Will Pronatalist Policy Work? The Case of South Korea

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Abstract

The total fertility rate in South Korea has consistently declined from its 2.1 replacement level in 1983 to its current level of 1.23 in 2012. From 2005 to 2010, the government implemented its first pronatalist set of policies to encourage people to have more children. Currently, fertility grants are provided at a provincial level, widely varying in their amounts and qualifications. These pronatalist policies have been found ineffective. This paper examines the desired family size of the university student population in South Korea and their responsiveness to cash transfers. By hypothetically assuming two different levels of cash transfers, I evaluate the elasticity of desired family size along the intensive margin by using the survey data designed as a part of this paper. This paper finds positive effects of the cash transfers on desired family size and a positive correlation between the amounts of the cash transfers and desired family size. Furthermore, desired family size of the middle income group is particularly elastic to the income shock the cash transfers generate.

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1 Introduction

The fertility rate of South Korea has been the lowest among the countries of low fertility rates. In 1983, the total fertility rate of South Korea reached the 2.1 replacement level and further declined to its lowest level of 1.2 in 2008. Although the level of fertility in 2012 showed a marginal improvement by increasing to 1.23, there is little sign of recovering the total fertility rate to the 2.1 replacement level. There are a number of studies, which attempt to disentangle political, sociological, economical and historical factors that have together contributed to the decline of the fertility rate in South Korea These studies present some possible causes of the low fertility rate: for example, 1) changes in economic conditions in general, such as increasing costs of living; 2) higher standard of living and changes in social expectations on males and females; 3) no uniform policies in an effort to promote higher fertility rate (T. Kim 1993; Park 2003; D. Kim 2005).

Thirty years ago, the South Korean government further intensified the family planning program that had first begun in 1962 by campaigning "Even two children per family are too many for our crowded country". "During the 70s and 80s, if there were more than two children in a household, then the parents of that household were often considered barbaric," a professor of economics in South Korea shared his description of how attentive the Korean population was to the family planning at the time. However, the South Korean government started to realize the potential problems caused by the persistently low fertility rates since 1983 along with the ageing population of the country, posing great threats to the future economy in South Korea. The Korean population has been well aware of the problems soon to threat on the country. In response to these widespread concerns, the current Korean central government, led by the first female President Geun-hye Park recently inaugurated in 2013, has identified the current low fertility rate as one of the prime concerns in South Korea and promised its citizens a set of pronatalist policies. During the presidential campaign, President Park discussed general ideas of how to approach the concern. However, as of April 2013, the Korean central government has not yet presented details of the policies (Jun 142).

This paper attempts to evaluate the effects of different levels of cash transfer from the government on desired family size by analyzing survey data collected in South Korea. A randomized trial of survey was designed and administered as a part of the paper, targeting the university student population in South Korea. Before I proceed with this paper, although inspired by the current problem in South

Korea with its low fertility rate, I acknowledge that this paper focuses on desired family size, in particular of, the university students in South Korea and its elasticity, as supposed to actual fertility rate.

This paper unfolds as follows. Section 2 presents historical and policy backgrounds with reviews of related literature. Section 3 presents the hypotheses of this thesis to be tested. Section 4 describes the processes of survey designing, administration and data entry, and provides a description of the dataset as a whole and by some of the variables of importance. Section 5 discusses statistical methods this paper employs to evaluate the data. The results are presented in Section 6, 7 and 8. Section 9 concludes the paper.

2 Motivation and Background

The Family Planning program in South Korea from its first implementation in 1962 to 1985 is considered one of the most effective government programs for lowering fertility rates (Jones et al. 2002; Lutz et al. 2007). However, partly if not wholly because the Family Planning program was too successful, the current fertility rate of South Korea has been the lowest among the OECD countries.[1] In this section, a brief history of the fertility transition in South Korea is presented, followed by an analysis of the Family Planning program during the 70s and 80s and the first pronatalist policies implemented from 2005 to 2010. Lastly, this section attempts to understand the relationsip between desired family size and total fertility rate and discusses the importance and limitations of desired family size in understanding a private choice of number of children to have in the future.

