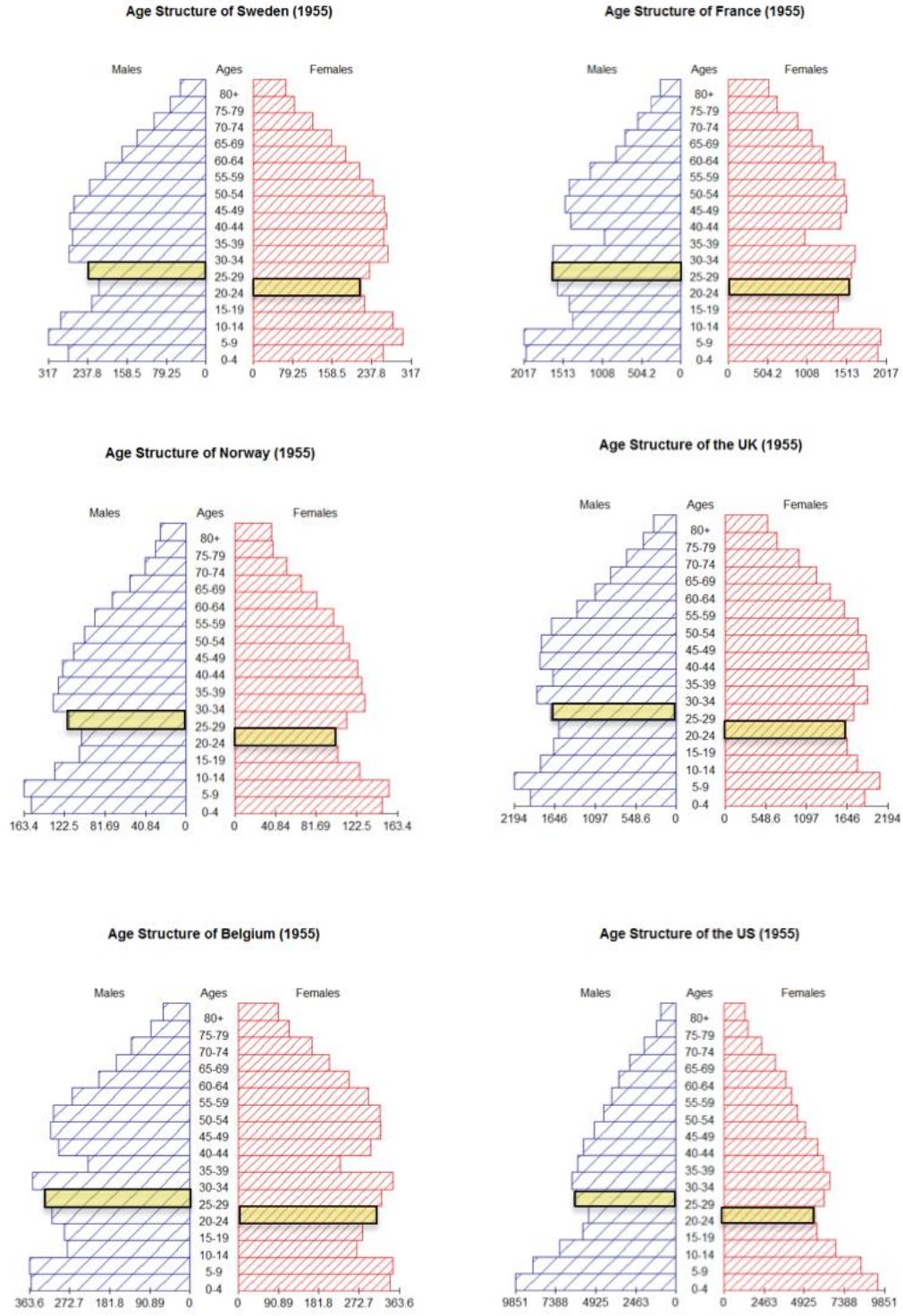
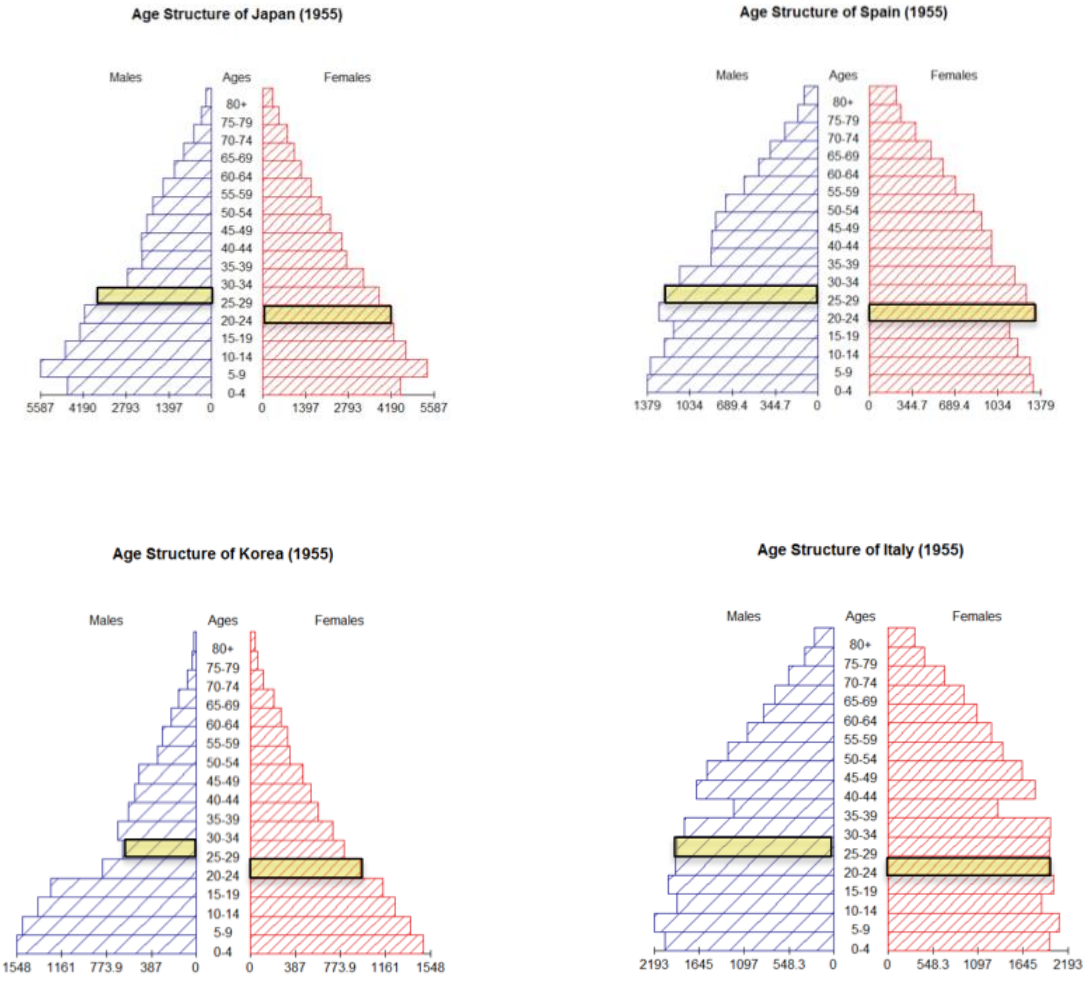


Figure 1.6: Population Age Structures in Select Second-Wave Developers (1955)



Tables 1.1 and 1.2 provide the mean age at first marriage for men and women in all the countries examined, as well as attempts to quantifiably capture the gender-equity dividend. We note that, on average, men marry women 3 years younger than them. Dividing the number of females aged 20-25 by the number of males aged 25-30 provides numeric support that older males outnumbered younger females in first-wave developers but not in second-wave developers in the mid-20th century. Theoretically, these age

structures provided the demographic infrastructure for first-wave developers to make strides in creating advances in household gender equity.

Two important points regarding the gender-equity dividend should be emphasized.

First, when stating our key assumption to the gender-equity dividend – that men marry at older ages than women – an intuitive question arises: *why don't men match with women closer to their age if they face a scarcity of younger women*? The mid-century marriage squeeze did indeed correspond to shifts in marriage timing (e.g., between 1951 and 1978, mean age at marriage for American men decreased .54 years and increased .53 for American women), though these shifts were symmetric for men and women and fairly modest in magnitude, and thus did not eliminate the marriage squeeze. This limited ability to reduce the marriage squeeze by adjusting the gender-gap in the age at marriage is likely due to the fact that cohort size composition among individuals aged 20-40 took place abruptly in the 1950s (i.e., the marriage squeeze did not sprout up gradually, but rather, quickly). Thus, when the marriage squeeze began, women of similar age to men were likely married, and men therefore had to marry downward in age. For a new equilibrium in the mean age of marriage for men and women to emerge, the marriage squeeze would necessarily need to occur over longer periods of time (and marriage squeezes in Asia as a result of distorted sex ratios may be an example for this process; see Guilmoto 2012).

And second, it is important to emphasize that the benefits of the gender-equity dividend are unlikely to be reaped in the absence of institutional, cultural, and economic factors that promote greater gender equity. These factors, including rises in female labor force participation, gender equity oriented policies, and cultural shifts in women's rights are arguably the most important catalysts to changes in gender equity attitudes/behaviors, whereas the gender-equity dividend is simply a facilitator of these changes.

Table 1.1: Ratio Males (25-30)/Females(20-25) and Mean Age at Marriage by Sex (1955) in First-Wave Developers

Country	Males 25-30 (thousands)	Females 20-25 (thousands)	Males (25-30)/Females(20-25)	Mean Age At Marriage (Males)	Mean Age At Marriage (Females)
Sweden	236	212	1.11	26.20	23.20
France	1,633	1,539	1.06	25.30	22.50
US	6,108	5,582	1.09	23.30	20.60
Belgium	328	311	1.05	24.80	22.00
Norway	117	101	1.17	25.60	22.20
UK	1,700	1,629	1.04	24.80	21.80

Notes: Due to data unavailability for 1955, mean age at marriage represents values in 1960.

Table 1.2: Ratio Males (25-30)/Females (20-25) and Mean Age At Marriage By Sex (1955) in Second-Wave Developers

Country	Males 25-30 (thousands)	Females 20-25 (thousands)	Males (25-30)/Females(20-25)	Mean Age At Marriage (Males)	Mean Age At Marriage (Females)
Spain	1,240	1,327	0.93	27.90	24.70
Italy	1,912	1,964	0.97	28.50	24.70
Japan	3,723	4,170	0.89	27.30	24.70
Korea	635	946	0.67	25.20	21.30

Notes: Due to data unavailability for 1955, mean age at marriage represents values in 1960.

There has been a fragmented discussion in the literature supporting the idea that population age structures exerted catalytic pressure on gender norms in first-wave developers. In Sweden, for example, Kabeer (2007) and Florin and Nilsson (1999) argue that sustained low fertility throughout the early 20th century and rapid economic growth led to labor shortages in the 1960s. Kabeer (2007, p. 249) asserts that the small nation of about 7.5 million had "a choice between encouraging immigration or persuading [more] women to increase their labor force participation". Gender advocates, backed by Sweden's strong labor unions, supported the latter position, prompting political parties to incorporate the ideals of gender equity in their platforms (Sandqvist 1992; Florin and Nilsson 1999; Kabeer 2007). "Getting mom a job and making dad pregnant", as put by one young parliamentarian in the 1970s, encapsulates the direction in which Swedish society wished to move (Klinth 2002). A string of policies and initiatives were to follow in order to get men and fathers more involved in family life and women more involved in the labor market (Nagy 2008; Klinth 2008).

A similar story unfolded in the United States. Decades of low immigration due to the restrictive "Johnson-Reed Act" combined with low levels of fertility from the 20s through early 1940s gave rise to a marriage squeeze for men—that is, an age structure favorable to women in the marriage market (see Figure 1.5 above). Heer and Grossbard-Shechtman (1981, p. 62) contend that "the marriage squeeze [of the 1950s and 60s] was instrumental in reducing not only the proportion of females who could marry but also the compensation which men were obliged to give women for traditional wifely and maternal duties".

1.4 Fertility and Gender Equity In Second-Wave Developers

Whereas Northern/Western European and the English-speaking countries experienced rapid industrialization in the mid-19th/early 20th century, second-wave developers constitute a group of countries that have experienced sustained large increases in living standards and development primarily from the mid-20th century onwards. Second-wave developers include countries in Southern Europe, East Asia, and to an arguable extent, Eastern Europe. While a characterization of second-wave developers based on the timing of industrialization is sufficient for our purposes, indicators such as GDP growth rates and historical human development index (HDI) figures can be used to confirm the grouping of these countries as "second-wave developers" (see Appendix I; see also, Crafts 2002, Maddison 2007, and Galor and Moav 2004).

While institutional gender equity (in labor market and educational opportunities) has increased in second-wave developers over the last half-century, often at very rapid pace, it has been widely documented that family-oriented gender equity in these second-wave developers lagged behind those in the first-wave developers (Esping-Andersen 2009). And the differences in household gender equity measures between first and second-wave developers remain substantial to date. For example, in second-wave developers like Italy, Portugal, Japan, and Korea, women perform a daily average of three to four hours more of unpaid work (i.e., household tasks) than men; in first-wave developers like Denmark, Sweden, the USA, and Belgium, this figure lies within one to

two hours (Miranda 2011).[12] Furthermore, strong family values that stress marriage, discourage cohabitation, and encourage traditional breadwinner norms persist across second-wave developers (Reher 1998; Anderson and Kohler 2013).

Differences in fertility trends between first and second-wave developers have also been salient. While cohort fertility levels in most first-wave developers remained relatively stable from 1950-1979[13], they have fallen—in many cases substantially—over the same period in second-wave developers (Myrskylä et al. 2013). Furthermore, very low period TFRs (between 1.0-1.4 children per woman) over the last two decades have been documented almost exclusively in second-wave developers (Kohler et al. 2002; Goldstein et al. 2009). Many studies argue that fertility differentials between countries that we classify as first-wave and second-wave developers are driven in large part because of a strong-work family conflict in second-wave developers (e.g., Myrskylä et al. 2013; McDonald 2013; Esping-Andersen 2009).

While the gap between institutional and family-oriented gender equity remains large in second-wave developers, there is evidence that some second-wave developers are entering an incipient stage of change regarding gender norms and family values similar to what first-wave developers underwent in the 1970s. For instance, Rindfuss et al. (2004, p. 843) make a compelling case that "major changes in Japan have converged to create

[12] While we report absolute differences in unpaid work, the relative differences between first and second-wave developers are equally stark. For example, in Denmark the ratio of men/women unpaid work differences stands around 72% while in Korea the ratio hovers around 20% (Miranda 2011).
[13] Cohorts not having finished their childbearing years (e.g., 1965-1979) have been projected by Myrskylä et al. (2013)

conditions favorable for dramatic family change".[14] Their conclusion stems from mounting tensions between traditional family expectations and changes in the labor market, educational system, consumer preferences, and women's desires for greater gender equity in marriage. Similar findings of the nascent breakdown of traditional family norms have been observed in other second-wave developers, like Spain, where "[y]oung parents behave increasingly like Americans when it comes to who reads with the children and who washes the dishes" (Esping-Andersen 2009, p. 173). While too early to make definitive claims, second-wave developers may soon be following first-wave developers in adopting a more equitable gender regime.

1.5 Theory

In light of the aforesaid historical and contemporary trends, we postulate that countries attain very low fertility rates following periods of fast-paced socioeconomic development. During this period, rapid gains in institutional gender equity are made while family gender equity lags; in other words, women's access to education and employment increases rapidly while family/household norms remain unchanged or change only gradually. This period of incoherent levels of gender equity in individually oriented social institutions and family-oriented social institutions leads to a "work-family conflict" for

[14] Feyrer et al. (2008, p. 21) express similar optimism for European countries where household norms remain traditional: "In the lowest fertility European countries the progress of women is limited both in the workforce and in the household relative to other high income countries. We see this as a temporary state. The social structure in these countries and the division of child care has led women to choose to have fewer children than did their mothers, but we see no reason why these social factors cannot also work in the other direction and lead to future increases in fertility."

career-oriented women (e.g., McDonald 2013; Bellavia and Frone 2005; Schreffler et al. 2010). As a result of this disequilibrium in gender equity, a period of low fertility emerges and persists, often lasting several decades. With some delay, the low fertility resulting from these work-family conflicts can subsequently facilitate changes toward greater gender equity through a gender-equity dividend that results in a relative scarcity of women relative to men as a result of the age-structure at young-adult ages. Indicators of familial gender norms becoming more equitable include greater participation by males in household and childrearing tasks, and attitudinal shifts supporting dual-earning partnerships. These changes are facilitated by favorable social, demographic, and economic factors, which, similar to the demographic dividend in relation to economic development, open a window of opportunity for advances in household gender equity.

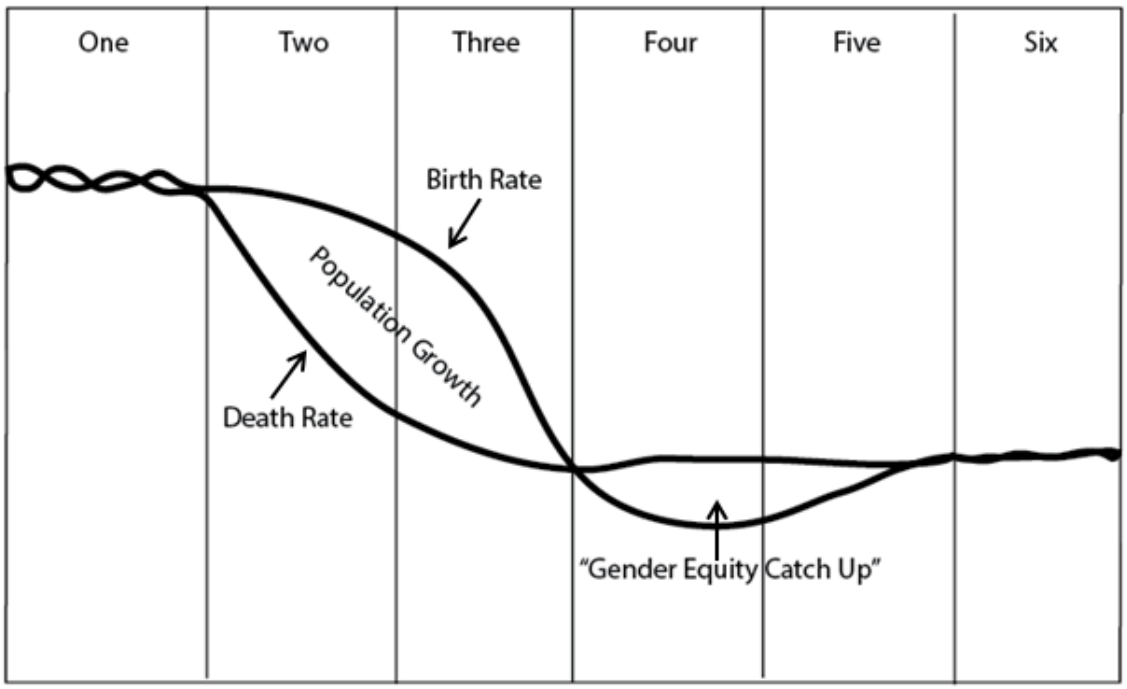
Our theoretical framework can be directly incorporated as part of the demographic transition (see Figure 1.7). In Phase 4, fertility drops to sub-replacement levels, in part due to an incongruence between *traditional* family gender equity and *modern* institutional gender equity that results in a substantial work-family conflict. Over time, family-oriented gender equity "catches up" to institutional gender equity as a consequence of institutional, societal, cultural, economic, and—as we introduce in this paper —demographic changes, effectively weakening the work-family conflict. As a result, having both a career and family becomes more compatible, leading to less voluntary childlessness and relatively higher fertility rates. If one were to place developed countries in the transition in Figure 1.7, Western/Northern European and English-speaking countries, the forerunners of the

demographic transition and industrialization, would fall roughly in Phase 5. Southern Europe and East Asian countries, most of which began developing in the 20th century, would fall in Phase 4 of the transition. With a weak work-family conflict and near-replacement fertility, Sweden and Denmark are arguably the closest countries to reach Phase 6. Ironically, these two countries were cited by Van de Kaa (1987, p. 11) as the frontrunners of the Second Demographic Transition —a theory that presumes long-term sub-replacement fertility (Lesthaeghe 2010).[15]

We should point out that in Phase 6 a convergence between actual and desired fertility levels occurs —not necessarily a return to replacement level. Nonetheless, the Figure is drawn under the assumption that desired fertility levels roughly equate to replacement level fertility, as desired fertility in nearly all developed countries hovers around 2-2.2 children per woman (Sobotka and Beaujouan 2014).

