Competition Tightness Underlies the Effect of Population Density on Fertility: A Life History Theory Approach

This paper attempts to suggest an evolutionary psychological approach to understand low fertility. In demographic studies, various approaches including economic, educational, institutional viewpoints have provided robust explanations for the fertility declining in countries focusing on GDP per capita, school enrollment, marriage system, and so forth (e.g., Casterline, 2001; Hirschman, 1994; Robinson, 1997; Smith, 1989). In addition to those explanations, this research proposes that the fertility decline might be analyzed within the relationship between the environmental condition and psychological responses: high population density and low fertility.

In a viewpoint of evolution, higher population density is known as engendering greater competition, leading people to compete with each other to monopolize socially desirable resources (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Levine, Martinez, Brase, & Sorenson, 1994; Isbell, 1991). Under such a dense thus socially competitive environment, it might have been adaptive for most humans in evolutionary past to allocate their time and energy to delay reproduction and slowly accumulate competitive abilities instead of fast reproduction (Kaplan & Gangestad, 2005). According to the Life History (LH) theory (Roff, 1992; Stearns, 1992), a responsive system evolved responds to the cues of density/competition in ones' environment by delaying their reproductive timing and by accumulating competitive abilities such as knowledge and skills to win the social competition (e.i., slow LH strategy). Recent findings supported the density effect on fertility: across nations and across the U.S. states, dense thus socially competitive environments exhibited lower fertility, later marriage age, and greater investment in education (Sng, Neuberg, Varnum, & Kenrick, 2017).

Despite these previous findings regarding the density-fertility relationship, there remains a dearth of research about the psychological mechanism that drives and facilitates the relationship. In this paper, we propose that tightness of competition will take an important mediating role between density and fertility in a nation. Tightness of competition, in this research, is conceptualized as homogeneity in competition goals in a society. Given desirable goals and evaluative standards in a society are defined as values (Schwartz 2003), the concept of tightness of competition is closely related to the cultural tightness: homogeneity in values in a culture (Pelto, 1968; Gelfand et al., 2011). However, note that among various values, this research especially focuses on the values relevant to social competition, that is the goals and standards of competition in a society.

Based on the notion that people faced high density tend to endorse consensus standards of competition to put their long-term efforts to achieve them, we hypothesize that a range of socially desirable goals within a dense society will likely to be converged as a narrow, homogeneous set of ones: if individuals pursue uncommon, uncertain, socially-unguaranteed standards, their long-term efforts

would likely to be futile with regard to achieving higher status in their society. Somewhat consistent with this prediction, previous research on cultural tightness found that higher population density at the national level tightens the range of desired goals in a country or a U.S. state (Gelfand et al., 2011; Harrington & Gelfand, 2014). On top of previous findings regarding the density-fertility relationship, we propose that the tightness of competition may aggravate the intensity of social competition, leading people in a dense environment delay reproductive timing and lower fertility.

The Current Study

Using two different indices of tightness of competition, we test whether tightness of competition statistically mediates the relationship between population density and fertility at the level of nations.

Data and Methods

Population density. We use population density as an independent variable. We obtained population size and land area data of countries in 2017 from the CIA World Factbook (Central Intelligence Agency, 2017).

Fertility. We use total fertility rate and crude birth rate as dependent variables. We obtained total fertility rate and crude birth rate of nations in 2017 from the CIA World Factbook (Central Intelligence Agency, 2017).

Indicators of tightness of competition. Two different indices of the tightness of competition are planned to be used. First, we use cultural tightness of a nation as a proxy of tightness of competition. As noted above, cultural tightness (low tolerance for deviance and homogeneity in values in a culture) might be closely related to the level of tightness of competition in a nation. In this research, we adopted the measurement of cultural tightness of the work of Uz (2014), and thus operationally define standard deviation (*SD*)s of desired values in a society as a proxy of tightness of competition. We plan to obtain those SDs from the dataset from European Values Study Group and World Values Survey Association in the nearest years (Inglehart, et al., 2014). Secondly, based on the notion that higher education functions as a desirable goal provides benefits (OECD, 2011; Blomquist, Coomes, Jepsen, Koford, & 2014), we will use the tertiary school enrollment rate (% gross) of a nation in 2017 as an indicator of level of competition for a desirable goal (i.e., getting higher education) in a nation. We plan to obtain those rates from the dataset from the World Bank (The World Bank, 2017).