2.1 History of the Fertility Transition of Korea

Kim (1991) divides the Korean demographic transition into five stages "based on changes in the level of fertility, mortality, migration, and population growth along with major political and socioeconomic factors in Korean society" since 1910 (118-9). During the first three stages until the end of the Korean civil war, namely the traditional stage, the early transitional stage and the chaotic stage, the high fertility rate persisted, while the mortality rate declined significantly in South Korea. The following stage is called the late transitional stage. During this period, the total fertility rate began to fall

[1] OECD (2011), OECD Family Database, OECD, Paris

due to the government's active pursuit of its Family Planning programs and economic growth. As Kim (1991) writes, the government program "introduced financial, legal and other disincentives to childbearing" (121). In addition, people became gradually more interested in improving the standard of living and the quality of their children.

Although the changes in socioeconomic conditions contributed to the drastic decline in fertility, government-organized family planning efforts are considered the major factor, which successfully lowered the fertility rate in South Korea. The South Korean government first campaigned for two children per household in the 70s and advanced to encourage people to have one child per household in the early 80s until 1985 when it abolished all the policies related to its family planning efforts. The intensity of this program can be better illustrated by Cohen (1996)'s description of the diffusion of contraception in South Korea during this time period; she writes, "Korea had the highest vasectomy prevalence in a developing country outside of India as of 1988. The Korean vasectomy program also started early, with almost half a million men receiving vasectomies by 1973."[2] Though not confirmed officially, several Korean male adults whom I met during the fieldwork recount their experience of being recommended to receive vasectomy by military officials during the civil defense training in exchange of an official exemption from future trainings in the 70s.

In addition to a drastic decline in the fertility rate, South Korea underwent significant changes in several areas. First, the average education attainment levels for both male and female consistently increased. Doepke (2004) observes a positive correlation between attainment level of education and economic growth in South Korea since the onset of economic liberalization. Second, a rapid decline of fertility in South Korea along with its remarkable economic growth has been frequently analyzed to examine the quantity-quality trade-off with respect to a household's fertility and human capital investment decisions. As Sandmo (1993) summarizes, Gary Becker first formulated this notion of quantity-quality trade-off emphasizing the interaction between the quality and quantity of children in a household setting.[3] In this spirit, there are a number of studies explaining "demographic transition, human capital accumulation, economic growth and convergence" (Hahn et al. 120). In short, all of these studies ultimately find that the decline of the fertility rate in South Korea has

[2] A similar discussion is presented in Liskin et al. (1993)

[3] A formal description of the quantity-quality trade-off is not detailed in this paper. See Becker et al. (1990) for detailed information. The relations between wage and education are also frequently explored using the Korean case (Kim and Topel 1995; Davis 1992; Park et al. 1996).

been closely related to the changes in economic conditions (e.g. wage and cost of living).

2.2 Current Status of the Fertility Rate of Korea and Related Policy Agenda

Currently, South Korea since 1985 has been in the re-stabilization stage according Kim's categorization of the Korean demographic transition (ironically, the South Korean population is far from being stabilized due to a persistent decline in fertility, exasperated by the ageing population). The total fertility rate in South Korea was at 1.23 in 2012 and has been consistently low except in 2000 when the fertility rate slightly improved to 1.72 due to the new millennium baby boom. The major problem with the low fertility rate in South Korea is caused by its ageing population. First, the rate of labor force participation would diminish. Second, although the age dependency ratio of working population and economically dependent population (e.g. the elderly and children) has substantially declined to 38 percent in 2010, the dependency ratio is projected to reach 55.28 percent in 2030, 74.69 percent in 2040 and 89.04 percent in 2050 (Jun et al. 2010). As a result, the costs of pension system and health care would rapidly increase, leading to deficits in the national debt.[4] In an effort to increase the fertility rate, the South Korean government first implemented its pronatalist policy in 2006 until 2010, called "the First Basic Plan for Low Fertility and Aged Society" (the FB plan). Samsik Lee (2009) outlines five categories of the FB plan: 1) Attenuating socioeconomic burden of childcare for family with children; 2) Expansion of childcare infra, with diversity and good quality; 3) Expansion of support for pregnancy and childbirth; 4) Increasing compatibility between works and home; 5) Formulating gender-equal family and social culture. This experiment with pronatalist set of policies ended in 2010 with no evident success.[5] Overall, the South Korean government initiated the FB plan with good intent, but failed to provide effective financial and social incentives to achieve its grandiloquent goal.