[15] Van de Kaa (1987, p. 11) states that Denmark and Sweden are the "[o]nly two European countries [that] appear to have experienced the full sequence of changes in family formation that have led to very low fertility".

Figure 1.7: Extended Demographic Transition



1.6 Empirical Support

Our theoretical framework integrates well with recent empirical analyses that have started to re-evaluate the relationship between socioeconomic development and fertility. Bongaarts and Watkins (1996), for example, use the Human Development Index (HDI) and show a strong linear negative fertility-development association. More recently, Myrskylä et al. (2009) demonstrated the emergence of a J-curve relationship between fertility and HDI, suggesting that very advanced levels of socioeconomic development may cause fertility decline reversals, Several recent studies have investigated this in more detail using both micro and macro data, and despite some criticisms of Myrskylä et al.'s (2009) findings (e.g., Harttgen and Vollmer 2014; Furuoka 2009), there is increasing empirical and theoretical support that the relationship between

development and fertility has fundamentally changed in recent decades among the most developed countries (e.g., Harknett et al 2014; Testa 2014; and Luci-Greulich and Thévenon 2014).

Deviating somewhat from the above literature on the J-curve relationship between fertility and HDI, we argue in this paper that the – in historical comparison small – changes in recent development *per se* are not driving the reversal in fertility declines. Instead, within our long-term perspective, we argue that relatively high and stable fertility levels are prevalent in countries that began developing in the 19th/early 20th century (e.g., Norway, the USA, the Netherlands, Australia, Sweden, etc.).[16] Specifically, consistent with the theory outlined here, thanks to greater gender equity that has emerged in these first-wave developers as a result of the gender-equity dividend in the second half of the 20th century, it has become more feasible for women to balance a work and family life. As a result of this head-start in development, these countries also tend to be ranked highly at or near the top of development indices such as the HDI. Nevertheless, their relatively high fertility levels are not due to simply achieving a certain threshold of development. Instead, the relatively high current fertility is rather due to having established a society in which evolved familial norms have made work and family more compatible, an accomplishment that was in part facilitated by the gender-equity dividend occurring earlier in the 20th century.

[16] While period total fertility rates for some first-wave developers fluctuated quite markedly during the latter half of the 20th century, cohort total fertility rates remained relatively stable (see Myrskylä et al. 2013). Sweden is a prime example: its period total fertility rate fluctuated from 2.13 in 1990 to 1.5 in 1999, though cohort fertility in Sweden has hovered around 2 births per woman for women born 1930-1965.

Emphasizing this mechanism leading to gender equity, our theory therefore can reconcile the "puzzles" such as S. Korea and Japan in Myrskylä et al.'s (2009) J-shape relation between fertility and development. Specifically, while they have quickly caught up in literacy, life expectancy, and wealth over the last 50 years, second-wave developers with comparable HDI levels as second-wave developers (e.g., Japan, South Korea, and Hong Kong) are outliers to the J-curve relationship because persisting low gender equity drives fertility to very low levels.[17] These countries have (not yet) benefitted from the gender-equity dividend. Thus, even as the East Asian or Southern/Eastern European countries attain higher HDI levels, it seems unlikely to us that fertility (and specifically, the quantum of fertility) would rebound significantly to higher levels without changes in gender regimes. But they are likely to do so in the future.

As Goldin (2004) rightfully points out, only recently has the possibility of combining a job and family become widespread throughout all income and educational strata in the United States.[18] We must continually remind ourselves that it took more than a century from the onset of industrialization for this process to occur, and for the attitudinal, institutional, and economic groundwork to be laid to facilitate the balance of work and family in first-wave developers (and even among first-wave developers, the balance of work and family is often still challenging). From this logic, it becomes clear that **time** has served as a crucial ingredient for lagging household gender equity to catch

[17] Other contributing factors to East Asia's ultra-low fertility rates, such as a stronger "quality-quantity" tradeoff have also been tied to the region's fast pace development story (Anderson and Kohler 2013).
[18] Goldin makes this observation for educated women in the United States, but we argue that it is applicable to other first-wave developers.

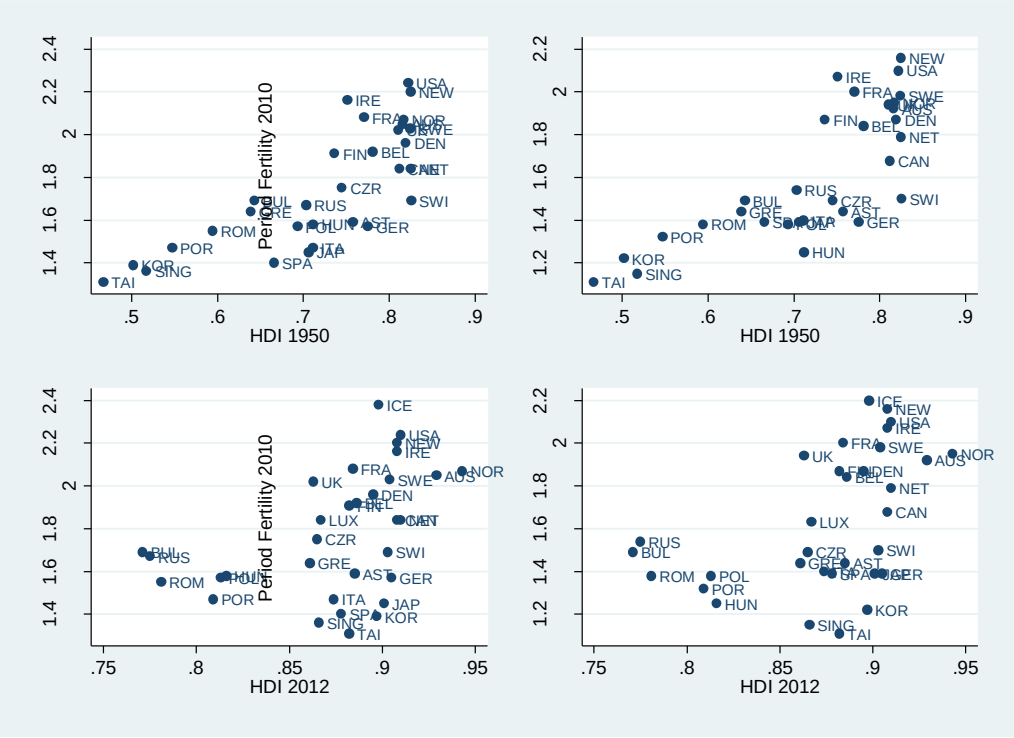
up with institutional gender equity. This is consistent with the cultural lag theory (Ogburn 1922), as well as recent theoretical developments that emphasize slowly-changing schemas as major determinants of fertility change (Johnson-Hanks et al., 2011). On the surface, therefore, a simple explanation for why second-wave developers face a strong work-family conflict is that second-wave developers have simply not had enough time for family-oriented gender equity to catch up to institutional oriented gender equity. On a deeper level, this lag in fertility response is related to the change of underlying norms, schemas, and institutions, which respond gradually and only with delay to changes in educational and occupational opportunities for women.

Thus, we hypothesize that the prevailing traditionalism regarding family norms, sex roles, and gender equity in Southern/Eastern Europe and East Asia is partly attributable to the fact that the **onset** of rapid socioeconomic development in these countries occurred much later than the first-wave developers, and that the **pace** of development occurred at such a fast rate that household gender equity started to lag behind, resulting in a mismatch between institutional and household gender equity in many second-wave developers that often persists until today. Given the close connection between low gender equity and low fertility, the fast pace and late onset of development contribute to second-wave developers' low fertility rates via low gender equity. A corollary of this finding for comparative cross-country studies is that the pace of development should be a predictor of how low fertility drops towards the end of the fertility transition.

HDI figures for 1950 plotted against 2010 period fertility and completed fertility for the 1979 cohort lend support to our hypothesis: the most developed countries in the mid-20th century—all first-wave developers—have, on average, substantially higher fertility than second-wave developers. Among all developed countries, HDI figures for 2012 explain only about 18% of completed cohort fertility variation (for the 1979 birth cohort) and 22% of 2010 period fertility variation (see Figure 1.8). Remarkably, HDI estimates for the same countries in 1950 are much better predictors of today's fertility trends, explaining about 60% of current variation in both period and cohort fertility. While the graphs say nothing about family policies, gender equity, or labor market flexibility, the 1950 HDI figures suggest that the pace and the onset of development are much more explanatory of current fertility trends than present-day development levels.[19]

[19] As is apparent in Figures 1.7 and 1.8, while the pace and onset of development are strong predictors of how low fertility will drop, they do not fully explain heterogeneity in specific lowest levels of fertility.

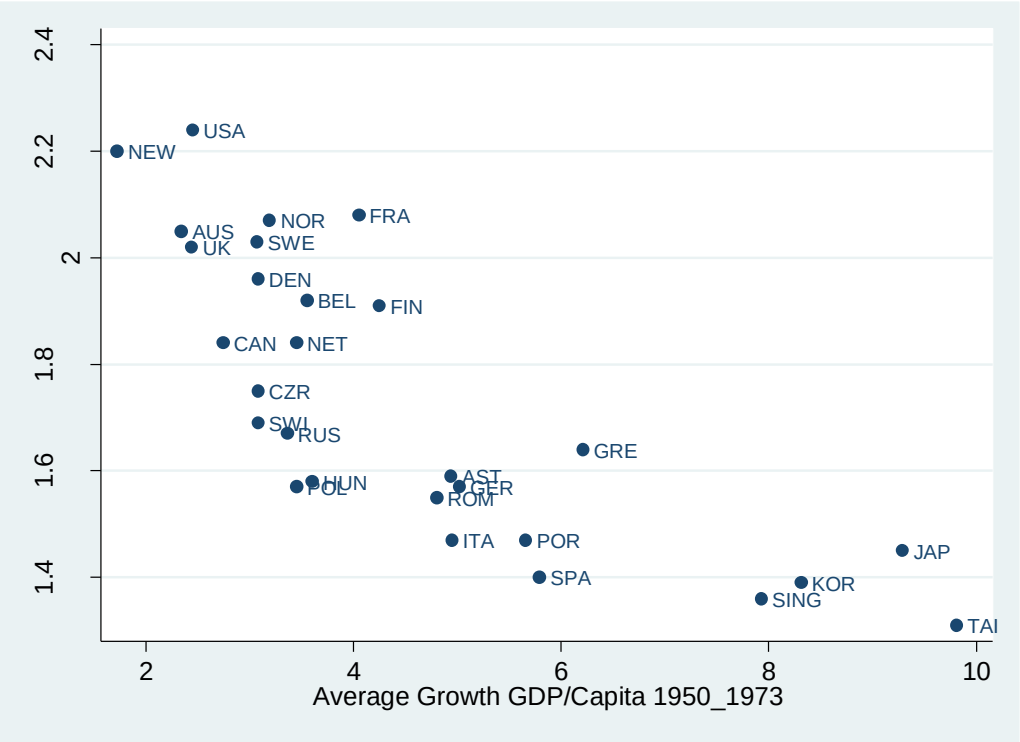
Figure 1.8: Top Left-Cohort Fertility (1979) on HDI 1950; Top Right-Period Fertility (2010) on HDI 1950; Bottom Left-Cohort Fertility (1979) on HDI 2012; Bottom Right-Period Fertility (2010) on HDI 2012



Source: 1950 HDI estimates from Crafts (2002) and 1979 Cohort Fertility values from Myrskylä et al. (2012)

A similar pattern prevails when using GDP growth rates as the proxy for development pace: regressing present-day fertility measures (i.e., 1979 cohort fertility) on Maddison's computed GDP growth rates from 1950-1973 illustrates that among today 's developed countries, those that experienced fast economic growth during the mid-century currently have the lowest fertility rates, while relatively high fertility prevails in countries that experienced only moderate growth during this time.

Figure 1.9: Cohort Fertility (1979) on Annual Average GDP/Capita Growth (1950-1973)



Source: Myrskylä et al. (2012) and Maddison (2007)

1.7 Discussion and Conclusion

Adopting a long-term perspective of low fertility across the 20th century, this paper provides novel theoretical insights into the interrelations between low fertility, socioeconomic development, and gender equity. We have argued that the pace and onset of socioeconomic development are inherently linked with different gender equity regimes—a key driver of fertility variation within developed countries. Moreover, the *pace* of socioeconomic development emerges in our framework as a predictor of how low fertility drops towards the end of the fertility transition. We also shed light on a demographic feedback mechanism we call the *gender-equity dividend*. During this dividend, a young adult age structure (caused by below-replacement fertility) yields a

relative scarcity of women relative to men (given the prevailing gender-differences in the age at marriage). In turn, these age structures facilitate changes in gender norms in the egalitarian direction through increased female bargaining power. Greater gender equity is then likely to help raise or stabilize fertility in low-fertility high-income countries. In this process, therefore, the emergence of below-replacement fertility implies a *homeostatic mechanism* that over the medium/long-term can contribute to increases in fertility, such as has been documented in some advanced countries with high levels of gender equity in recent decades. This theory helps explain the fertility pattern in countries such as S. Korea, where a rapid decline in fertility during the demographic transition has resulted in very low contemporary fertility levels associated with relatively high levels of household gender inequity. Piecing together these insights, we propose a variant of the demographic transition that accounts for the interplay between changes in fertility and changes in gender equity.

Should our theory hold up, fertility will nudge closer to desired fertility levels in the today's "developed world" as the gap between incoherent "institutional" and "family" oriented gender equity continues to close. This will not only continue to occur in first-wave developers but also begin to accelerate in second-wave developers.

Furthermore, if one assumes the development of incongruent realms of gender equity is inevitable and generalizable, today's swiftly developing countries (including China, India, and Brazil, where nearly 3 of the world's 7 billion citizens live) could well enter periods of very low fertility. Indeed, such a scenario is already playing out in in

Brazil, where fertility has been below the replacement level for nearly a decade, and urban China, where cities like Shanghai have documented TFRs under one (Lutz 2009; see also, Lutz 2008). Our theoretical framework gives reason to cautiously speculate that "third-wave" developers" – including countries such as China, Brazil, and India – could replace second-wave developers as the new frontier of low and lowest-low fertility in the 21st century.

Necessarily a broad theory of development and fertility such as the one presented here oversimplifies a number of complex, nuanced aspects of the interrelations between low fertility, socioeconomic development, and gender equity. As a result, this paper suffers from a number of limitations.

The first limitation is that our theory does not take into account other factors contributing to low fertility. We highlight some processes, including changing gender norms during the development process, that in our opinion had a profound impact on fertility across many contexts and at different time periods, and which are essential for understanding future fertility patterns in high-income countries that have had experienced persistent low fertility for a substantial period, and middle-income countries into which below-replacement fertility is spreading. But it is also clear that incongruent levels of gender equity (i.e., a strong work-family conflict) were not the *sole* driver of low fertility in early 20th century, nor are they the sole driver of low fertility today (see Van Bavel (2010) and Caldwell and Schindlmayr (2002)). Out of various economic, cultural, and social contexts emerge forces that either foster or hinder the realization of desired

fertility. For example, economic conditions in Eastern Europe have been linked to low fertility since the fall of the Iron Curtain (e.g., Witte and Wagner 1995; Filipov and Dorbritz 2003; Caldwell and Schindlmayr 2002; Thornton and Philipov 2009). In East Asia, the high pressure on parents to provide costly private education has elevated the price of children so much that many families face a strong quality-quantity trade-off (Anderson and Kohler 2013).[20] And long-standing, high levels of youth unemployment may encourage childbearing postponement in Southern Europe, which has been documented as a driver of very low period TFRs and may impact completed childbearing levels (Kohler et al. 2002; Lutz et al. 2006).

The second limitation of this paper is that it fails to adequately explain how the mid-century baby boom squares in with the story we tell, and why women in the 1940s-1960s withdrew into housewifery.[21] The baby boom was not only a period of high fertility and nuptiality, but also of traditional breadwinner roles in the household and a widespread acceptance of these roles (Coontz 2011).[22] Several explanations exist as to why these transitorily reemerged as the hegemonic norms. One explanation, put forth by Doepke et al. (2007), argues that younger women in mid-20th century were crowded out of the labor market by men who had returned from WWII and by older women who had

[20] It has been argued that the surge in competition among youth, which has led to the a strong quality-quantity trade-off in the region, can be partly attributed to East Asia's rapid socioeconomic development (Anderson and Kohler 2013).

[21] It is important to stress that there was significant heterogeneity in baby booms across high-income countries in the mid 20th century, both in terms of the "quantum" and "tempo" of fertility (Van Bavel and Reher 2013)

[22] Coontz (2011, p. 39) asserts that "even women who had experienced other models of family life and female behavior said that during the 1950s they came to believe that normal families were those where the wife and mother stayed at home, and that normal women were perfectly happy with that arrangement."

gained experience in the labor market during the war. As a result of these worsening labor market prospects of young women, many decided to marry and have children. Another explanation for the return to traditional breadwinner roles during the baby boom is that high scale female labor force participation during WWII created a post-war environment in which working mothers became even more heavily stigmatized. Terms such a "latchkey children" and "eight-hour orphans" were used during to war to refer to children whose "neglectful mothers" left them during work (Zucker 1944). Just after the war, hostile attitudes toward working mothers disseminated throughout the country, and "a concerted effort developed to defend traditional values" (Chafe 1976, p. 16).[23] According to Chafe (1976, p. 20), "[m]agazines during the 1950s celebrated the virtues of "togetherness" and advertisers attempted to sell their product by showing families with four children—the 'average' American family—out on a picnic or vacation. Public opinion polls showed that the vast majority of Americans did not question the traditional allocation of sex roles and believed that a woman's primary place was in the home. Thus, while traditional breadwinner roles reigned during the baby boom era, spanning from the mid-1940s to early 1960s, female labor force participation aspirations remained lower than early 20th century levels in most countries (Appendix II).[24] Ruggles (2015) argues that the period of the baby boom is unusual in the sense that an exceptionally

[23] In 1944, the Chairman of the Womanpower Committee of the War Manpower Commission in the Cleveland area predicted that "[w]e can expect the voices of the supporters of the back to the home movement to be louder and stronger than in the days of the depression. One of the reasons for this is because "[t]he consciousness of the value of children quickened through war and the belief that the child is best taken care of in the home by his mother**"** (Michel 1999, p. 49).

[24] In the United States, FLFP actually increased between 1900 to 1960, though this was likely due to a greater share of older women working (Doepke 2007)

strong male wage growth in the post-WWII years has prolonged the patriarchal family model that persisted earlier in the 20th century. Only this rapid wage male growth made a male-breadwinner model economically sustainable for a large fraction of the population, and along with it, the persistence of relatively traditional gender norms, a weak work-family conflict, and as a result, relatively high fertility. But this period was unusual. Nevertheless, it is consistent with our framework in that a lack of gender equity and a weak work-family conflict (see bottom-right quadrant in Figure 1.2), driven in part by economic factors and unique post-WWII social and demographic factors, importantly contributed to the high fertility during the baby boom. Hence, while our theory focuses on recent fertility trends in mostly high-income countries, the basic mechanisms of our framework are likely to have shaped the baby boom as well.[25]

Countries that represent outliers to our theoretical framework present a potential third limitation of our theoretical model. In particular, Germany and Austria stand out for being countries that began industrializing in the early 20th century along with other first-wave developers. Yet unlike other first-wave developers, Germany and Austria still exhibit very low fertility. The German-speaking fertility pattern is unique compared to other low fertility settings in Europe due to its high rates of childlessness but relatively high progressions to second and third birth rates (Sobotka 2008). Recent research suggests that institutional factors, such as family and labor market policies, likely explain

[25] It is beyond the scope of this paper to do so, but we believe that our understanding of fertility dynamics would greatly benefit from empirical analyses on the origins and consequences of the baby boom that adopt the theoretical framework outlined in this paper.

the "Western European fertility divide" between Germany and other Western countries (Klüsener et al. 2013), and that Germany and Austria—along with the other Axis powers, Italy and Japan—experienced cultural and institutional responses to the war that have negatively impacted their fertility levels (Weinreb and Johnson-Hanks 2014). Germany and Austria, like other first-wave developers, exhibited population age structures conducive to gender equity change in the mid-20th century; however, unlike places such as Sweden and the US, the institutional, cultural, and economic factors promoting greater gender equity were not present in Germany and Austria during their "gender-equity dividend". These two countries face a comparatively weak policy environment for career-oriented women wishing to have a family, as exemplified by a tax code that penalizes working mothers, and by a lack of inexpensive daycare facilities for dual-earner households. Moreover, it is common in Germany and Austria that working mothers participate in the labor market only part-time (that is, women have "one foot in the labor market and another in the traditional domestic sphere"), which, in effect, may not be sufficient to catalyze men's adoption of more gender symmetric behavior. Hence, while the mechanisms underlying the gender-equity dividend are likely to have been at work in both Germany and Austria, the specific institutional context of these countries has limited the extent to which it resulted in increased gender equity, increased female labor force participation and higher fertility. While some of the specific institutional factors driving the somewhat distinct German and Austrian fertility regime have frequently been emphasized in the literature, the literature may still benefit from research that investigates why Germany and Austria have been slow to adopt the more family-friendly

environments that have arisen in other Northern/Western European countries and other first-wave developers during the 2nd half of the 20th century.