In addition, we plan to use GDP per capita and levels of urbanization from World Bank and CIA Factbook in 2017 as covariates to examine the effect of population density statistically controlling for those variables.

Preliminary Results and Expected Findings

In a preliminary analysis, we replicated the previous findings (Sng et al., 2017) that showed the relationship between population density and fertility and birth rates found in previous research (See Table 1). The results showed that population density is negatively correlated with fertility indices.

Table 1. Means, Standard Deviations and Correlations among Variables

	Mean	***SD***	**1**	**2**	**3**
1. Population Density	4.35	1.76	—	-.21**[a]	-.21**[b]
2. Total Fertility Rate	2.53	1.21		—	.98**[a]
3. Crude Birth Rate	19.02	9.38			—

**. Correlation is significant at the 0.01 level (2-tailed).
[a]. n = 223 (countries)
[b]. n = 225 (countries)

Based on these preliminary results, we assume that indices of tightness of competition-SDs of values and tertiary school enrollment rate of nations-will mediate the relationship between population density and fertility (see Figure 1). We will explore whether the indices of tightness of competition fully mediate the relationship between population density and fertility. The effects of GDP per capita and urbanization will be statistically controlled.

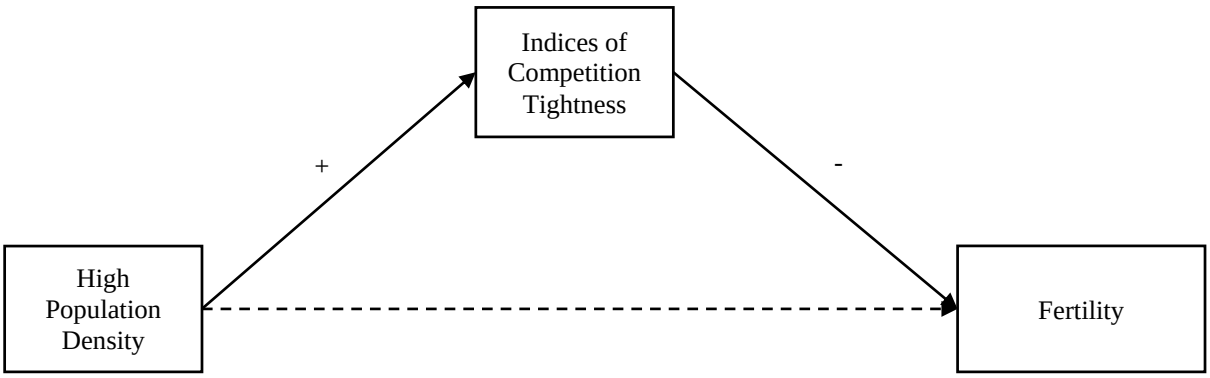

Figure 1. A conceptual model of population density and its impacts on tightness of competition and fertility.

Further, we will try to divide countries into two demographical contexts: 1st and 2nd demographic transition context and the lowest low fertility context (TFR below 1.3). There have been several overarching theoretical approaches to the 1st and the 2nd demographic transitions (e.g., microeconomic approach, generational wealth flow approach, innovation/diffusion approach, institutional approach etc.), approaches that have been able to applied to countries and regions of different social, economic, cultural, and/or historical background. The lowest low fertility context observed among the Southern and Eastern European countries and a number of East Asian countries has yet to be fully addressed by an overarching theoretical approach. Therefore, we will see whether or not the model centered on the tightness of completion that we suggest in the current study can explain

the phenomenon of continued TFR below 1.3 across countries in Europe and Asia during the past three decades.

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