[4] Using the methodology presented in Ronald Lee's paper on externalities to childbearing (1991), Jungho Kim (2009) finds that the intergenerational transfer is responsible for the largest part of the externalities to childbearing in South Korea. The imminent problem with the public pension and health care systems in South Korea must have been exasperated by the persistent low fertility rate since 1985. Section 9 discusses this concern more in depth in order to discern whether or not the cash transfer being proposed in this paper is cost-effective in relations to the magnitude of the externality.

[5] Using 2007 data, Lee (2009) concludes that strong positive policy effects are found in health nutrition system for maternity and children, and compatibility between works and home. However, because the year 2007 coincided with demographic effect of increased number of women in childbearing and marriage age, it is difficult to consider the results from his analysis as purely caused by the FB plan.

Since the end of the FB plan, the South Korean central government has not yet provided any set of pronatalist policy uniform across the nation. Instead, cash transfer in the form of a fertility encouragement grant is currently provided at the borough level. However, the amounts of cash transfers and qualification for receiving the grants widely vary across boroughs.[6] Public awareness of the grant and the details about the qualifications and the amount of support are generally low. Studying the policies and practices implemented to encourage childbirth in Sweden, Andersson (2005) concludes that "institutional factors [are shown] to be far more decisive than cultural ones in shaping childbearing [behavior]", and confirms a unified form of family policies on childbearing as a prevailing factor in Sweden. Considering the current situation in which the South Korean government has not initiated any significant nationwide policies since 2010, this paper argues that it is important to formulate a set of pronatalist policies at the national level by the South Korean central government as an effort to encourage childbirth, thereby establishing a foundation on which further policies and practices can be devised.

Desired family size in South Korea is a prime scholarly interest of this paper. Desired family size and total fertility rate are two different measurements; the former does not necessarily lead to a reliable projection of the latter. Bongaarts (1998) examines the causes of the persistent discrepancy between desired family size and actual fertility rate by identifying six factors.[7]

"Given the lack of studies using longitudinal data on individual data on individuals' fertility intentions and preferences, however, little is known, for example, about the extent to which individuals' total wanted fertility is stable, which individuals are likely to adjust it and what factors attenuate its predictive strength."

The relationship between the two measurements is yet to be formally defined and still require further academic investigations. In particular with respect to the Korean case, it is still difficult to fully understand the decision mechanisms regarding desired family size as well as constructing a reasonable connection between its desired family size and actualized family size.

[6]There are a number of boroughs, which do not provide any grants. Some provide very generous grants (e.g. 10,000 USD for the third child), while some provide grants at a marginal level (e.g. 50 USD for the birth of a child).

[7]Bongaarts paper introduces a translation formula involving multiplicative variables, accounting for the six factors identified to explain the gap between DFS and TFR.TFR and DFS in Jun's research (2003) on the case of South Korea. However, not only is it difficult to numerically measure these factors, but "there is no agreed-upon methodology for measuring" them (27). There are few other studies exploring the nature of desired family size (Adsera 2005; Sinha 2004; Heiland et al. 2008). Heiland et al. (2008) write,

3 Hypothesis

As discussed in the previous section, further longitudinal studies on the relations between desired and actualized family size are required to better understand the mechanisms involved in the projection of future fertility rate from self-reported desired family size. Although inspired by the fertility transition and the current low fertility rate in South Korea, this thesis solely evaluates desired family size of the university student population in South Korea and its elasticity to different levels of government cash transfer by using the survey data designed as a part of this research. The survey consists of three different types; Type A and B propose different amounts of cash transfer for childbearing for a third child while the other serves as a control, not proposing any cash transfer from the government.