Lastly, our theory does not account for important within-region and within-country heterogeneity with regards to fertility, socioeconomic development, and gender norms. Fertility rates as well as socioeconomic indicators between Southern Italy and Northern Italy, for example, differ starkly from one another (Caltabiano et al. 2009). Further research considering these important areas of heterogeneity may shed light on diffusional factors relating to gender equity change.

1.8 Appendix I: First- and Second-wave Developer Dichotomization

We use economic and development indicators (e.g., GDP and HDI) to dichotomize today's "developed world" into first-wave and second-wave developers.

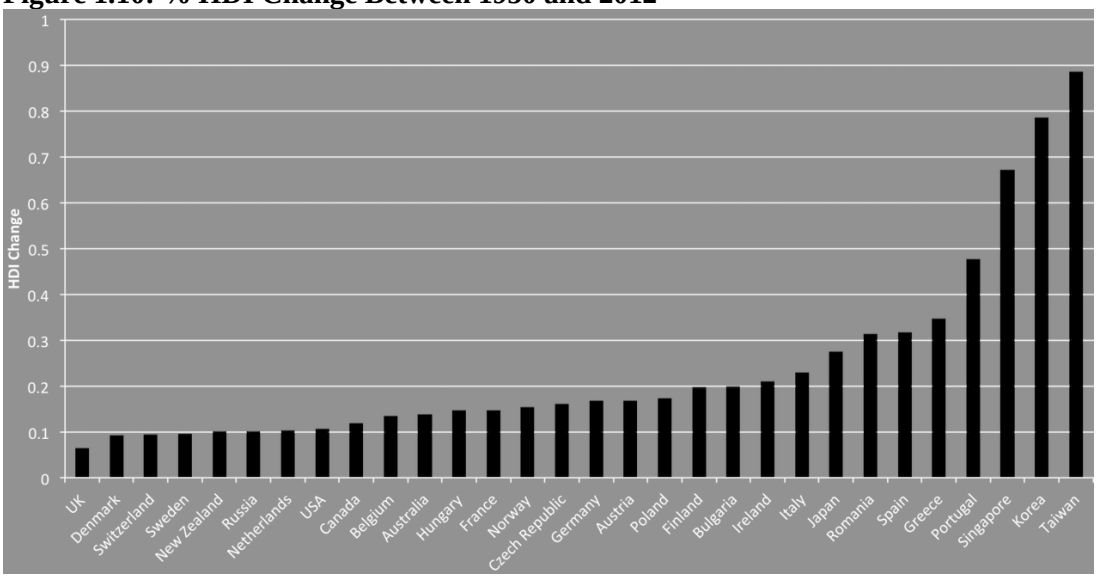
First we examine the percent change in HDI between 1950 and 2012. HDI values for 2012 come from the United Nations (2012), and mid-century HDI figures from Crafts (2002). One notes that countries that experienced large percent increases between 1950-2012 in HDI, appearing to the right of the Figure, are clustered in East Asia (Singapore, Taiwan, Korea, and Japan), Southern Europe (Greece, Portugal, Spain, and Italy), and Eastern Europe (Romania, Bulgaria, and Poland). Conversely, countries that were relatively highly developed in the mid-century—first-wave developers—are clustered on the left of Figure 11.

Some countries appear to have not changed much in "development" between 1950 and 2012. The UK is a prime example: life expectancy and GDP per capita in the UK increased substantially during this time period (69.2→80 years and $6,847→ $32,738, respectively), though the change in HDI lies around a mere 6.5%.

The reason why the UK does not appear to have not progressed much is that yearly HDI calculations are made using different maximum values for the "health and wealth" components (life expectancy and GDP per capita). Because our HDI figures for 1950 are uniformly calculated using the same maximum value for all countries, the

percent change in HDI provides a useful tool to assess the speed with which our selected countries developed.[26] For more information, see Crafts (2000).

Figure 1.10: % HDI Change Between 1950 and 2012



We also examined the pace of economic growth in the early 20th century relative to the mid-20th century. The idea is that countries that experienced rapid economic development in the early half of the century would fall into the "first-wave developer" category and those that experienced very fast growth in the mid to latter half of the 20th century would be considered "second-wave developers". We use average GDP per capita growth rates computed by Maddison (2007) for the periods 1913-1950 and 1950-1973. Dividing the second average by the first illustrates the ratio of growth between the two periods. Thus, .5 for example would indicate that GDP growth during the period 1913-

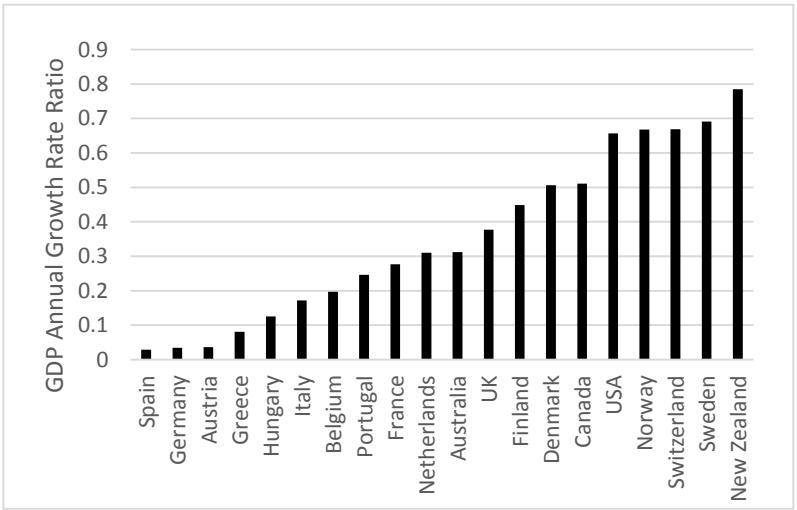
[26] The United Nations recognizes that because their HDI calculations are relative, it poses difficulties for researchers in comparing HDI figures over time for individual countries. The UN therefore released "Hybrid HDIs" for the years 1970-2010 which attempt to solve this problem. However, we do not use these figures because they are not available before 1970 and therefore do not capture the advances in development made in the 1950s and 1960s in many developed countries.

1950 was half as much as between 1950-1973. These values are illustrated in tabular as well as graphical form in Table 1.3 and Figure 1.11.

Table 1.3: GDP Annual Growth Rate Averages (1913-1950)/(1950-1973)

GDP Annual Growth Rate Average			
Country	**1913-1950**	**1950-1973**	**Ratio**
Spain	0.17	5.79	0.029
Germany	0.17	5.02	0.034
Austria	0.18	4.94	0.036
Greece	0.5	6.21	0.081
Hungary	0.45	3.6	0.125
Italy	0.85	4.95	0.172
Belgium	0.7	3.55	0.197
Portugal	1.39	5.66	0.246
France	1.12	4.05	0.277
Netherlands	1.07	3.45	0.31
Australia	0.73	2.34	0.312
UK	0.92	2.44	0.377
Finland	1.91	4.25	0.449
Denmark	1.56	3.08	0.506
Canada	1.4	2.74	0.511
USA	1.61	2.45	0.657
Norway	2.13	3.19	0.668
Switzerland	2.06	3.08	0.669
Sweden	2.12	3.07	0.691
New Zealand	1.35	1.72	0.785

Figure 1.11: GDP Annual Growth Rate Averages (1913-1950)/(1950-1973)

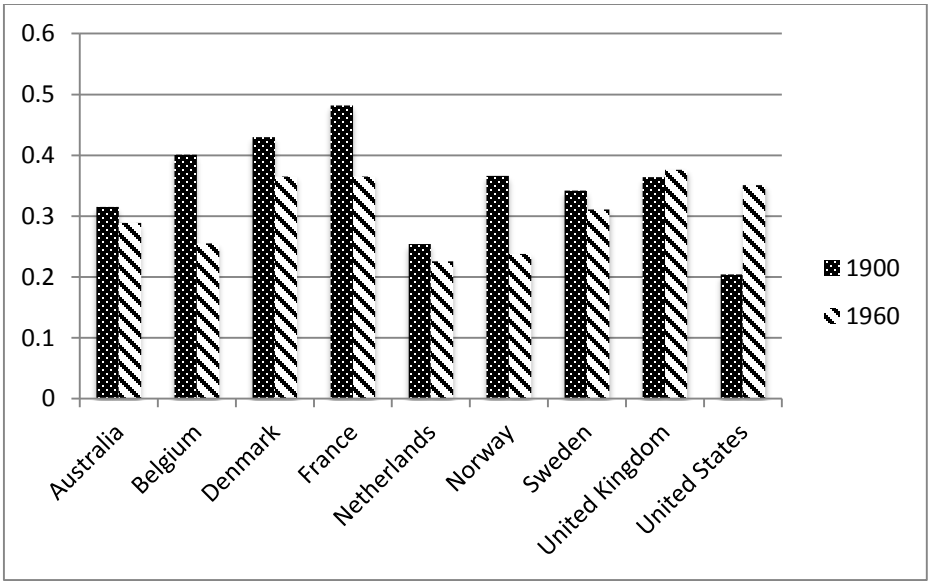


Some countries fit nicely within our dichotomous framework. Clear first-wave developers would be **the United Kingdom (UK), France, Sweden, Denmark, Luxembourg, the United States of America (USA), Iceland, Canada, Switzerland, the Netherlands, New Zealand, Belgium, Finland, Norway, Australia, and Austria.** Second-wave developers would include **Spain, Italy, Portugal, Singapore, Hong Kong, South Korea, Taiwan, Poland, Czech Republic, Bulgaria, and Hungary**.

Some countries lie somewhere between first and second-wave developers. Above all, **Germany, Italy, and Japan** share characteristics with both first-wave and second-wave developers. On the one hand, these three countries had experienced economic growth and improvements in living standards prior to WWII, and were integral players in the early 20th century global economy. On the other hand, the war-torn and politically fragmented Axis powers all experienced drastic setbacks in living standards during the war (see Scheck 2008; Zamagni 1993; and Dower 2000). These years of hardship were followed by "economic miracles" ("*il miracolo economico*" in Italian, "*Der Wirtschaftswunder*" in German, and "高度経済成長" in Japanese), which set the course for these "post-war re-developers" to quickly improve living standards and regain their foothold as economic powerhouses. Thus, while post-war re-developers historically align with first-wave developers, *they have experienced quick development over the second half of the 20th century*, and as such, share many of the same demographic and social characteristics with other second-wave developers.

1.9 Appendix II: Historical Female Labor Force Participation

Figure 1.12: Female Labor Force Participation Rates for Select First-Wave Developers, 1900 and 1960



Source: Olivetti (2013)

Chapter 2: Gender Ideology and Fertility Trends in the United States: Evidence from the National Longitudinal Survey of Youth 1979

2.1 Introduction

As Chapter 1 discusses in length, among the "toolkit" of compelling theories explaining low fertility variation is *gender equity theory*. Though its roots stem from the early work of Sorrentino (1990), Chesnais (1996), and Mason (1995), gender equity theory was formally articulated by McDonald at the turn of the 21st century (McDonald 2000). McDonald argued that low fertility results from an incoherence of gender equity levels in individually oriented social institutions and family-oriented social institutions. In other words, in contexts where women are at equal footing with men in educational and labor market opportunities, but face an inequitable and overtaxing home environment, the combination of work and family is difficult, and as a result, may cause some women to postpone or forego finding a permanent partner or establishing a family in order to pursue their career aspirations. Conversely, high levels of gender equity in both family and individually oriented institutions facilitate the combination of work and family, leading to higher levels of fertility on the country-level.

In recent years, a string of empirical analyses has sought to shed light on McDonald's theory. While these analyses use different indicators of gender equity (e.g., global gender indices, labor force participation rates, gender attitudes, and the division of household labor), they all reach the conclusion that, on the country-level, high gender equity is associated with moderately high levels of fertility whereas low levels of gender equity correlate with very low fertility (Myrskyla et al. 2011; Myrskyla et al. 2012;

Brinton and Lee 2010; Anderson and Kohler 2013). As a result, some scholars have gone so far as to suggest public policy measures to increase gender equity (e.g., Olah 2011; Toulemon 2011).

While high levels of gender equity strongly correlate with moderately high levels of fertility *among* developed countries, contradictory empirical evidence has caused a debate whether the relationship between low gender equity and low fertility holds *within* these societies. For example, investigating this question using data on egalitarian attitudes in eight European countries, Puur et al. 2008 found that more egalitarian attitudes held by men are linked with higher fertility. Yet looking at the same countries (in addition to several others), but using different methods of analysis, Westoff and Higgins (2009) came to the opposite conclusion—that is, male egalitarian attitudes are associated with lower fertility. A more detailed review of this literature is covered in the Background section.

Whereas Chapter 1 focuses on gender-fertility dynamics at the macro-level and seeks to explain fertility variation across countries, the aim of the present Chapter is to explore gender-fertility dynamics at the micro-level. One may imagine that the drivers of macro-level fertility variation also apply to the micro-level, yet the field of demography offers plenty of examples in which discrepancies between the country and individual levels exist. For example, obesity is positively correlated with income on the country-level (i.e., the richest countries tend to be the most obese); however, *within* countries, obesity has a strong negative correlation with income (i.e., poor individuals are disproportionately obese). This paper is motivated by a growing body of literature with unresolved conclusions regarding the micro-level association between gender equity and

fertility within developed countries.

Much of the recent attention on the fertility-gender equity relationship within societies has been heavily European focused (e.g., Westoff and Higgins 2009; Philipov 2008; Miettinen 2011; Goldsheider et al. 2010). Within the United States, few studies have systematically analyzed individuals' attitudes on gender equity and their associations with fertility outcomes. Of those that have, their evidence remains inconclusive at best. For example, Torr and Short (2004) analyze whether gender ideology is associated with the progression to a second birth, but ignore first and third birth transitions and fail to link early life-gender attitudes with later-life completed family size. Kaufman (2000) examines whether gender attitudes are associated with fertility desires and intentions, yet, presumably due to data limitations, does not investigate whether these desires or intentions are predictive of actual fertility outcomes. Nonetheless, Kaufman's results indicate that compared to traditional women, egalitarian women are less likely to intend to have a child while for men, the opposite is true (Kaufman 2000).

By means of a new methodological approach using longitudinal data on fertility and attitudes on gender equity that span four decades, this paper fills in the gaps in the literature on fertility and gender equity in the United States by analyzing whether gender equity attitudes (hereinafter referred to as "gender ideologies") are predictive of completed family size (children ever born), and birth progressions from childless to first, first to second, and second to third. This study is unique in that it examines whether differences in the gender equity-fertility relationship exist between males and females.

While attitudes do not necessarily reflect "family-oriented gender equity" (such as

the division of household labor), behavioral change regarding gender roles is often grounded in attitudes that signify the internalization of role responsibility (Perry-Jenkins and Crouter 1990; Kaufman 2000). Additionally, nearly a dozen studies investigating the effects of gender ideology on the division of household labor find that both men and women's gender ideology is highly associated with the division of household labor (Davis and Greenstein 2009; Cunningham 2005; Hochschild and Machung 1989; Bianchi et al. 2000; Kroska 2004; Hu and Kamo 2007; Lavee and Katz 2002; Brayfield 1992; Nordenmark and Nyman 2003; Kan 2008).

The paper is structured as follows. I first examine the changes in gender ideologies in the United States over the second half of the 20th century. Following David and Greenstein (2009, p. 89) I define gender ideology as "the underlying concept of an individual's level of support for a division of paid work and family responsibilities that is based on the notion of separate spheres". As the authors note, there are several nuanced alternatives in the literature, including "gender role attitudes", "attitudes about gender", "gender-related attitudes", and "gender egalitarianism". Drawing on a set of questions pertaining to gender norms and attitudes asked in the National Longitudinal Survey of Youth in 1979, 1982, 1987, and 2004, respondents' gender ideologies are classified using latent class analysis for each of the respective years. These classes are used to assess attitudinal change over the latter half of the 20th century. While descriptive, these analyses provide insight into temporal changes in gender ideologies in the US. Moreover, these gender ideology classes serve as the key independent variable in the subsequent analyses.

Using the three gender ideology classes, I explore the relationship between gender

ideologies and lifetime fertility (children ever born) as well as between gender ideology and birth transitions (or parity progressions). Analyzing both lifetime fertility and parity progressions in this study leads us to develop more nuanced insights into the relationships between fertility and gender ideology. On one hand, the analysis using lifetime fertility gives us the ability to clearly state fertility differentials in terms of children per woman between individuals of different gender ideologies. On the other hand, the analysis using parity progressions as the dependent variable sheds light on the relative odds of progressing to having a first, second, and third birth, and whether these differences are statistically significant. Moreover, gender ideologies are fluid and not static over the life course; examining the relationship between parity progression and gender ideology has the added advantage of allowing for time ordering (whereas lifetime fertility does not).

2.2 Background

The United States has witnessed a transformation in gender norms over the last half-century, giving rise to impressive trends toward more egalitarian behaviors and attitudes. Within the realm of the division of household labor, for example, household work for women had been nearly cut in half between 1965 and 2000, but had doubled for men during this period (Bianchi et al. 2000; see also, Thornton 1989; Kaufman 2000). Using five large-scale social surveys, Thornton and Young-DeMarco (2001) show that the trend toward egalitarian attitudes regarding gender equity in the household and female labor force participation changed substantially from the 1960s well into the 1990s. This pattern holds true for both men and women, mothers and their children, and among both high school students and the population as a whole (Thornton and Young-DeMarco 2001). More recent literature suggests that similar attitudinal and behavioral change

toward egalitarianism has occurred throughout the 2000s (Bianchi et al. 2006).

The changing tides of gender norms have been of interest to demographers because of the presumed relationship between gender equity and fertility. Yet opposing theoretical frameworks in the literature make it difficult to anticipate whether egalitarian gender attitudes would correlate positively or negatively with fertility for men and women. For example, more egalitarian gender attitudes among women may boost fertility if it translates into greater flexibility for the mother and a reduced work-childrearing conflict for spouses (Goldscheider and Waite 1991; Puur et al. 2008). However, traditional ideologies among women may be associated with an expectation to have large families, or conversely, egalitarian women may be expected to have either "no families" or "new families" (Miettinen et al. 2010; Goldscheider and Waite 1991). Following the classical Beckerian perspective (e.g., Becker 1991), if traditional women specialize in the household while men specialize in market work, it is likely that the opportunity costs of having and rearing children would be lower among traditional women than egalitarian women, leading to higher fertility.

For men, an egalitarian gender ideology could result in fewer children, as egalitarian men likely invest more time and energy in their kids, thus increasing the costs of children (Bernhardt and Goldscheider 2006). On the other hand, with men sharing more household and childbearing responsibilities, it may well be that egalitarian men "appreciate the benefits of becoming fathers", making them more likely to want to become fathers than traditional men (Bernhardt and Goldscheider 2006, p. 21). Egalitarian men may also have more children than traditional men if their contribution in the household alleviates the "double burden" of childrearing and working for their

spouses (Miettinen et al. 2011).

The empirical evidence on the relationship between gender ideology and fertility relationship is as conflicting as its theoretical underpinnings. On one hand, numerous within-country and cross-national studies have found positive associations between traditional gender ideologies and fertility and/or fertility intentions. For example, using the Gender and Generations Survey (GGS), Speder and Kaitany (2009) show that traditional gender ideologies significantly correlate with having a second and third child for both men and women. Westoff and Higgins (2009) use the European/World Values Survey and find that in all eight selected European countries analyzed, men's egalitarian attitudes were negatively associated with fertility.

On the other hand, a set of other studies find that egalitarian gender ideology correlates with *higher* fertility (and that traditional gender ideology correlates with *lower* fertility). For instance, Puur et al. (2008) found that men with egalitarian attitudes had higher desired and actual fertility than men with more traditional attitudes. And Tazi-Preve et al. (2004) show that in Finland, a traditional division of labor was associated with a lower probability to want another baby while the inverse was the case for egalitarian couples.

Still other studies yield mixed results by sex, such as Philipov's (2008) study on 11 European countries, which found that for women, "modern attitudes" were associated with lower intentions to become parents while for men, the opposite was true in several countries; Miettinen et al. (2011), who report that egalitarian and traditional attitudes among Finnish men increase expected fertility, while for women the impact of gender ideology is ambiguous; and Lappegård et al. (2012), who using the GSS for eight

European countries, find negative associations between fertility intentions and egalitarian attitudes towards gender roles in the public sphere and mothers' role in the family, yet a positive relationship between father's role in the family and childbearing intentions.

The conflicting evidence on the relationship between gender ideology and fertility may arise from differences in how gender ideology variables are operationalized or in the methodological approach taken (Miettinen 2011; Goldscheider et al. 2010). Moreover, individuals' gender ideologies likely interact with a country's economic and political structure, as well as the country's "overall tenor of the gender system", resulting in differential effects on fertility outcomes across different settings (Westoff and Higgins 2009, p. 72).

The aforementioned literature has focused almost entirely within the European context. As highlighted, few studies have looked at the relationship between fertility and gender ideology in the United States. Among these, gender ideology has not been found to be a significant predictor of having a second child (Torr and Short 2004), yet it has been found to correlate positively with birth intentions for men and negatively for women (Kaufman 2000).

To the author's knowledge, this is the first study to systematically examine whether gender ideology is associated with completed family size, and progressions from childless to first birth, and from second birth to third birth in the United States. This two-pronged methodological approach should reveal more detailed nuances on the gender ideology-fertility relationship for both men and women.

2.3 Data

For my analyses, I use the National Longitudinal Survey of Youth 1979, a national probability sample sponsored by the Bureau of Labor Statistics. With an initial sample size of 12,686 individuals aged 14-22 in 1979, the NLSY79 is one of the richest longitudinal datasets in the United States that follows individuals throughout their reproductive years. I examine only individuals who remain in the survey until 2006 (N=7,654), as all respondents were above age 40 in this year and further childbearing among these respondents is rare (Morgan and Rackin 2010). Two subsamples, including the military sample (N=1,079) and the economically disadvantaged, nonblack/non-Hispanic sample (N=1,643) were no longer eligible for interview after 1990. Thus, about 77% of the individuals interviewed in 1979 who were eligible for re-interview in 2006 are retained in the analyzed sample.

In each analysis, men and women are analyzed separately in order to compare the associations between gender ideology and fertility between the sexes. Despite previous concerns about severe underreporting of male births in major surveys, a recent analysis suggests that nine-tenths of early births to men in the NLSY went reported (Joyner et al. 2012). One should keep this bias in mind for any interpretation of results in this article. Table 2.1 highlights key characteristics about the sample used in this paper.

Table 2.1 Background characteristics of sample

Background Characteristics	
	Percent %
Sex	
Male	48.8
Female	51.2
Race	
Hispanic	19.5
Black	31.1
NH-White	49.4
Both Parents Immigrants (% Yes)	7.7
Education	
Less than High School	10.5
High School	43.4
Some College	24.3
College+	21.8
Lifetime Poverty	
Zero	55.7
One	21.3
Two	10.4
Three	5.8
Four+	6.7
Region (2006)	
Northeast	15.5
North Central	23.4
South	41.6
West	19.4
Non-Response	1.0
Marriage	
Never Married	17.7
Married	57.2
Separated	5.3
Divorced	18.5
Widowed	1.4
N	7,654

Source: NLSY 1979.

2.4 Methods

First, to construct a gender ideology variable, latent class analysis is performed on a set of eight categorical variables related to attitudes on the division of household labor, female labor force participation, and the position of women in the domestic sphere. These attitudinal questions on gender ideology have been shown in the literature to be both reliable and valid measures (David and Greenstein 2009). The eight questions, displayed in Table 2.2, were asked in 1979, 1982, 1987, and 2004.

Table 2.2: Attitudinal questions on gender roles asked in 1979, 1982, 1987 and 2004

Question	Abbreviation	Responses
"A woman's place is in the home, not in the office or shop."	Place in Home	1-Strongly Agree, 2-Agree, 3-Disagree, 4-Strongly Disagree
"A wife who carries out her full family responsibilities doesn't have time for outside employment."	No Time Employment	1-Strongly Agree, 2-Agree, 3-Disagree, 4-Strongly Disagree
"A working wife feels more useful than one who doesn't hold a job."	Useful	1-Strongly Disagree, 2-Disagree 3-Agree 4-Strongly Agree
"The employment of wives leads to more juvenile delinquency."	Delinquency	1-Strongly Agree, 2-Agree, 3-Disagree, 4-Strongly Disagree
"Employment of both parents is necessary to keep up with the high cost of living."	Inflation	1-Strongly Disagree, 2-Disagree 3-Agree 4-Strongly Agree
"It is much better for everyone concerned if the man is the achiever outside the home and the woman takes care of the home and family."	Traditional Best	1-Strongly Agree, 2-Agree, 3-Disagree, 4-Strongly Disagree
"Women are much happier if they stay at home and take care of their children."	Happier	1-Strongly Agree, 2-Agree, 3-Disagree, 4-Strongly Disagree
"Men should share the work around the house with women, such as doing dishes, cleaning, and so forth."	Men Share	1-Strongly Disagree, 2-Disagree 3-Agree 4-Strongly Agree

Source: NLSY 1979. *Note:* Response choices have been recoded from their original form so that all response options correspond with a similar gender ideology.

Latent class analysis (LCA) serves as a powerful tool that makes the interpretation

of related categorical variables straight-forward and applicable in empirical models (Linzer and Lewis 2011). The classes from the LCA are derived by categorizing respondents into different gender ideologies based on their responses to the eight gender-related questions. The number of classes used is chosen based on a combination of theoretical justifications and parsimony measures. The estimation technique yields two important sets of results: the item response probabilities conditional on class membership and the estimated class membership proportions.

To produce these results, let π_{jrk} represent the probability that class r produces the k^{th} outcome on the j^{th} variable, and let p_r represent the mixing proportions that provide the weights of the weighted sum of the cross-classification tables. After choosing the number of classes, p_r and π_{jrk} are estimated by maximizing a log likelihood function using the expectation maximization (EM) algorithm (Dempster et al. 1977). The posterior probability that each individual belongs to each class using Bayes formula is then estimated. For the analysis I use the poLCA package in R (Linzer and Lewis 2011).

After running the analysis, individuals were grouped into three gender ideology classes and one class for "missing". Given the response probabilities conditional on each class (results not shown), one could conclude that class 1 members hold more traditional views on gender equity, female labor force participation, and gender roles while class 3 members hold more progressive (or "egalitarian") views on these matters. Class 2 members lie somewhere in the middle of the class 1 and class 3. For the purpose of simplicity, we refer to **class 1 membership as "traditional", class 2 membership as "median", and class 3 membership as "progressive"**. Class 4 is reserved for individuals who were coded either "missing", "refused to answer", "I don't know" or

"question not asked". Class 4 represents a very small proportion of total class membership (about 3%) and thus does not pose any serious statistical issues in the analyses. Similar models were run using three, five, and six classes; however, the Bayesian information criterion and Akaike information criterion fluctuated little between these models, and the theoretically intuitive option of four classes (three gender ideology classes and one missing class) was chosen. The choice of three gender ideology classes also reflects common practice in the literature on gender ideology and fertility (e.g., Lappegard et al. 2012).

It should be noted that the latent class analysis treated each respondent at each of the four time points as independent (N= 30,616). Thus, with eight questions and five possible responses to each question, the final possible combinations of responses in the analysis were well over 1,000,000.

After computing three distinct gender ideology classes, I examine the relationship between lifetime fertility (children ever born) and gender ideology. There is no prevailing methodological convention in the literature on how to treat the dependent variable (children ever born) in this analysis. Some studies employ OLS for its easy-to-interpret properties (e.g., Ainsworth et al. 1996; Bollen et al. 2002), while others (e.g., Nguyen-Dinh 1997; Verwimp and Van Bavel 2005) use Poisson or negative binomial regressions because "children ever born" is a count variable. Given the distribution of the data, as well as the fact that the mean (1.99) and variance (variance=2.13) are roughly equal—a precondition for the Poisson distribution, I run and base my discussion off of Poisson regression analyses.

The nature of the research question asked in this section—whether gender

ideology of an individual affects his or her completed family size—gives rise to an obvious modeling challenge; namely, how to account for gender ideology, a time-varying independent variable, in a model with completed fertility, a time-invariant outcome. To circumvent this issue, I perform two analyses: one to capture the effect of early life gender ideology on completed fertility, and another to capture the effect of "gender ideology transitions" on fertility.

The first analysis estimates a Poisson regression using the 1979 gender ideology variable, allowing us to view the association between early-life gender ideology and completed family size.

For the second analysis, I create a new variable by concatenating respondents' gender ideology in 1979, 1987 and 2004, yielding 27 distinct "gender ideology trajectories" ("missing" classes were not included, yielding slightly smaller sample sizes than in the first analysis). For example, individuals falling into the traditional class for all three waves (1979, 1987, and 2004) would be coded *trad→trad→trad*; *trad→median→prog* would include respondents who belonged in the traditional class in 1979 but switched to the median class in 1987 and then again to the progressive class in 2004; and *trad→med→med* would be for those who transitioned from traditional in 1979 to median in 1987 and remained in the median category. I exclude the 1982 category for several reasons: 1) the least class membership changed between 1979 and 1982, and 2) concatenating all four years would yield an overwhelming number of reference categories (81 "gender ideology trajectories", as opposed to 27). The gender ideology trajectory reference category in the analyses is "consistently traditional" individuals (i.e., *trad→trad→trad*). Only statistically significant gender ideology trajectories for either

men or women are reported.

Significant socioeconomic, racial, marital, educational, and to a lesser extent, geographic variation in fertility levels exists in the United States (Yang and Morgan 2003; Fosler et al. 1990). While the purpose of this study is not to examine the impact of these variables on fertility outcomes, it is important to control for these possible confounders. Two variables are used to control for socioeconomic status, ***lifetime poverty***, a dummy variable measuring the number of occasions respondents reported living in poverty from 1979 to 2006 (zero-reference, one, two, three, four or more), and a dummy variable for ***education*** (Less than High School, High School Completed-reference, Some College, College or higher). ***Region of residence in 2006***[27] (Northeast-reference, North Central, South, West), ***race*** (Hispanic, Black, Non-Hispanic/Non-Black-reference)***, marital status in 2006*** (never married, married-reference, separated, divorced, widowed), and ***immigrant status*** (1 if parents were born outside of the US, 0 if not) are included to control for regional, racial, marital, and immigrant fertility variation. Year of birth is also controlled for in the model to capture any fertility variation by cohort year, although this is not anticipated given the fact that cohort fertility in the United States changed very little from 1957-1965 (Myrsykla et al. 2012). Lastly, on theoretical grounds that egalitarian men and women could differ in their fertility, I run separate models by sex. Because region is a time-varying covariate, I run separate models with region of residence in 1979 and 1987; these models yield almost identical results.

To test whether gender ideologies are associated with birth progressions, discrete

time-survival models are run for each of the three birth transitions (childless to first birth, first birth to second birth, and second birth to third birth). The data were set up using event history techniques in order to overcome several limitations involved with traditional logistic regression. Among these limitations is the inability to control for time-varying covariates, including our key independent variable—gender ideology. Because some of our respondents changed their gender ideology over the various waves, it is important to capture whether those ideologies affected the likelihood of having a birth during the same time interval. Other covariates, including region of residence, marital status, and education also may have varied for individuals throughout the survey.

Like in the analyses with children ever born as the dependent variable, a number of control variables are implemented to hold constant possible confounders. To control for socioeconomic status and educational attainment, ***total family income*** (continuous variables) and ***education*** (Less than High School, High School-reference, Some College, College or higher) are included in the models (note: lifetime poverty is not measured). ***Region*** (Northeast-reference, North Central, South, West), ***race*** (Hispanic, Black, Non-Hispanic/Non-Black-reference)***, marital status*** (never married-reference, married, separated, divorced, widowed), and ***immigrant status*** (1 if both parents were born outside of the US, 0 if not) are retained in the model, though I allow marital status and region to vary.

2.5 Results

As the LCA results below indicate, in 1979, about 19% of individuals in the sample belonged to the "progressive" class, 50% to the median, and 30% to the "traditional" class. By 2004, these numbers had reversed; that is, the median retained

nearly half of the individuals while the progressive class nearly doubled to around 31% and the traditional class halved to around 15%.

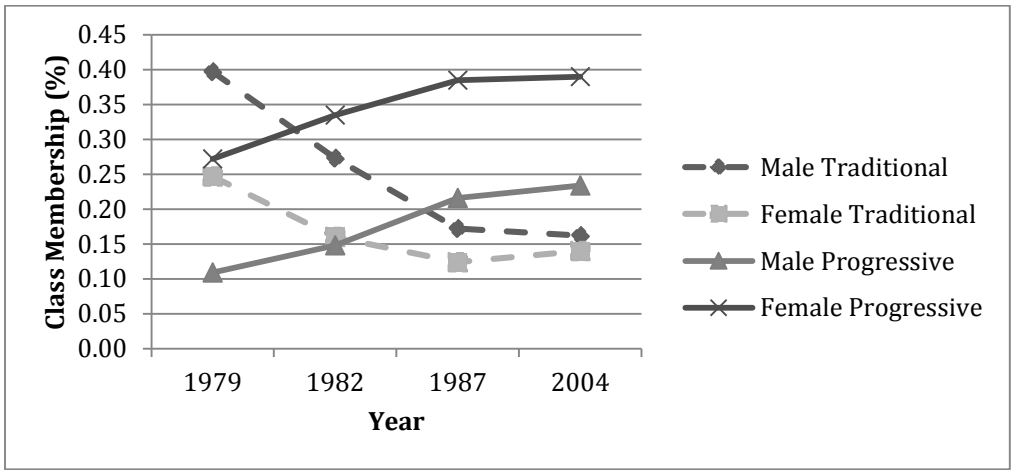
Table 2.3: LCA Results: Gender ideology class membership by survey year

	1979	1982	1987	2004
Traditional	32.0%	21.5%	14.8%	15.1%
Median	48.5%	51.8%	50.2%	47.4%
Progressive	19.3%	24.3%	30.3%	31.4%
Missing	0.2%	2.4%	4.8%	6.2%

Source: Author's own calculation from attitudinal data from NLSY 1979.

Stratifying the gender ideology classes by sex (Figure 2.1) indicates that the declines in "traditional" class membership have been driven by both men and women identifying less with traditional gender attitudes; by 2004, roughly an equal proportion of women belonged in this class as men. The "progressive" classes for both men and women experienced similar absolute increases over time, with the most change occurring between 1979 and 1987. While the sample size as a whole became more progressive in their attitudes toward gender equity, there remains a large gender gap between men and women.

Figure 2.1: Traditional and progressive classes, by sex



Source: Author's own calculation from attitudinal data from NLSY 1979. *Note:* "Median" individuals not shown.

The LCA results corroborate the large literature documenting that individuals have adopted more progressive (or "egalitarian") gender attitudes over the latter half of the 20th century (Bianchi et al. 2000; Thornton 1989; Kaufman 2000; Thornton and Young-DeMarco 2001).

The results for the first analysis looking at the association between early-life gender ideology and completed fertility, illustrated in Table 2.4, finds that progressive women in 1979 have slightly smaller family sizes (about 10%) than traditional women. The model suggests no significant differences between traditional women and "median" women (using the 1979 gender variable); nor does completed fertility for traditional (1979) men and their progressive or median counterparts for that same year appear to differ.

The Poisson regression results for the second analysis, displayed in Table 2.5, indicate that gender ideology is significantly associated with fertility outcomes. The evidence is much stronger for women, for whom many variants of "progressive" and

"median" gender ideology trajectories are associated with much lower fertility compared to "traditional" gender ideology. Specifically, compared with consistently traditional women (*trad→trad→trad*), consistently progressive women have a 25% smaller family size. Controlling for all other covariates, consistently median women had a 13% smaller family size than their consistently traditional counterparts. For men, consistently progressive males had much lower fertility than their traditional counterparts (around 20% lower completed fertility). The only other statistically significant gender ideology trajectory for men was *trad→med→med* (i.e., men who became less traditional from baseline had fewer kids than those who remained traditional).

It is worth noting that socioeconomic status, race, and marital status all yielded significant results. As expected, controlling for all other variables, low socioeconomic status, being Hispanic and Black, and low educational attainment are associated with greater fertility for both men and women. Immigrant status and year born did not yield significant coefficients, and region was only weakly significant for females.

Table 2.4: Poisson regression results: Completed family size on 1979 gender ideology and other covariates

	Female (N=3885)			Male (N=3691)		
	Coeff.	Sig.	S.E.	Coeff.	Sig.	S.E.
Gender Ideology (ref. = Traditional)						
Median	-0.03		0.03	-0.01		0.03
Missing	-0.41		0.33	-0.34		0.25
Progressive	-0.09	**	0.03	-0.06		0.04
Race (ref. = NH-White)						
Hispanic	0.12	***	0.03	0.25	***	0.04
Black	0.13	***	0.03	0.30	***	0.03
Lifetime Poverty (ref. = Zero)						
One	0.09	**	0.03	0.04		0.03
Two	0.26	***	0.04	0.20	***	0.04
Three	0.34	***	0.05	0.28	***	0.06
Four+	0.61	***	0.04	0.25	***	0.06
Educational Attainment (ref. = High School)						
Less than High School	0.12	**	0.04	0.01		0.04
Some college	-0.03		0.03	-0.06		0.03
College	-0.19	***	0.03	-0.12	**	0.03
Region (ref. = Northeast)						
North Central	0.12	**	0.04	0.05		0.04
South	-0.05		0.03	-0.07		0.04
West	0.05		0.04	0.00		0.04
Marital Status (ref. = Married)						
Never Married	-0.64	***	0.04	-0.93	***	0.04
Separated	-0.11	*	0.04	-0.06		0.06
Divorced	-0.17	***	0.03	-0.17	***	0.03
Widowed	-0.24	**	0.08	-0.42	**	0.15
Immigrant Parents	0.04		0.05	0.04		0.05
Constant	0.79	***	0.08	0.67	***	0.08

Source: NLSY 1979. *Note:* Cohort coefficients were small and insignificant and thus not reported.
*p<.05; **p<.01; ***p<.001

Table 2.5: Poisson regression results: Completed family size on gender ideology trajectories and other covariates

	Female (N=3599)			Male (N=3208)		
	Coeff.	Sig.	S.E.	Coeff.	Sig.	S.E.
Gender Ideology (ref. = trad →trad →trad)						
med →med →med	-0.14	*	0.07	-0.07		0.06
med →med →prog	-0.16	*	0.07	-0.09		0.07
med →prog →med	-0.27	**	0.08	-0.09		0.08
med →prog →prog	-0.18	*	0.07	-0.13		0.08
trad →med →med	-0.10		0.07	-0.13	*	0.06
prog →med →med	-0.19	*	0.08	-0.17		0.11
prog →prog →med	-0.18	*	0.09	0.04		0.11
prog →prog →prog	-0.30	***	0.07	-0.19	*	0.10
Race (ref. = NH-White)						
Hispanic	0.13	***	0.04	0.24	***	0.04
Black	0.14	***	0.03	0.31	***	0.03
Lifetime Poverty (ref. = Zero)						
One	0.10	**	0.03	0.06		0.03
Two	0.25	***	0.04	0.22	***	0.05
Three	0.33	***	0.05	0.33	***	0.06
Four+	0.62	***	0.04	0.33	***	0.07
Educational Attainment (ref. = High School)						
Less than High School	0.10	*	0.04	-0.01		0.04
Some college	-0.02		0.03	-0.05		0.03
College	-0.17	***	0.03	-0.11	**	0.04
Region (ref. = North East)						
North Central	0.12	**	0.04	0.05		0.04
South	-0.05		0.04	-0.07		0.04
West	0.05		0.04	0.00		0.04
Marital Status (ref. = Married)						
Never Married	-0.65	***	0.04	-0.91	***	0.05
Separated	-0.10	*	0.05	-0.06		0.06
Divorced	-0.18	***	0.03	-0.13	***	0.04
Widowed	-0.27	**	0.08	-0.47	**	0.17
Immigrant Parents	0.01		0.05	0.05		0.05
Constant	0.87	***	0.10	0.70	***	0.10

Source: NLSY 1979. *Note:* Only statistically significant gender ideology trajectories for at least one sex reported in output. Gender ideologies represent class membership change from 1979→1987→2004. For example, an individual who moves from progressive (in 1979) to median (in 1987) to traditional (in 2004) would be coded "prog→med→trad". Cohort coefficients were small and insignificant and thus not reported.

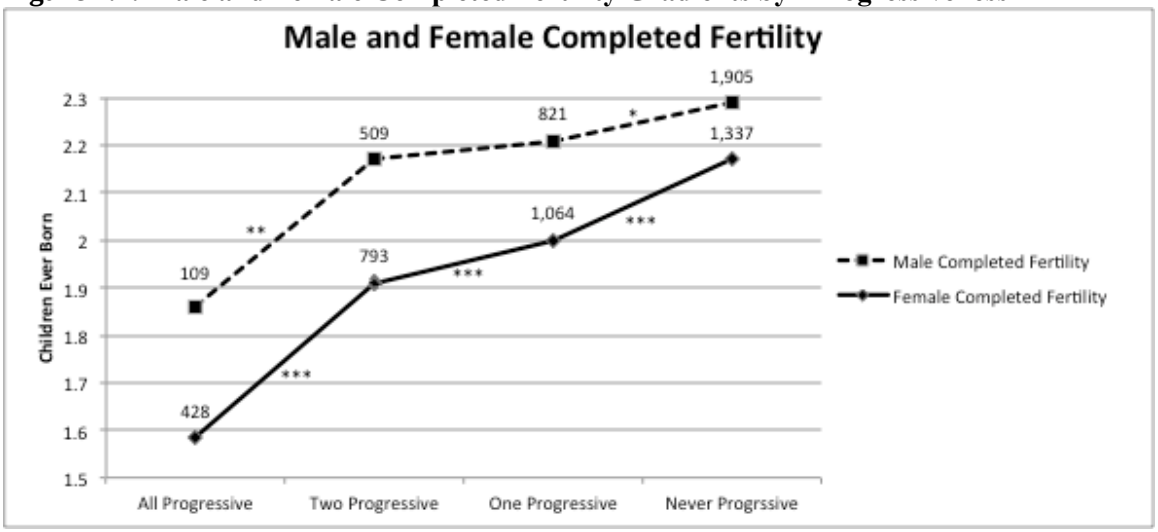
*p<.05; **p<.01; ***p<.001

After estimating the second analysis (Table 2.5), predicted values for children ever born were estimated for each individual based on their gender ideology trajectory and controlling for all covariates.

Figure 2.2 below illustrates average fertility levels for groups of varying levels of "progressiveness". "Consistently Progressive" refers to individuals who belonged to the progressive class in 1979, 1987, and 2004 (e.g., *prog→prog→prog*). "Two Progressive" denotes a group of individuals who fall into any gender ideology trajectories with exactly two progressive categories (e.g., *prog→med→prog*, *med→prog→prog*, etc.). "One Progressive" is constituted of individuals in a gender ideology trajectory of only one progressive class (e.g., *prog→med→med*, *med→prog→med*, etc.). Individuals who never belonged to a progressive class (e.g., *med→med→med*; *trad→trad→med,* etc.) are classified "Never Progressive".

Figure 2.2 shows steep gradients for both men and women by progressiveness. For women, statistically significant fertility levels between all four groups exist, with "consistently progressive" individuals having an average of 1.59 children—well below the replacement rate of 2.05—and "never progressive" females having an average of nearly 2.2. For men, fertility ranges from 1.88 for "consistently progressive" males to 2.3 children for "never progressive" males.

Figure 2.2: Male and Female Completed Fertility Gradients by "Progressiveness"



Source: Author's own calculations from NLSY 1979. *Notes*: Number of individuals belonging to each group above each point. Stars represent significance levels between two groups. "All Progressive" refers to individuals who belonged to progressive class in 1979, 1987, and 2004 (e.g., *prog →prog →prog*); "Two Progressive" denotes a group of individuals in gender ideology trajectories with exactly two progressive categories (e.g., *prog →med →prog*, *med →prog →prog*, etc.); "One Progressive" classifies individuals in a gender ideology trajectory of only one progressive class (e.g., *prog →med →med*, *med →prog →med*, etc.); and "Never Progressive" includes individuals who never belonged to progressive class (e.g., *med →med →med*; *trad →trad →med,* etc.).
*p<.05; **p<.01; ***p<.001

The output for the third analysis, which analyzes the relationship between three birth transitions and gender ideology, is found in Tables 2.6 and 2.7 (for males and females, respectively).

Table 2.6: Male birth progressions estimated using discrete-time models

	Male Birth Progressions		
	Childless to First	**First to Second**	**Second to Third**
Start	1.07*	1.24***	1.33***
	(.016)	(.015)	(.024)
Year Born	0.99	1.1***	1.07***
	(.016)	(.014)	(.02)
Gender Ideology (ref. = Traditional)			
Median	.89	.96	.86
	(.068)	(.07)	(.08)
Missing/Unknown	.4148	.46	.18
	(.31)	(.26)	(.19)
Progressive	0.76**	1	.9
	(.08)	(.09)	(.10)
Race (ref. = NH-White)			
Hispanic	1.6***	1.03	1.66***
	(.16)	(.09)	(.18)
Black	2.8***	1.18**	2***
	(.23)	(.08)	(.17)
Region (ref = North East)			
North Central	1	.98	1.2
	(.10)	(.08)	(.11)
South	0.93	.96	.82
	(.09)	(.08)	(.09)
West	1.07	1.2	1.1
	(.15)	(.1)	(.13)
Marital Status (ref. = Never Married)			
Married	11.83***	2.69***	2.85***
	(.96)	(.18)	(.24)
Separated	7.93***	1.94***	3.25***
	(1.49)	(.36)	(.65)
Divorced	3.86***	1.32	3.55***
	(.68)	(.21)	(.59)
Widowed	1.4	1.1	2.71
	(1.52)	(.92)	(2.36)
Education (ref. = High School)			
Less than HS	1.48*	1.66***	1.16
	(.23)	(.24)	(.3)
Some College	0.99	1.75***	1.59
	(.18)	(.26)	(.38)
College+	1.94***	2.66***	2.38
	(.26)	(.33)	(.49)
Income	1***	1	1
	(2.13e-06)	(1.47e-06)	(1.94e-06)
Immigrant Status	0.85	1.22	1.15
	(.12)	(.13)	(.16)

Source: NLSY 1979.
*p<.05; **p<.01; ***p<.001

Table 2.7: Female birth progressions estimated using discrete-time models

	Female Birth Progressions		
	Childless to First	**First to Second**	**Second to Third**
Start	.99	1.09***	1.19***
	(.011)	(.013)	(.017)
Year Born	1.01	1.1***	1.09***
	(.013)	(.013)	(.017)
Gender Ideology (ref. = Traditional)			
Median	.89	.95	.72***
	(.061)	(.07)	(.06)
Missing/Unknown	1.07	.1.13	2.06
	(.57)	(.56)	(1.05)
Progressive	0.71***	.9	.61***
	(.05)	(.07)	(.06)
Race (ref. = NH-White)			
Hispanic	1.5***	1.1	1.63***
	(.12)	(.08)	(.16)
Black	2.4***	1.2**	1.96***
	(.16)	(.07)	(.16)
Region (ref = North East)			
North Central	1.15	1.11	1.2
	(.10)	(.08)	(.12)
South	0.93	.93	.81*
	(.09)	(.07)	(.08)
West	1.08	1	.89
	(.10)	(.08)	(.10)
Marital Status (ref. = Never Married)			
Married	7.57***	2.66***	3.16***
	(.50)	(.16)	(.25)
Separated	4.42***	1.53**	2.22***
	(.57)	(.21)	(.36)
Divorced	2.79***	1.51**	2.58***
	(.37)	(.18)	(.37)
Widowed	2.85*	.81	1.28
	(1.48)	(.46)	(.81)
Education (ref. = High School)			
Less than HS	1.02	1.61***	.94
	(.23)	(.17)	(.18)
Some College	0.56***	1.32**	1.09
	(.18)	(.16)	(.20)
College+	1	2.23***	1.955
	(.1)	(.22)	(.29)
Income	1***	1	1
	(1.83e-06)	(1.48e-06)	(1.97e-06)
Immigrant Status	0.75*	1.22	1.11
	(.08)	(.11)	(.14)

Source: NLSY 1979.
*p<.05; **p<.01; ***p<.001

The results, illustrated in Tables 2.6 and 2.7, suggest that, controlling for socioeconomic, regional, and demographic variables, gender ideologies are associated with the transitions from childlessness to first birth and from second birth to third birth for women. Compared to women holding a "progressive" gender ideology, females with a "traditional" gender ideology had 1.41 higher odds of having a first birth. No statistical difference between traditional and "median" women existed for this first transition. Furthermore, the model suggests that among women who already had one child, gender ideology did not influence a woman's probability of having a second child. Yet for women who had two children, gender ideology was found to be an important predictor of going on to have a third birth. Specifically, compared to women with "progressive" and "median" ideologies, women with a traditional gender ideology had 1.64 and 1.72 higher odds, respectively, of transitioning from second birth to third birth.

For men, the statistical evidence that gender ideology influences birth progressions is scant. Among the three transition models, the only statistically significant ideology coefficient was that of progressive childless men, who had a .76 lower odds of ever having a child compared to traditionally-thinking men. In other words, men with a traditional gender ideology had 1.35 higher odds of having a first birth than men with a progressive gender ideology.

These results mirror Torr and Short's findings that gender ideology does not influence the probability for individuals to have a second birth. The stigma against single-child families may explain why this is the case: individuals who have one child, regardless of their gender ideology, likely felt pressure to give that child a sibling.

2.6 Discussion and Conclusion

This paper takes a new methodological approach using a rich longitudinal dataset to confirm previous findings in the literature on attitudinal change regarding gender norms in the United States over the latter half of the 20th century.

Using three gender ideology classes, the paper finds that gender ideology is highly correlated with fertility outcomes in the United States. Both men and women with progressive views on gender equity have lower fertility than respondents with traditional views, though these conclusions were stronger, more consistent, and more significant across models for women. Progressions from childless to first birth, and from second to third birth were significantly associated with gender ideology for women, with progressive female respondents having much lower odds of making these transitions than their traditional counterparts. For men, with the exception of progressive men having lower odds of having a first birth than traditional men, there was little evidence that gender ideology is associated with the propensity to have a second or third birth.

The United States joins a number of other developed countries that have relatively high levels of family-oriented gender equity and relatively high fertility. Macro-level analyses generally accept that these two variables are causally related, as greater gender equity allows women to pursue their desired fertility while maintaining their career aspirations. Yet the present study documents a striking inconsistency to this logic, as it finds that the United States' relatively high fertility rate is driven by traditional women who have much higher fertility than their gender egalitarian counterparts. One possible reason for this micro/macro discrepancy is that the overall economic and institutional structure of the United States may promote higher fertility among women of all gender

ideologies. In other words, the gender equity "tide" may increase or decrease the fertility of all gender ideology groups. This hypothesis may also explain other macro/micro inconsistencies in fertility research, such the positive correlation between fertility and female labor force participation on the country-level (Kohler et al. 2002) and the negative correlation between these two variables on the micro-level (Hakim 2003).

In addition to this discrepancy, a number of limitations to this study should be highlighted. First, while a strong theoretical justification can be made as to why gender ideology would influence fertility behavior, having a child could plausibly cause one to change his or her gender ideology. Using the 1979 gender ideology variable in the first analysis (i.e., Table 2.4) lends credence to the argument that gender ideology does indeed influence completed fertility, as the majority of the sample (above 95%) had never given birth in this year. Nonetheless, examining the effect of having a birth on gender ideology, and more broadly, elucidating the correlates of gender ideology change, could provide insight into whether bidirectional causation exists in the gender ideology-fertility relationship.

In a similar spirit, a second limitation is that this paper does not account for the possible effects of religiosity on gender ideology. It is likely that the related familial, community, and institutional components of religion shape one's gender ideology. Appendix I lends support to the idea that religiosity and gender ideology are closely linked by showing the relationship between traditional/progressive class membership and two measures of religiosity, religious affiliation and religious attendance. These four graphs illustrate striking differences in gender ideology on both measures of religiosity. They also show a temporal reversal in class membership whereby individuals of all

religious denominations have become less traditional over time. An important next step in investigating the gender ideology and fertility relationship in the United States should consider the role of religion in shaping these processes. Incorporating religion in cross-national comparisons of the fertility-gender ideology relationship may also benefit the literature by highlighting a potentially unique pathway to relatively high fertility in the United States.

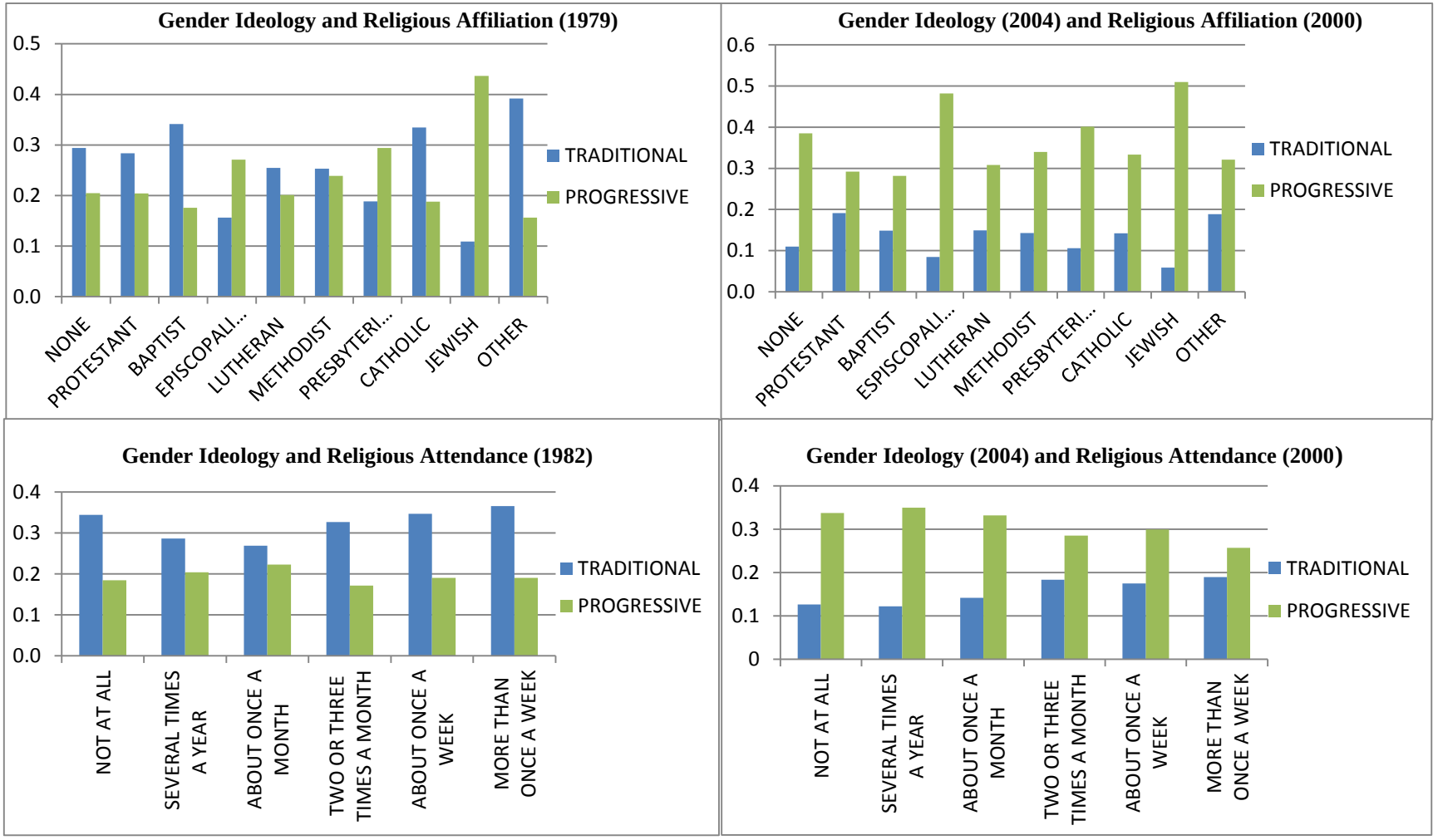
A third limitation is that this study omits variables related to childcare support and labor force participation. It is likely that individuals—especially progressive women—with strong support networks, financial access to childcare, and flexible work arrangements have higher fertility than those without these work-family facilitators.

The final limitation of this study is that, because we do not have data on respondents' spouses, we are examining individuals "in a vacuum", outside of their spousal context. There is likely an interaction effect between the gender ideologies of spouses such that discordant ideologies (i.e., traditional husband and progressive wife) would likely result in much different fertility outcomes than concordant ideologies (i.e., both traditional husband and wife).

Future research would benefit from considering these limitations. Furthermore, integrating more recent data with younger birth cohorts may indicate whether the relationships elucidated in this paper change across temporal contexts. As the individuals of the NLSY spin-off datasets (the "NLSY Children and Young Adults" and the "NLSY 1997") reach the end of their childbearing years, replications of this study would provide insight as to whether differential fertility outcomes by gender ideology are fixed and persistent over time.

2.7 Appendix I: Religion and Gender Ideology

Figures 2.3-2.6: Gender Ideology and Two Dimensions of Religiosity in 1979-1982 and 2000-2004



Chapter 3: Shadow Education and the Quality-Quantity Tradeoff in the 21st Century

3.1 Introduction

In 1986, the Population Council dedicated Volume 12 of its flagship journal, *Population and Development Review*, to "the causes and consequences of the recent scarcity of births in industrial countries" (Davis et al. 1986, p. ix). The journal featured a series of articles by some of the century's most eminent demographers in hopes of giving the phenomenon of low fertility more scholarly attention, with respect to underlying causes, trends and long-term implications. Ansley Coale delved into the demographic effects of below-replacement fertility, Gary Becker developed a model of altruism and the economic theory of fertility, Sam Preston covered the interplay between changing values and falling fertility, Ronald Lee elaborated on the value and allocation of time and its implications for fertility, Paul Demeny showcased the importance of policies surrounding low fertility, and Kingsley Davis and Nathan Keyfitz each gave broad-brush accounts of low fertility from various disciplinary perspectives. While their contributions summarized and innovatively developed economic, sociological, and hybrid approaches to understanding fertility declines in industrial countries, only one - by Shigemi Kono - tied low fertility rates to the rising costs of childrearing induced by educational pressures.

Kono's elaboration on the social landscape of Japan placed emphasis on the country's scarcity of resources and Confucian-inspired work ethic. In turn, according to Kono, these variables have turned Japan into a fiercely competitive society in which the

psychological and monetary costs of children drive down the country's low fertility rate. Kono (1986, p.171) writes:

> In a resource-scarce but advanced society, fierce competition permeates every corner of life…[r]igorous entrance examinations for ranking universities and for large and prestigious corporations become common. Demographic responses to such an environment are to delay marriage and reduce family size.

Kono continues, observing that:

> Severe and ruthless examinations [have] become the style of life in Japan. […] In order to get into a good university, one has to enter a good senior high school, and to get into a good senior high school, one has to enter a good junior high, and so on. In Tokyo at 10:30 P.M. on Friday, suburban trains are filled with primary school pupils aged around 10 who are just returning from well-known juku (after-school cram sessions).

In a governmental poll Kono cites, the three most frequent answers from Japanese couples aged 20-35 as to why they did not attempt to realize their ideal family size were 1) cost of education is too high; 2) raising children requires a lot of money; and 3) raising children imposes heavy physical and psychological burdens (Atoh et al. 1983; Kono 1986). Kono's contribution was important because it shed light on a distinctive fertility-reducing social force Japan possessed that Western Europe did not – a strong and omnipresent quality-quantity tradeoff that permeated all social and economic strata, motivated in part by the economic burden of raising competitive children in an increasingly competitive environment.

The "quality-quantity" tradeoff can be tied back to Arsene Dumont (1890), who argued that parents limit their family size because children hinder their path to success and achievement. Dumont contented that the same holds true for those who would like to "project their ambitions onto their children," as more offspring translates into fewer resources to be dispersed among the children (Van Bavel 2006). Numerous others,

including Banks (1954), Becker (1960), Aries (1980), and Dalla Zuanna (2007) have written extensively about the active effort of parents to limit their fertility in order to pincrease the "quality" of those children.

A separate literature largely ignored by demographers deals with the relatively recent and widespread phenomenon of "shadow education", defined by Baker et al. (2001) as "outside-school learning activities paralleling features of formal schooling used by students to increase their own educational opportunities." Shadow education is concerned with mathematics, languages, sciences, and other school-related subjects—*not* supplementary learning through offerings like Sunday School, choir or ballet, or Boy Scouts (Bray 2011). In a seminal study, Bray (1999) dispels the belief that shadow education is a wealthy East Asian phenomenon, and sheds light on shadow education's global presence in high, medium, *and* low income countries.[28]

This is the first paper to bridge the literatures on shadow education and fertility and to empirically investigate the relationship between shadow education and fertility within a cross-national framework. I begin by reviewing the literature on shadow education and the quality-quantity tradeoff. Next, I use data representing 42 below-replacement fertility countries to explore the country-level association between shadow education rates and fertility. Finally, I explore the individual level relationship between

[28] Bray et al. claim that a decade after Bray's 1999 article, "private tutoring had become recognized as a world-wide phenomenon that transcended geographic and national boundaries, as well as social class boundaries, with both policy makers and researchers beginning to look at the phenomenon more closely" (Bray et al. 2013, p. 2).

educational expenditures and fertility in 12 geographically, culturally, and economically diverse countries.

From the macro-level analysis, after controlling for HDI, I find that shadow education rates are negatively associated with country-level TFRs. The within-country analyses reveal that educational expenditures are negatively associated with fertility in most of the Latin American, Southern & Eastern European, East Asian, and Middle Eastern countries. Consistent with the hypothesis that the quality-quantity trade-off is much less present in Western countries, I find little relationship between individual-level educational expenditures and fertility in the Western countries in the sample (with the exception of Denmark).

3.2 Background

Shadow Education

From Brazil to Korea, Taiwan to Zimbabwe, and Russia to India, private tutoring (or "shadow education") has swept the world by storm over the last three decades (Mori and Baker 2010; Dang and Rogers 2008; Bray 1999; Baker et al. 2001). Shadow education rates vary greatly across countries, though in many places around the world, more than 40% of 15 year olds attend a private cram school (see Figure 3.1 and Table 3.2 below). The ubiquity of shadow education has had rippling effects on many countries' educational landscapes, driving educational and social inequalities and perpetuating a culture of competitiveness (Silova et al. 2006; Bray 1999; Bray and Lykins 2012). It has also become a large financial burden for parents who feel it necessary to send their

children to supplementary private tutoring sessions (Mori and Baker 2010; Bray and Lykins 2012).

If a high prevalence of shadow education raises the anticipated costs of having children to the point where it reduces fertility – as I argue in this paper – then having a clear grasp of the causes of shadow education is important for understanding heterogeneity in fertility rates. This section provides a summary of the literature on the causes of shadow education across countries.

1. School Quality

Parental dissatisfaction with educational systems serves as a major driver of private tutoring in middle and low-income countries (Dang and Rogers 2008; Bray and Lykins 2012). Inadequacies come in many forms, such as teachers failing to show up to school, students finding difficulty in understanding what was taught in class, not learning the necessary content for benchmark exams, or large classes that are perceived to be disadvantageous (Dawson 2010; Bray and Lykins 2012). In places where state run schools are viewed as incompetent, parents not only provide their children with private tutoring to give them an extra "leg up", but also to ensure that their children learn basic skills and concepts (Bray and Lykins 2012).

In more developed countries, dissatisfaction with state-run educational systems does not serve as a sufficient explanation for heterogeneity in shadow education rates. Korea and Greece, for example, have well-funded and well-staffed school systems but also very high rates of shadow education while Finland and Sweden also have well-

funded educational systems but low rates of private tutoring (Bray 1999). Thus, one must dig deeper to explain cross-country differences in shadow education rates.

2. Longstanding Cultural Emphasis on Education

East Asian countries, including China, Korea, Japan, Hong Kong, Singapore, and Taiwan, are dominated by centuries old Confucian values that stress the importance of learning, effort, and various forms of competition (Bray 2010; see also Rohlen and LeTendre 1996; Salili 2005). Moreover, the Confucian-related act of filial piety (respecting one's parents and relatives) lives concomitantly with an assumed duty on the parents to provide their children with the tools and resources to succeed.

3. Economic Shocks

Abrupt economic shocks foment an environment of employment uncertainty, which in turn makes the returns of a top-tier education more valuable. This explanation is best suited for Eastern Europe, where the sweeping social, economic, and political transformations of the early 1990s brought about financial insecurity and increased competition in the labor market (Kubánová 2006). In response to these rapid changes, private tutoring and sending one's children abroad were used as primary strategies for building the family's capital (Murawska and Pukiewicz 2006). Furthermore, over the past two decades the returns on higher education have increased enormously in the region (Kubánova 2006), perpetuating "a necessity" for private tutoring and causing enrollment rates in higher education to double or triple in many Eastern European countries (Silova

2010).[29] On the supply side, teachers who remained in government schools post-socialism were given inadequate salaries and were forced to supplement their income with private tutoring (Bray 2010; Bray 2011). Moreover, pressure from schoolteachers has contributed to an environment in which students feel they would be disadvantaged if they do not pay their teachers for private tutoring (Silova et al., p. 14). It should be noted that Africa resembles Eastern Europe in that teachers are increasingly seeing shadow education as a way of supplementing their incomes while parents see it as a mechanism of social mobility for their offspring (Bray and Suso 2008).

In East Asia, the economic crisis of 1997 is commonly noted for having intensified the competitive environment (Eun 2007; Park 2009). Discussing the climate in Korea, Eun (2007, p. 7) notes that "uncertainty was endemic" and distinguishing oneself from others was a necessity in order to receive the best university education and later, a high-paying and secure job.

4. Socioeconomic and Institutional Inequalities

While a nascent body of literature on shadow education and inequality argues that private tutoring exacerbates socioeconomic inequalities (Dawson 2010; Bray 2009), socioeconomic inequalities may contribute to the demand for shadow education. In a highly stratified society in which income differentials between the most and least educated are large, the incentive to provide one's children with private tutoring is

[29] Private tutoring has become so widespread in parts of Eastern Europe that it has become a contentious political topic in some countries. For example, the Minister of Education and Sport in Poland was quoted in 2005 for saying that in his country only "students at small rural schools" do not partake in private tutoring (Murawska and Pikiewicz 2006)

presumably greater than in a society in which the income gap between the most and least educated is small. After all, if parents can be sure that their offspring will have access to a livable wage – regardless of their eventual educational attainment – it is logical to presume that they will not pursue costly private education as fervently as parents in countries where educational status, often singlehandedly, is perceived to determine one's income and quality of life. Along similar lines, one could suspect shadow education rates to be lower in countries where social support systems ensure access to quality health care, higher education, and generous old age pensions to *all* individuals, regardless of educational background.

One would also expect greater shadow education rates in countries where the social and financial returns to a degree from an "elite" institution are high. For years this has held true in the US and UK, where the perceived benefits of an "Ivy League" or "Oxbridge" education has long driven fierce competition among high school students for admission into one of these institutions. Yet in many countries now, long-standing efforts to promote egalitarianism in higher education have been undermined by the creation of branded academic unions similar to the Ivy League and Oxbridge. Governments and universities alike, in an attempt to create more globally attractive and competitive institutions, have invariably created stratified hierarchies of academic prestige. Notable elite academic groups include China's "G9 League," Germany's "Excellence Initiative Universities," Australia's "Group of Eight," and Korea's "SKY".[30]

[30] There is great variation in the presumed "prestige" of these academic groups. For example, despite Germany's "Excellence Initiative," the German higher education playing field remains much more equal than in Korea, where attending an elite university can greatly influence one's earnings and social position (Card 2005).

Given their prestigious brand, studying at a university belonging to one of these groups is presumed to lead to greater social mobility and higher returns on one's time, efforts, and money. Discussing Japan, Kono (1986, p. 172) writes:

> [An] important factor conducive to low fertility in Japan is the exceedingly rigorous competition for admission to ranking schools such as the University of Tokyo. It is an ordeal not only for the applicants but also for their families. The advantages of success are great, the costs of failure severe. One lucky enough to gain acceptance to a prestigious school wears a badge of honor for the rest of his life. A graduate of a ranking university is usually promoted faster than others and benefits professionally from membership in a network of alumni who hold key positions in government and business. Sometimes, prestigious corporations send notices of job openings only to ranking universities.

And within the context of Korea, McDonald (2011) asserts that:

> The ultimate goal for most students is acceptance at one of the so-called SKY schools — Seoul National, Korea or Yonsei universities. In South Korea's status-conscious society, a degree from a SKY school is nearly a guarantee of a big career and lifelong prosperity. Pedigree is everything.

"Institutional inequalities" are also driven by national and world university rankings (Marginson 2005). That the world has become rank-obsessed can be evidenced by the fact that before 2003, there were no annually published global ranking lists; today there are over fifteen (see Hazelkorn 2012).[31] Millions of students around the globe eagerly await the release of annual national and international ranking tables, and use such "tools" to guide their university selection choices (Dill and Soo 2005; Dill 2006). As the gap between the highly, mediocrely, and low ranked universities becomes more heavily emphasized, it is fair to assume that the drive (and competition) to attend a top-ranking university increases (Dill 2006).[32]

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[31] Among these include the famous "QS World University Rankings", "Times Higher Education World University Rankings", and "U.S. News & World Report's Best Global Universities Rankings"

[32] Take Japan as an example. Kono (1986) cites a national sample conducted by the Office of the Prime Minister of Japan in 1985 in which over 80 percent of respondents aged 20 and over felt that the stature of the universities from which they graduated impacted their position on the social hierarchy and their professional mobility.

Thus, in contexts where socioeconomic and institutional inequalities make the returns to higher education and a "prestigious" degree greater, one should expect higher overall competition. In turn, this competition drives parents to take greater competitive-seeking measures – like providing costly shadow education – to give their offspring a comparative advantage.

5. Rapid Economic Development

Well before shadow education became widespread throughout the world, Dore (1976, p. 11) hypothesized that "the later development starts...the more widely education certificates are used for occupational selection, the faster the rate of qualification inflation, and the more examination-oriented schooling becomes at the expense of genuine education." Dore contended that newly developed (and developing) countries were subject to a "diploma disease" because of large income differentials, greater scarcity of wage/salary jobs, and lacking resources necessary for styles of education that combat rote-memorizing and exam-centered ritualism (Dore 2012). When many people are able to perform the same job, Dore argued, and there is little to choose between them, the use of academic qualifications as a screening mechanism makes the selection process more legitimate and transparent (Walford 1998). Dore explains that this process results from qualification inflation (or a "steady fall in the job-getting value of any particular qualification) and qualification escalation (or a "steady rise in the qualification required for entry into a particular job") (Dore 1976).

Along similar lines, Kohler and I argue that stark intergenerational differences in wealth and opportunities, which are byproducts of rapid development, have exacerbated

the cultural pressure for parents to provide costly education for their children in many developing and recently developed countries (Anderson and Kohler 2013). In these societies, the "grandparent generation" (or "pre-development generation") was raised in impoverished conditions lacking opportunity and social mobility. Their children, the "parent generation" (or "sandwich generation") was born into a world of social and economic transition in which the value of education became overtly important for success in a country with many more people than well-paid jobs. And their children, who we refer to as the "post-development generation," which is comprised of today's children and teenagers, have inherited their parent's education fever mentality. This tri-generational experience of differences in material wealth and social mobility is most apparent in East Asian countries – especially the Asian Tigers (Hong Kong, Korea, Singapore, and Taiwan) and China. While Eastern Europe does not necessary fall into this categorization due to its unique experience with state-run economics, the early 90's economic transition in the region led to greater prospects of social mobility, which in turn fueled the "rapidly-spreading" phenomenon of private tutoring (Silova 2010).

6. High Stakes Exams

National entrance examinations serve as a primary factor of college admissions in many countries worldwide, and reforms of these examinations and their increasing importance for getting into competitive universities have served as a driving force behind high rates of shadow education (Silova 2009; Bray and Lykins 2012). The *Maturita* (Slovakia), *Matura* (Poland), *Gaokao* (China), *Suneung* (Korea), *Prueba de Selección Universitaria* (Chile), *Panellinies* (Greece), and *Vestibular* (Brazil), for example, are not

only needed to finish high school, but are also used to determine the course of one's higher education pursuits. Dabillis (2014) calls the Greek *Panellinies* the "single event that defines a Greek student's success – or failure – in the Greek educational system," and points out that "highest scoring students get first crack at the most desired majors, such as law and medicine" while low scoring students may not even get a chance to study. (In 2014, the country had 70,305 public university spots for over 100,000 students taking the entrance examination). Tutors, who are often professors and teachers, have vested interests in maintaining high-stakes examinations, and for encouraging participation in shadow education (Popa and Acedo 2006, p. 104; Bray 2011).

7. Cohort Size Fluctuation

Demographic forces may also explain heterogeneity in shadow education rates. Takayasu (2003), for example, argues that education fever in Japan has "cooled down" in the 21st century due to long periods of below-replacement fertility. In contrast to its East Asian counterparts of Korea, Taiwan, China, Hong Kong, and Singapore, where fertility fell much more recently and precipitously, Japan has had below-replacement fertility since 1974. This has invariably led to smaller birth cohorts and reduced competition for university spots and labor market positions. The converse of this line of theoretical reasoning is that growing (or large) cohorts fuel competition for limited university places and scarce high-paying jobs, assuming a fixed number of positions (see Easterlin 1978).

8. Longstanding Youth Unemployment and High "Educated Unemployment"

The prevalence of shadow education in Southern Europe has been impressive over the last two decades, though rates still vary widely within the region (see Table 3.2). Reasons for private tutoring mirror those of East Asia and Eastern Europe; increased competition for university spots and a lack of parental confidence in public institutions have led to greater pressure on parents to invest more of their personal income in their children's education (Katsillis and Rubinson 1990; Andreou 2012). Southern Europe also stands out for having relatively high youth unemployment rates – a trend prevalent even before the so-called Great Recession (Kohler et al. 2002). This poor economic climate – especially for young people – has increased the financial return on higher education and has exacerbated the need to provide one's children with a competitive advantage (see Psacharopoulos 2009).[33]

The aforementioned points have reasoned why high rates of shadow education exist across many parts of the world, though they do not address why the phenomenon of shadow education is much less pervasive in Western countries. It is worth noting that Western Europe's small scale of shadow education has only recently increased as a result of increased competitiveness and the marketization of education (Bray 2011), though rates still lie well below those of their Eastern and Southern European counterparts. Strong and equitable educational systems coupled with diversified economic opportunities for young people and a broad array of higher educational opportunities

[33] Though high competition for university spots and jobs are cited as reasons for the necessity of shadow education in Southern and Eastern Europe, some countries do not fit this pattern. For example, Sweden, France, and Belgium have relatively high youth unemployment but relatively low rates of shadow education, while Japan and Korea have low youth unemployment but high rates of private tutoring. For an explanation of these outliers, see Bray (2011) and Anderson and Kohler (2013).

foster an environment in which private tutoring is not a necessity. Especially in Northern Europe, low-achieving students receive additional tutoring through the framework of the public school system (as opposed to a "parallel system"). Furthermore, high-stakes exams are non-existent in Scandinavian countries, which Bray (2011, p. 36) asserts is "no coincidence" that these countries also exhibit low levels of private supplementary tutoring.

Quality-Quantity Tradeoff

During periods of economic development, a growing demand for skilled workers to handle new technologies increases the demand for education (Perrin 2012). Parents often react to these changes by having fewer children in efforts to concentrate their resources and to provide more and higher-quality education for their children. The tradeoff between child "quantity" and child "quality" is a simple and straightforward way to understand the dynamics between human capital accumulation and fertility (Becker and Lewis 1974). Simply referred to as the "quality-quantity tradeoff", this theory has become an integral part of unified growth models with applicability across temporal and spatial contexts (see Galor and Weil 1999; Galor and Moav 2002; Doepke 2004; and Cervelatti and Sunde 2005).

The quality-quantity tradeoff theory has been examined and supported from an historical perspective in a number of empirical papers. Becker et al. (2010) exploit unique census based data from 19th century Prussia and present evidence of a quality-quantity tradeoff. Perrin (2012) tests the existence of the quality-quantity tradeoff for 19th century France, and finds a significant negative correlation linking number of children and female

investments in human capital. Similarly, using parish data from England in the 18-19th century, Klemp and Weisdorf (2011) document a negative effect of family size on literacy. Exploring the relationship between fertility and educational outcomes in early 20th century Ireland, Fernihough (2011) finds that negative impact between sibship size and school enrollment, and notes that this relationship is stronger in more industrialized areas. Despite differences in data and methods, these studies collectively make a compelling case that the quality-quantity tradeoff was indeed present in historical Europe.

Empirical analyses on the quality-quantity tradeoff in the late 20th and early 21st century also suggest that family limitation is closely tied with better offspring outcomes in several contexts. For example, Basu and Desei (2012) document the rise of single child families in India and find that single-child parents 1) are voluntarily having only one child; 2) compared to parents of larger families, single-child parents do not consume more, work more, or enjoy greater leisure time, but rather, they *invest more* in their offspring's education; and 3) competition is driving parents to send their children to private schools and supplement their education with additional lessons. They label this phenomenon "India's Middle Class Dream". Thornton (1979) finds that US parents under the age of 40 in 1975 who have high aspirations for child quality (e.g., education, extracurricular activities, and maternal input) have much lower achieved and intended fertility than parents with low child quality aspirations. And using exogenous variation of fertility brought about by multiple births (i.e., twins) as an instrumental variable, Liu (2014) and Li et al. (2008) demonstrate that in China, the number of children has significant negative effects on child height and educational outcomes, respectively.

Despite the two large bodies of literature on shadow education and the quality-quantity tradeoff, no paper to date has argued that the sweeping phenomenon of shadow education serves as a global driving force of low fertility in the 21st century. My hypothesis, consistent with Becker (1960), is as follows: as competition increases for university admissions and high-paying jobs, the steps taken by parents to ensure offspring success become more necessary, more rigorous, and more expensive. Equipping one's offspring with the educational opportunities to succeed through costly private tutoring (or "shadow education") has become increasingly commonplace around the globe. The high costs of raising children have led parents to increasingly turn to single or two-child families. This relationship should theoretically be observed when looking at heterogeneity in fertility rates both across *and* within countries: *ceteris paribus*, countries with higher shadow education rates should have lower fertility than countries with low participation in shadow education, and *within countries*, parents who have higher human capital input costs for their offspring should have fewer children than parents with lower "quality-enhancing" expenditures. For the latter analysis, I expect the association between shadow education expenditures and fertility to be smaller in magnitude in places where shadow education is less prevalent than in countries where it is widely practiced.

3.3 Data and Methods

For the following empirical analyses, I use the 2009 and 2012 waves of the Programme for International Student Assessment (PISA), a cross-national survey of 15 year old school pupils administered by the Organization for Economic Cooperation and Development (OECD). The primary focus of the PISA initiative is to provide cross-

national comparisons of educational performance in three competence fields – reading, math, and science. The secondary focus is to collect individual and household level economic and demographic data, in addition to participation in education-related events such as private tutoring. For the purpose of this investigation, I use the second area of information. Students chosen to participate in the survey receive a questionnaire and for a subset of countries, parents also complete a questionnaire. Given that the questions asked vary somewhat between waves, I use the 2012 Student Survey for the macro-level analysis and the 2009 Parent Survey for the micro-level analyses.

Macro-Level Analysis

The macro-level analysis tests whether fertility is associated with shadow education rates in 42 low fertility countries (i.e., with TFR values under 2.1).[34] Using the 2012 wave of PISA, I calculate shadow education prevalence rates from the question asking students: "How many hours on average do you spend a week: Attend out of school classes organised by a commercial company, and paid for by your parents." Respondents who answered 1 or more hours were coded "1" (i.e., they participate in shadow education) and respondents who reported no hours were reported as "0" (i.e., they do not participate). These prevalence rates are displayed in Table 3.2. It should be kept it mind that these are simply estimations of shadow education rates *among 15 year olds*, and that rates likely vary by age and school year in different countries. For example, a 1997 survey in Seoul (Korea) found that elementary school children were much more likely to receive private tutoring than academic high school students (82% versus 59%), while a

[34] These countries appear with an asterisk in Table 3.2.

1993 survey in Japan found the opposite (24% of elementary school pupils versus 60% of secondary school students) (Japan 1995; Paik 1998). Furthermore, these numbers capture only the prevalence of students who use outside paid *commercial services* (in some countries colloquially known as "test prep services" and in others, known as "cram schools"). They do *not* capture private tutoring lessons given to students by independent one-on-one tutors. Because the practice of private one-on-one tutoring may be more prevalent in some countries than others, this imprecision is a source of bias in the analysis.

If shadow education prevalence rates proxy for a quality-quantity tradeoff, and if the PISA respondents are 15 years old at the time of the survey, then one must look at country-level fertility measures 15 years *before* the survey was given, as this would be the time when fertility decision making occurred. Thus, the outcome variable included in the analysis is period TFR from 1997. Moreover, because of the well-documented country-level associations between fertility and health, wealth, and education, the UN's Human Development Index, which is a composite score of life expectancy (health), GDP per capita (wealth), and literacy rates/school attendance (education), is used as a moderator variable.

The analysis is run using OLS regression with an interaction term between shadow education rates and HDI under the presumption that shadow education rates could influence fertility differentially at various development levels. After running the regression, I compute the slopes of shadow education rates on TFRs while holding the

value of the moderator variable, HDI, constant at values running from .75-.95 at .025 intervals. The slopes are displayed in Table 3.3 and plotted in Figure 3.2.

Micro-Level Analysis

Using the 2009 parent survey, I employ OLS regression to explore whether fertility differentials exist by educational expenditures in 12 countries. Being the only global survey that includes measures of household level private educational expenditures, family income, parental education, and family size, PISA provides the unique opportunity to examine the relationship between private educational expenditures and fertility, controlling for two important possible confounders: parental education and family income. The countries for which all of these data are available can be geographically clustered into the following groups: **Western** (Denmark, Germany, and New Zealand), **East Asian** (Hong Kong, Macau, and Korea), **Southern** & **Eastern European** (Portugal, Hungary, and Lithuania), **Latin American** (Chile and Panama), and **Middle Eastern** (Qatar).

The key independent variable (educational expenditures) asks parents:

> *"Please answer the following question thinking just of expenses related to <the student who brought this questionnaire home>. In the last twelve months, about how much would you have paid to educational providers for services?"*
>
> Nothing 1
> <More than $0 but less than $W> 2
> <$W or more but less than $X> 3
> <$X or more but less than $Y> 4
> <$Y or more but less than $Z> 5
> <$Z> or more 6

The reference category for the analysis is "none", meaning that the regression is essentially comparing parents who spend nothing on shadow education to parents who spend low, medium-low, medium, high, and very high amounts. As a robustness check, I perform the same analysis using a "medium low" as the reference category for educational expenditures (see Appendix I).

It is important to note that each country has specific categorical ranges that differ based on average purchasing power and income for each country. Moreover, the categories are reported in local currency. Table 3.1 displays the categorical distributions for categories for Denmark, Chile, Portugal, and Qatar to highlight these differences.

Table 3.1: Educational Expenditures Categories in Select Countries

Denmark (DKK)	Chile (PESO)	Portugal (EURO)	Qatar (QT)
None	None	None	None
1-500	0-3500	0-75	500-1000
501-1000	3500-35500	75-3999	1000-6000
1001-5000	35500-67500	4000-7999	6000-11000
5001-20000	67500-100000	8000-11999	11000-16000
20000+	100000+	12000+	16000+

Source: PISA 2009

The "family income" variable resembles the private educational expenditure variable in that there are six categorical ranges for income specific to each country. The top-coding on the very highest income earners and private education spenders should be considered a source of bias when interpreting the results. The second control variable, parental education, is measured as the highest attained educational level by either of the student's parents.

As with the macro-level analysis, the micro-level analysis requires us to consider the timing of fertility making decisions. Specifically, it is important to know the extent to which shadow education was practiced when the 2009 parent respondents made their fertility decisions (in 1994). If participation in shadow education were high in the mid-1990s, it would mean that the parents in the 2009 PISA survey had their children in a context of high competition and faced an anticipated costly upbringing. Conversely, if participation in shadow education in the mid-1990s were low, the argument that parents faced with a strong "quality-quantity tradeoff" would be less compelling.

The Third International Mathematics and Science Study (TIMSS), collected in 1994-1995, provides a rare cross-national snapshot of private tutoring prevalence in a relatively large set of economically diverse nations (Baker et al. 2001). Baker et al.'s analysis of the TIMSS supports the claim that shadow education was widespread in many countries in the mid-1990s: they find that the percentage of middle school respondents receiving shadow education in mathematics alone was 58% in Hong Kong, 50% in Hungary, 48% in Korea, 43% in Lithuania, 20% in New Zealand, 17% in Germany, and 8% in Denmark (Baker et al. 2001). While data for Qatar, Chile, Panama, and Macau are not available in the TIMSS, others have documented that costly educational expenses, in some form or another, were prevalent in Chile and Macau in the mid-1990s. For example, citing UNESCO statistics, Wolff and Castro (2001) report that Chile had the highest percentage of primary and secondary students enrolled in private high schools in South America (nearly 42% and 45%, respectively). Li and Choi (2014) reflect on Macau's longstanding history with high participation in private tutoring. Given the paucity of

scholarly accounts/data on private tutoring prevalence in the mid-1990s in Qatar and Panama, it is difficult to ascertain the extent of the burden imposed on parents by educational expenditures. Nonetheless, the relatively high shadow education rates documented in the TIMSS in Kuwait (25%) and Colombia (85%) – Qatar and Panama's geographically, culturally, and economically similar neighbors, respectively – may serve as some rough indication that shadow education rates were probably not insignificant in Qatar and Panama (Baker et al. 2011).

Figure 3.1: Shadow Education Rates Among 15 Year Olds in Select Countries in Wave 4 PISA Countries[35]

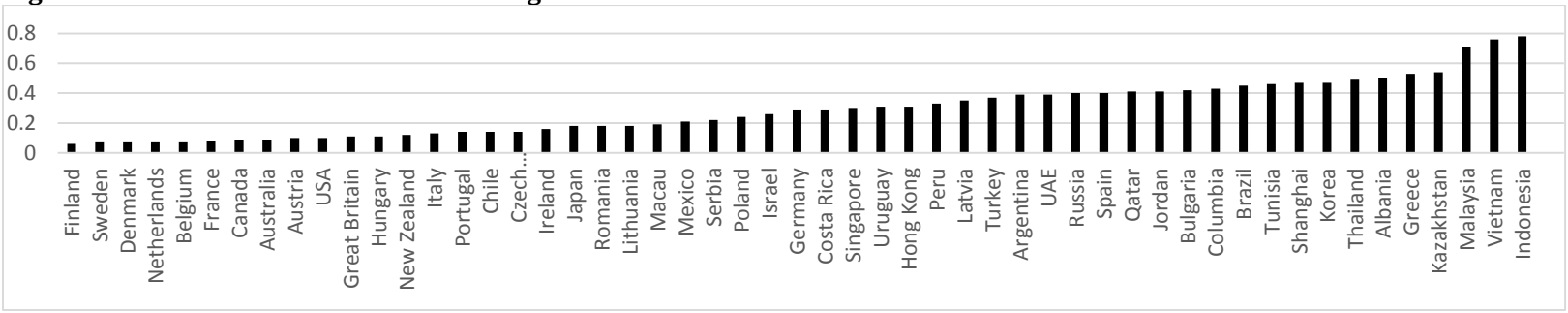


Table 3.2: Shadow Education Rates Among 15 Year Olds in All Wave 4 PISA Countries

Percent of Students Aged 15 in Shadow Education							
Norway*	3%	Switzerland*	12%	Serbia*	22%	Spain*	40%
Finland*	6%	Italy*	13%	Poland*	24%	Qatar	41%
Liechtenstein	6%	Croatia*	14%	Israel	26%	Jordan	41%
Sweden*	7%	Portugal*	14%	Tapei	28%	Bulgaria*	42%
Denmark*	7%	Chile	14%	Germany*	29%	Columbia	43%
Netherlands*	7%	Czech Republic*	14%	Costa Rica	29%	Brazil	45%
Belgium*	7%	Luxemburg*	15%	Singapore*	30%	Tunisia	46%
Iceland*	7%	Ireland*	16%	Montenegro*	30%	Shanghai	47%
France*	8%	Japan*	18%	Uruguay	31%	Korea*	47%
Canada*	9%	Slovakia*	18%	Hong Kong*	31%	Thailand*	49%
Australia*	9%	Slovenia*	18%	Peru	33%	Albania	50%
Austria*	10%	Romania*	18%	Latvia*	35%	Greece*	53%
USA*	10%	Lithuania*	18%	Turkey	37%	Kazakhstan*	54%
Great Britain*	11%	Macau	19%	Argentina	39%	Malaysia	71%
Hungary*	11%	Estonia*	20%	UAE	39%	Vietnam	76%
New Zealand*	12%	Mexico	21%	Russia*	40%	Indonesia	78%

Source: Author's calculated estimates from PISA 2012.
Note: Countries with asterisks had below-replacement fertility in 1997 and are included in macro-level fertility analysis.

[35] Note: Iceland, Croatia, Liechtenstein, Switzerland, Norway, Slovenia, Slovakia, Estonia, Montenegro, Taipei, and Luxemburg were dropped from Figure 3.1 but can be found in Table 3.2.

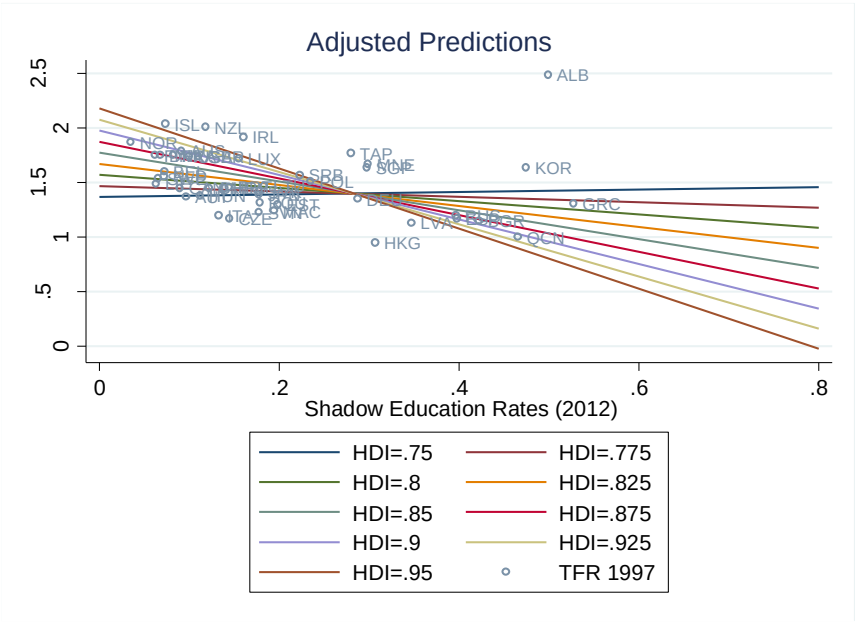
3.4 Results

The margins plot below (Figure 3.2) illustrates the relationship between country-level shadow education rates (2012) and TFRs (1997) in low fertility countries, while holding constant HDI (1997) at different values. It reveals that the slopes for fertility on shadow education prevalence are significant for all values of HDI at or above .80 (see Table 3.3). The divide between moderately high fertility countries and very low fertility countries within the frame of shadow education is stark: Norway, Finland, Australia, Sweden, Denmark, Netherlands, Belgium, Iceland, and France all had shadow education rates under 10% in 2012 and TFRs around 1.7-2 in 1997; Greece, Russia, Spain, Taipei (Taiwan), Germany, Singapore, and Hong Kong all had shadow education rates between 29%-53% in 2012 and TFRs at or below the "lowest-low" fertility mark of 1.3 in 1997. One should consider that many other co-occurring trends and similarities (especially with regard to family structures, gender norms, and institutional policies) are clustered within these two groups of relatively high and relatively low fertility countries, limiting causal inference. Nonetheless, these results suggest that the quality-quantity tradeoff may serve as *one* force driving heterogeneity in fertility rates among the most developed countries.

Table 3.3: Slopes of Shadow Education Rates (2012) on Fertility (1997)

Slope of Fertility on Shadow	HDI	SE	P-Value	95% Confidence Interval	
0.11	0.750	0.34	0.74	-0.58	0.80
-0.25	0.775	0.33	0.46	-0.92	0.43
-0.61	0.800	0.35	0.09	-1.31	0.10
-0.96	0.825	0.39	0.02	-1.75	-0.18
-1.32	0.850	0.44	0.01	-2.22	-0.43
-1.68	0.875	0.51	0.00	-2.71	-0.65
-2.04	0.900	0.58	0.00	-3.22	-0.86
-2.40	0.925	0.66	0.00	-3.74	-1.06
-2.76	0.950	0.74	0.00	-4.26	-1.26

Figure 3.2: Slopes of Shadow on Fertility at Different HDI Levels



Source: PISA 2012

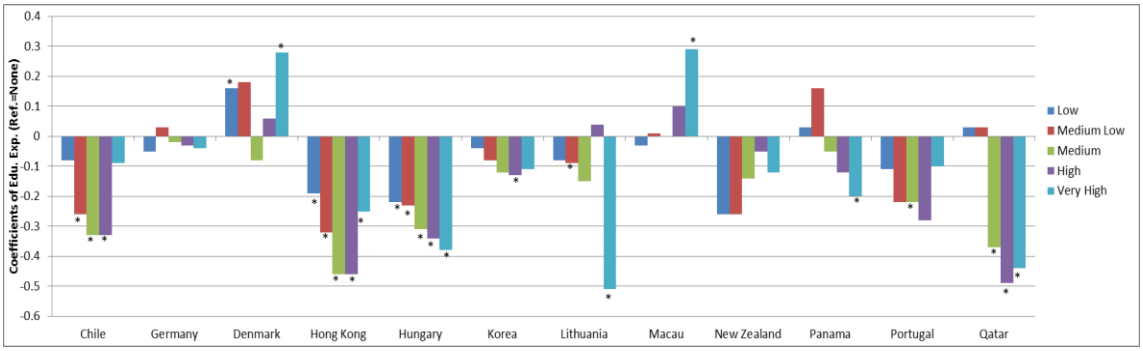
The results from the micro-level (within-country) analyses lend support to the hypothesized quality-quantity tradeoff. As Figure 3.3 and Table 3.4 suggest, looking cross-nationally, the significance and magnitude of the coefficients of the analyses vary from country to country; however, in most countries (Chile, Hong Kong, Hungary, Korea, Lithuania, Panama, Portugal, and Qatar), there appear to be gradients in the expenditure-fertility relationship, such that greater levels of private educational

expenditures are associated with lower levels of completed fertility. While not all of the differences between the educational expenditure levels and fertility are significant (e.g., in Panama and Korea, only one expenditure group displays statistically significant fertility compared to the reference category), the overall patterns of these eight countries present a compelling case that those who spend money on their offspring's shadow education typically have fewer children than those who spend nothing.

The four countries that did not follow the "quality-quantity" pattern can be clustered into two groups. Germany and New Zealand revealed no statistically significant differences between parents who spend nothing on their children's private education and parents who spend low, medium, or high amounts. Denmark and Macau – two widely different countries on a multitude of dimensions – on the other hand, reveal similarly unique patterns: comparing parents of similar educational and income levels, those spending very high amounts on private education in fact have *more* children than parents who spend nothing. As mentioned, because "educational expenditures" and "family income" are categorical variables that have been top-coded (e.g., "$10,000 or more), it is impossible to know the income of "high earners" and the educational expenditures of the "high spenders." This bias may serve as one possible explanation for why Denmark and Macau stand out as outliers in the analysis. Perhaps those who belong to the highest category of spenders are so rich that they have more children. The top-coding of these variables may also explain why we see breaks to the fertility-expenditure gradients in Chile, Hong Kong, Korea, Portugal, and Qatar in the highest spending category (see Figure 3.3).

Using a different reference category confirms that the results are robust: as seen in Table 3.4 (Appendix I), in the eight quality-quantity tradeoff countries highlighted, compared to parents who spend "medium-low" amounts on their children, parents who have higher shadow education expenditures typically have fewer children and parents who spend less on shadow education typically have more children. As with the original analysis, Germany and New Zealand showed no differences in fertility, and Denmark and Macau displayed a somewhat idiosyncratic pattern.

Figure 3.3: Fertility gradients by educational expenditure category (reference: No private tutoring expenses; for full output, see Table 3.4)



Source: PISA 2009
*p<.05; **p<.01; ***p<.001

Table 3.4: Full Output of Micro-level Analysis For 12 Countries (Coefficients and Standard Errors in Parenthesis)

	Chile	Germany	Denmark	Hong Kong	Hungary	Korea	Lithuania	Macau	New Zealand	Panama	Portugal	Qatar
Edu. Expenses (Ref.=Nothing)												
Low	-0.08	-0.05	0.16*	-0.19**	-0.22***	-0.04	-0.08*	-0.03	-0.26	0.03	-0.11	0.03
	(0.06)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)	(0.04)	(0.05)	(0.16)	(0.08)	(0.10)	(0.08)
Medium Low	-0.26***	0.03	0.18	-0.32***	-0.23***	-0.08	-0.09	0.01	-0.26	0.16	-0.22*	0.03
	(0.06)	(0.08)	(0.10)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.16)	(0.12)	(0.09)	(0.08)
Medium	-0.33***	-0.02	-0.08	-0.46***	-0.31***	-0.12	-0.15*	0	-0.14	-0.05	-0.22*	0.37***
	(0.09)	(0.11)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.16)	(0.11)	(0.11)	(0.09)
High	-0.33**	-0.03	0.06	-0.46***	-0.34***	-0.13*	0.04	0.1	-0.05	-0.12	-0.28	0.49***
	(0.12)	(0.12)	(0.06)	(0.08)	(0.06)	(0.06)	(0.11)	(0.08)	(0.19)	(0.10)	(0.16)	(0.11)
Very High	-0.09	-0.04	0.28***	-0.25*	-0.38***	-0.11	-0.51***	0.29***	-0.12	-0.20*	-0.1	0.44***
	(0.09)	(0.17)	(0.07)	(0.12)	(0.10)	(0.07)	(0.14)	(0.08)	(0.18)	(0.10)	(0.27)	(0.10)
Income (Ref.=Very Low)												
Low	0.09	0.21*	-0.27*	0	0.14**	0.02	-0.09	0.02	0.08	-0.35***	-0.08*	-0.11
	(0.05)	(0.08)	(0.12)	(0.05)	(0.05)	(0.04)	(0.05)	(0.03)	(0.08)	(0.09)	(0.04)	(0.07)
Medium Low	0.01	0.05	-0.34**	0.01	0.20***	0.04	-0.11*	-0.06	0.07	-0.41***	-0.12**	0.02
	(0.06)	(0.08)	(0.12)	(0.05)	(0.05)	(0.03)	(0.05)	(0.04)	(0.08)	(0.11)	(0.04)	(0.08)
Medium	0.1	0.07	-0.11	0.05	0.28***	0.01	-0.13**	-0.05	0.11	-0.45***	-0.13**	0.02
	(0.06)	(0.08)	(0.12)	(0.06)	(0.06)	(0.04)	(0.05)	(0.04)	(0.08)	(0.12)	(0.05)	(0.09)
High	0.01	0.03	-0.19	-0.09	0.20*	0.04	-0.06	0	0.01	-0.28*	-0.08	0.06
	(0.06)	(0.08)	(0.12)	(0.07)	(0.08)	(0.04)	(0.07)	(0.06)	(0.08)	(0.11)	(0.05)	(0.09)
Very High	0.12	0.11	-0.11	0	0.37***	0.08*	0.04	0.11*	0.08	-0.43***	-0.10*	-0.09
	(0.06)	(0.08)	(0.11)	(0.05)	(0.07)	(0.04)	(0.12)	(0.05)	(0.07)	(0.09)	(0.04)	(0.07)
Parental Education (Ref.=Basic)												
Some HS	-0.08	-0.14	0.03	0.04	-0.33***	-0.17**	-0.52	-0.09***	-0.02	-0.55***	-0.13***	-0.17
	(0.05)	(0.15)	(0.08)	(0.06)	(0.05)	(0.06)	(0.37)	(0.03)	(0.11)	(0.11)	(0.03)	(0.10)
High school	-0.09	-0.30***	-0.06	-0.20***	-0.39***	.	-0.62	-0.27***	-0.09	-0.39**	-0.12**	-0.17
	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)	.	(0.37)	(0.05)	(0.08)	(0.12)	(0.04)	(0.09)
Some college	-0.07	-0.38***	-0.08	-0.18**	-0.44***	-0.14*	-0.83*	-0.19***	-0.06	-0.46***	-0.09	-0.62***
	(0.06)	(0.07)	(0.06)	(0.06)	(0.07)	(0.06)	(0.37)	(0.05)	(0.08)	(0.09)	(0.07)	(0.10)
College or more	-0.12	-0.27***	0.07	-0.16**	-0.35***	0.23***	-0.81*	-0.34***	-0.13	-0.63***	0.02	-0.87***
	(0.06)	(0.08)	(0.07)	(0.05)	(0.06)	(0.06)	(0.37)	(0.05)	(0.08)	(0.08)	(0.05)	(0.08)
Constant	2.54***	2.36***	2.27***	2.49***	2.53***	2.42***	2.89***	2.29***	2.71***	3.48***	2.33***	4.84***
	(0.06)	(0.09)	(0.12)	(0.07)	(0.06)	(0.08)	(0.36)	(0.05)	(0.17)	(0.08)	(0.10)	(0.10)
N	4954	2238	3233	3910	3596	4806	3781	5517	3070	2622	4142	5266

*p<.05; **p<.01; ***p<.001

3.5 Discussion

The quality-quantity tradeoff theory describes the process whereby parents consciously have fewer children in order to increase "child quality" through resource concentration. In an era of fierce competition in education, I argue that the costly educational expenditures now pervasive in many countries around the world create a 21st century quality-quantity tradeoff. I hypothesize that a stronger quality-quantity tradeoff exists in countries where competition for university spots and top jobs causes parents to invest heavily in their children, and that countries in which shadow education is more pervasive have lower TFRs than countries with low levels of participation in shadow education.

To operationalize these hypotheses, I first look at the relationship between shadow education and fertility across countries. This analysis demonstrates that across low-fertility countries, country-level shadow education rates correlate strongly with TFRs and can explain about 34% of variation in country-level fertility.

I then test the quality-quantity tradeoff within 12 economically, geographically, and culturally diverse countries using individual level data. I use an educational expenditure variable to proxy for "intended child quality," as parents who spend more on their children are presumably doing so in order to boost educational success of that child. My analyses compare the fertility between parents who do not spend anything on additional "shadow education" for their child (the student respondent) with parents who spend various categorical amounts on additional private education. An intuitive concern

with this approach is whether variables like socioeconomic status of the parents influence educational expenditures. To account for this source of possible endogeneity, I control for parental education and family income. Moreover, because the analyses were conducted separately by country, country-level variables, such as national educational standards, average governmental expenditures on schooling, and other institutional, cultural, and economic factors that could influence or attenuate the relationship between fertility and private educational expenditures are, by nature, held constant. The results yield statistically significant fertility-expenditure gradients can be found in 8 out of the 12 countries analyzed, suggesting a "quality-quantity" tradeoff within these countries.

The central findings of this paper are threefold: First, a review of a wide body of literature suggests that the drivers of shadow education are multifaceted. From poor school quality to social and institutional inequalities to high-stakes exams, there is no "magic explanation" as to why shadow education prevalence is high in some countries and low in others. Second, the percentage of 15-year-old students receiving private tutoring around the world spans a vast range, from 3% in Norway to 78% in Indonesia. These estimations confirm a growing body of literature on the ubiquity of shadow education in high, medium, *and* low-income countries. And third, taken together, the across and within population analyses lend credence to notion that the rising phenomenon of shadow education is a strong predictor of fertility.

While this paper offers insight into an unexplored niche in the low fertility literature, several limitations should be noted to 1) highlight the shortcomings of the

analyses and 2) preemptively inform future empirical studies examining the quality-quantity tradeoff with relation to shadow education.

With regard to the macro-level analysis, one key limitation is that the shadow education participation rates estimated in this paper only reflect the percentage of 15 year olds receiving private tutoring. As I have pointed out, the use of shadow education can vary significantly by age and grade.

Moreover, the shadow education participation rate I calculate is a crude measure of *prevalence* that fails to capture the *intensity* of private tutoring. If we imagine a country in which all students receive one hour of private tutoring a week, and another country in which ½ of the students receive ten hours of weekly private tutoring, we would be correct in saying that country A has higher prevalence, while country B has higher intensity. A reasonable hypothesis within the quality-quantity framework is that both the intensity and prevalence of shadow education play into the equation. Future analyses that incorporate both of these dimensions would be helpful in providing a more nuanced evaluation on the macro-level relationship between fertility and shadow education.

A last noteworthy limitation in the macro-level analysis is the use of the period TFR as the outcome variable. While the period TFR continues to be the most commonly used measure in cross-national fertility studies, it suffers from tempo-distortions caused by childbearing postponement. Because different countries found themselves at different stages in the "postponement transition" in 1997 (the outcome variable year), some countries' fertility levels necessarily were biased downwards more than others. Sweden

serves as a prime example of this distortive phenomenon: the TFR of Sweden in 1997 was 1.52, while completed cohort fertility for Swedish women born 1950-1975 never dropped below 1.9.

The micro-level analyses also feature several limitations. First, top-coding on the family income and educational expenditure variables presents a problem with the estimation of the fertility-expenditure relationship among the highest spenders and highest earners. Another limitation is that the PISA data do not include a number of control variables that may attenuate the relationship between shadow education and fertility, such as within-country region (e.g., urban vs. rural) and age of siblings (i.e., birth order). Lastly, there is a possibility of further childbearing among parental respondents, though this is unlikely, as 15 year gaps in childbearing are rare.

An overarching limitation to both the macro- and micro-level analyses is the question of causality. Given the cross-sectional methodological approach and limitations of the data, the findings in this paper do not warrant causal interpretation. Whether couples reduce their fertility *in order to* have higher quality offspring, or couples with fewer children (for reasons unrelated to human capital aspirations of their offspring) have more resources to spend on their children's education is impossible to bear out of any sort of data without explicit questioning about the reason for family size limitation. Future researchers addressing this topic would benefit from more explicit questioning regarding fertility aspirations, the reasons for limiting fertility, and the perceived impact of costly educational expenditures on fertility decision-making.

3.6 Conclusion

Similar to Chapter 1, the driver of low fertility discussed in this Chapter – a strong quality-quantity tradeoff – is also closely tied to rapid economic development and also is part of a homeostatic feedback mechanism. Weak educational institutions coupled with large school-age cohorts competing for limited elite academic spots and well-paying labor market positions, lingering economic uncertainty, generational differences in wealth, large inequalities, and often times, high-stakes exams, foster a culture of "education fever." The result is, as I argue in this Chapter, that parents are more likely to reduce their fertility in order to produce successful, well-educated offspring. However, similar to Chapter 1, as persistent low-fertility generates smaller birth cohorts, competition invariably reduces and so too does the quality-quantity tradeoff.

The above claim not only makes theoretical sense but also can be witnessed from an historical perspective and seems to hold empirically for the world in which we live. There is likely no better case study exemplifying this phenomenon than Japan, a country that can be characterized as having developed rapidly much earlier than its East Asian counterparts (Anderson and Kohler 2013). Takasuya (2003, p. 205) explains that the number of 18-year olds declined from 2.05 million in 1992 to 1.5 million in 2002, resulting in "considerably less intense" competition to get into university in the country. While obtaining a spot at an elite university will persist for Japan's foreseeable future, declining cohort sizes will invariably translate into an easing of competition – especially among less prestigious institutions (Takasuya 2003).

A look at past, current, and projected cohort sizes of 18 year olds in selected low-fertility countries in Table 3.5 illustrates how rapid demographic shifts resulting from low fertility can manifest within just 60 years. Between 1990 and 2050, cohorts of 18 year olds will have fallen by nearly half in Greece, Russia, and Japan, and by almost a two-thirds in Korea.

Table 3.5: Cohort Sizes in Select Countries over Time

	Number of 18 year olds in 1990, 2010, 2030, and 2050			
Year	**Japan**	**Korea**	**Russia**	**Greece**
1990	2,014,572	908,078	2,003,477	167,261
2010	1,226,359	695,687	1,730,310	105,382
2030	1,074,437	411,509	1,771,097	99,746
2050	834,137	337,269	1,248,826	89,272

Source: US Census Bureau

While shrinking country-level cohort sizes may not affect the competition for internationally competitive jobs, they will likely impact the competition in local economies, and perhaps more importantly, the competition within local educational systems. In turn, one would expect the perceived costs of child input to reduce, and that this in turn would cause fertility to increase.

The ubiquity of shadow education and greater competition in education and the labor market create an environment in which large financial pressures are perceived to be needed to ensure "child quality". Should these pressures persist or intensify, one may expect that the quality-quantity tradeoff will become an increasingly important driver of low fertility in the 21st century. Conversely, as low fertility persists across geographical and economic contexts, one may expect an easing of competition through declining

cohort sizes. This paper calls on future researchers to develop surveys and methodological approaches to explicitly assess the extent to which desired child quality influences fertility, and the extent to which low fertility influences the quality-quantity tradeoff.

3.6 Appendix 1: Additional Output. Table 3.6: Micro-level analysis with different ref. category for educ. expenditures

	Chile	Germany	Denmark	Hong Kong	Hungary	Korea	Lithuania	Macau	New Zealand	Panama	Portugal	Qatar
Educational Expenditures												
None	0.26***	-0.03	-0.18	0.32***	0.23***	-0.04	0.09	-0.01	0.26	-0.16	0.22*	-0.03
	(0.06)	(0.08)	(0.10)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.16)	(0.12)	(0.09)	(0.08)
Low	0.18***	-0.08	-0.03	0.13**	0.01	-0.08	0.01	-0.03	0	-0.13	0.11*	0
	(0.04)	(0.07)	(0.12)	(0.04)	(0.05)	(0.06)	(0.06)	(0.03)	(0.06)	(0.11)	(0.04)	(0.06)
Medium	-0.07	-0.05	-0.26*	-0.15***	-0.08	-0.12	-0.06	-0.01	0.13	-0.21	0	-[illegible]**
	(0.07)	(0.11)	(0.12)	(0.04)	(0.05)	(0.06)	(0.07)	(0.04)	(0.07)	(0.13)	(0.06)	(0.07)
High	-0.08	-0.06	-0.12	-0.14*	-0.12*	-0.13*	0.13	0.09	0.21	-0.28*	-0.06	-[illegible]**
	(0.11)	(0.12)	(0.11)	(0.06)	(0.06)	(0.06)	(0.12)	(0.06)	(0.12)	(0.13)	(0.13)	(0.09)
Very High	0.17*	-0.07	0.1	0.06	-0.15	-0.11	-0.42**	0.29***	0.14	-0.36**	0.11	-[illegible]**
	(0.07)	(0.17)	(0.12)	(0.11)	(0.09)	(0.07)	(0.14)	(0.07)	(0.09)	(0.12)	(0.25)	(0.08)
Income (Ref.=Very Low)												
Low	0.09	0.21*	-0.27*	0	0.14**	0.02	-0.09	0.02	0.08	-0.35***	-0.08*	-0.11
	(0.05)	(0.08)	(0.12)	(0.05)	(0.05)	(0.04)	(0.05)	(0.03)	(0.08)	(0.09)	(0.04)	(0.07)
Medium Low	0.01	0.05	-0.34**	0.01	0.20***	0.04	-0.11*	-0.06	0.07	-0.41***	-0.12**	0.02
	(0.06)	(0.08)	(0.12)	(0.05)	(0.05)	(0.03)	(0.05)	(0.04)	(0.08)	(0.11)	(0.04)	(0.08)
Medium	0.1	0.07	-0.11	0.05	0.28***	0.01	-0.13**	-0.05	0.11	-0.45***	-0.13**	0.02
	(0.06)	(0.08)	(0.12)	(0.06)	(0.06)	(0.04)	(0.05)	(0.04)	(0.08)	(0.12)	(0.05)	(0.09)
High	0.01	0.03	-0.19	-0.09	0.20*	0.04	-0.06	0	0.01	-0.28*	-0.08	0.06
	(0.06)	(0.08)	(0.12)	(0.07)	(0.08)	(0.04)	(0.07)	(0.06)	(0.08)	(0.11)	(0.05)	(0.09)
Very High	0.12	0.11	-0.11	0	0.37***	0.08*	0.04	0.11*	0.08	-0.43***	-0.10*	-0.09
	(0.06)	(0.08)	(0.11)	(0.05)	(0.07)	(0.04)	(0.12)	(0.05)	(0.07)	(0.09)	(0.04)	(0.07)
Parental Education (Ref.=Basic)												
Some HS	-0.08	-0.14	0.03	0.04	-0.33***	-0.17**	-0.52	-0.09***	-0.02	-0.55***	-0.13***	-0.17
	(0.05)	(0.15)	(0.08)	(0.06)	(0.05)	-0.06	(0.37)	(0.03)	(0.11)	(0.11)	(0.03)	(0.10)
High school	-0.09	-0.30***	-0.06	-0.20***	-0.39***	.	-0.62	-0.27***	-0.09	-0.39**	-0.12**	-0.17
	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)	.	(0.37)	(0.05)	(0.08)	(0.12)	(0.04)	(0.09)
Some college	-0.07	-0.38***	-0.08	-0.18**	-0.44***	-0.14*	-0.83*	-0.19***	-0.06	-0.46***	-0.09	-[illegible]**
	(0.06)	(0.07)	(0.06)	(0.06)	(0.07)	-0.06	(0.37)	(0.05)	(0.08)	(0.09)	(0.07)	(0.10)
College or more	-0.12	-0.27***	0.07	-0.16**	-0.35***	-0.23***	-0.81*	-0.34***	-0.13	-0.63***	0.02	-[illegible]**
	(0.06)	(0.08)	(0.07)	(0.05)	(0.06)	-0.06	(0.37)	(0.05)	(0.08)	(0.08)	(0.05)	(0.08)
Constant	2.28***	2.40***	2.46***	2.17***	2.30***	2.42***	2.80***	2.30***	2.45***	3.64***	2.11***	4.87**
	(0.05)	(0.10)	(0.15)	(0.04)	(0.06)	-0.08	(0.37)	(0.03)	(0.09)	(0.11)	(0.03)	(0.09)

*p<.05; **p<.01; ***p<.001

Conclusion

4.1 Introduction

The long-term social, economic, and political implications of low fertility are far reaching, affecting labor markets, the fiscal sustainability of social programs, marital and family relationships, demand for immigration, and a variety of population aging related issues (Pritchett and Viarengo 2013). Given these consequences, considerable research attention has been given to the drivers of low fertility. This dissertation adds to a large existing literature on the causes and consequences of low fertility within and across populations by exploring three dimensions of fertility in three chapters: Chapter 1) how are gender regimes related to low fertility, and how and why does this relationship change over time; Chapter 2) how do gender ideologies shape fertility differentials in the United States; and Chapter 3) is the widespread phenomenon of "shadow education" linked to macro or micro level fertility processes. By doing so, this dissertation makes several overarching contributions to the literature.

4.2 Contributions to the Literature

Chapter 1 and the Chapter 3 of this dissertation dissect two drivers of global variation in low fertility countries: gender equity and shadow education. Both chapters argue that the magnitude of these factors have macro-level effects on TFRs in developed countries, whereby low family-oriented gender equity and high participation in shadow education typically translate into low or lowest-low fertility (TFRs <1.5). On the other

hand, countries with high levels of family-oriented gender equity and low participation in shadow education generally have relatively high fertility (TFRs between 1.7-2.1). While these two chapters discuss the *causes* of low fertility in-length, they also touch on an important and novel contribution of this dissertation—that is, that the drivers of low fertility self-correct through a homeostatic feedback mechanism *caused by low fertility*.

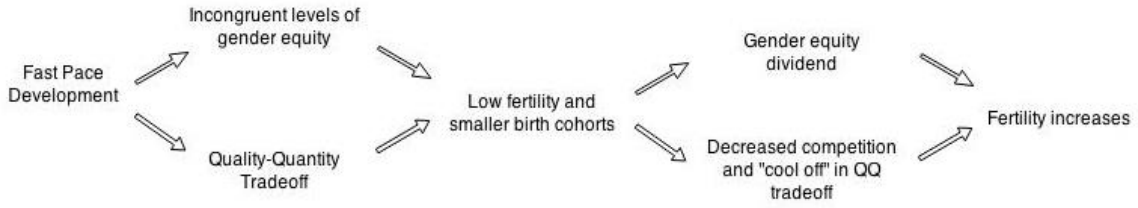
Chapter 1 argued that rapid economic development results in a strong work-family conflict. As a result of this work-family conflict, fertility falls and cohort sizes shrink. Over time, declining birth cohorts translate into a favorable marriage market in which young women gain bargaining power in relationships, thereby weakening the work-family conflict and resulting in fertility increases. We called this period the "gender-equity dividend", and gave the examples of Sweden and the United States – two countries that experienced large shifts in gender norms and fertility throughout the 20th century.

Chapter 3 argued that parents reduce their fertility to increase educational expenditures and produce successful, well-educated offspring. Similar to Chapter 1, the reduced fertility brought about by the "quality-quantity tradeoff" generates smaller birth cohorts, which invariably reduces competition and the quality-quantity tradeoff. As mentioned in Chapter 3, a well-documented example of education fever "cool off" is Japan, where below-replacement fertility has persisted for forty years.

Together, Chapters 1 and 3 demonstrate how low fertility (*caused by* a work-family conflict and strong quality-quantity tradeoff) generates smaller birth cohorts that

weaken the work-family conflict and quality-quantity tradeoff, leading to fertility increases. The following flowchart illustrates the homeostatic feedback process by which low fertility corrects itself.

Figure 4.1: Homeostatic Feedback Process Between Fertility and Gender Equity/Quality-Quantity Tradeoff



A second main contribution of this dissertation, and in particular, of Chapter 1, is that it draws on a long range of historical data and scholarly work to better understand the drivers of low fertility in the early 20th century. As the chapter highlights, the remarkable similarities in fertility patterns between early and late 20th century should prompt scholars of family demography to consider the old adage, "history repeats itself."

This dissertation also contributes to a growing body of unresolved empirical literature on the relationship between gender equity and fertility at the micro-level (Chapter 2) by examining fertility differentials by gender ideology. As the majority of existing literature on this topic has been conducted in Europe, Chapter 2 offers a fresh perspective in an understudied context (the United States) using rich longitudinal data.

A fourth noteworthy contribution of this dissertation is that it bridges together two separately discussed phenomena—low fertility and shadow education—within an existing, well-established framework pertaining to fertility, the quality-quantity tradeoff (Chapter 3). The rapid international expansion of shadow education has fundamentally

changed the financial pressures faced by parents around the world with regards to their offspring's education. It would be imprudent for cross-national comparisons of low fertility – especially those involving non-Western countries – to write off the impact of the financial pressures brought about by shadow education as secondary in importance to other well-established predictors of fertility variation.

4.3 Limitations and Suggestions for Future Research

While the limitations to each of the analyses in this dissertation have been discussed in their respective chapters, there are several overarching limitations that should be highlighted.

First, as Chapters 1 and 2 demonstrate, there is a great need to resolve inconsistencies in empirical findings between the macro- and micro-level. McDonald's theory – that greater household gender equity translates into higher fertility – does not apply to the United States, where traditionally thinking men and women have much higher fertility than their progressive counterparts.[36] Exploration into why these micro-macro inconsistencies exist and developing theoretical models to account for them would serve as fruitful areas of future research.

Furthermore, future research on low fertility may benefit from additional fertility-related questions on global surveys. While many cross-national surveys typically include measures on children ever born (e.g., the World Values Survey and the Programme for International Student Assessment), more detailed data on fertility-related measures would

[36] That McDonald's theory does not apply on the micro-level in the US is not surprising; after all, the framework is explicit in explaining country-level TFR variation.

give researchers a higher degree of methodological freedom to answer more complex questions. Given the limited demographic data on the PISA, for example, the scope of complexity in the micro-level analyses in Chapter 3 was restricted. Moreover, causal inferences in fertility research would be strengthened if surveys featured more explicit questioning about fertility intentions, childbearing motivations, and perceived hindrances to achieving ideal family size.

Finally, any broad theory involving bold predictions is necessarily limited by the uncertainty of future events. With that said, future research should monitor the extent to which the predictions set forth in Chapter 1 play out. Will gender regimes in Southern Europe and East Asia evolve as predicted? Will today's "second-wave developers" follow in the footsteps of "first-wave developers" and experience fertility increases? And will today's swiftly developing countries like China, India, and Brazil become the new poster children of lowest-low fertility in the years to come? As scholars of low fertility debate the future of low fertility and its potentially advantageous or pernicious consequences, continual efforts to strengthen theoretical and empirical approaches will be crucial for understanding the complex dynamics of low fertility.

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