First, I hypothesize that the presence of government transfer induces a higher number of family size individuals desire, and desired family size (DFS) is positively correlated with amounts of government cash transfer in its aggregate level. By proposing government transfer, the survey manipulates the prospects of individuals' future income. Second, using current monthly family income as a proxy, this paper further analyzes the effects of government transfer on the private choice of future family size along individuals' current family income and other covariates that affect the family income. The DFS choice of those individuals in the low income group is expected to be more elastic to the income shock caused by the hypothetical government transfer than that of those in the high income group. Third, individuals are further divided in terms of their current family income to observe the effects of the cash transfer in each income group by dividing monthly family income into three groups and quantiles.

4 Data

The data used for this paper comes from the survey, which was designed as a part of this research on the private decision of desired family size in South Korea. Although it is true that the process of designing a survey questionnaire and collecting data is a time-consuming task and costly, the advantages of this data are twofold. First, a process of survey design enables one to focus on variables of particular importance. One of the benefits of using a micro-dataset is the capability to observe different variables at the individual level as it is often the case that a certain dataset contains only a portion of variables. In addition to this problem of partiality, available datasets

may not include sufficient data for certain groups within a population on which a study focuses. Therefore, in an effort to integrate all the variables of interest into a single dataset and to concentrate on a target group within an aggregate population, this study chose to create a survey questionnaire and collect data of its own. Second, methodology of data collection often influences the outcome of a micro level dataset. In order to prevent the dataset from being plagued by undesired environmental externalities during survey administration, it was crucial to ensure that there was no exchange of knowledge among individuals; in particular, it was important to prevent possible information spillover about the variation in the survey types. This section of the paper outlines the detailed course of survey designing, sampling and administration, and provides a general description of the aggregate dataset and variables of interest.

4.1 Survey Design: Target, preliminary design, pilot study and revisions

The survey was designed to examine university students in South Korea as its target population group. Perhaps, it is more precise to claim that it was designed to target post-secondary institutions in South Korea, and thus their students. The reasons for choosing university students as a target study group are as follows.

First, according to the 2012 Household Census in South Korea, over 80% of the South Korean population between the ages of 17 and 25 currently attends a post-secondary institution.[8] Therefore, students from diverse socioeconomic backgrounds gather in post secondary institutions in South Korea. Second, as it is the purpose of this thesis to observe the elasticity of desired family size to different levels of government transfers, an institutional setting of university provides an appropriate environment for the administration of different types of surveys.[9] Third, most university students in South Korea continue to be economically dependent on their parents, often until they build a separate household through marriage (Kim 1999 170; Hahn et al. 171). In fact, if attending a university in the same region as their parents' residency, the majority of university students physically live in a house together with their parents. Due to this elongated period of interaction with parents, the students' family background almost certainly takes a vital role in influencing their preference of

[8] KNSO household census 2010

[9] The methodology of survey administration for this survey is discussed in the survey administration sub-section. Furthermore, the advantages and disadvantages of randomization of different survey types as supposed to a uniform survey inquiring a respondent how many children to have in the future in all 3 cases which Survey A, B and C separately ask are presented in the following sub-section.

desired family size in the short run as well as their actual childbearing decision in the long run. As discussed above, due to the elongated dependency, in particular financial, to their parents and their current engagement to an educational institution, it would be possible to identify some of the variables based on which people choose a certain number of children to have in the future.

Lastly and most importantly, the university student population is especially important in studying desired family size. It is generally the case that current university students are likely to reconsider, modify and actualize their fertility decision in a relatively short period of time.[10] Moreover, the current central government in South Korea is in the process of proposing a set of pronatalist policies, although the details and implementation time of it has yet been discussed.[11] If such policies are announced and take effect in the near future, the current university student population will be affected the most. For these reasons, this thesis chose university students in South Korea as its study subject. The preliminary survey was designed with 50 variables on basic personal background information, family background information, and individual's preferred marriage age, desired numbers of sons and daughters and desired family size of the subsequent generation.

The preliminary survey was drafted in order to run a pilot study and identify the questions that cause confusion, need clarification or raise unforeseen problems before implementing a full-scale administration of the survey. Considering these objectives of the pilot study, it was not yet necessary to include any passage or question implying government support in the questionnaire. The pilot study was conducted at two universities in South Korea, where I administered the survey on site. The dataset from the pilot study suggested possible improvements to the administration procedure and questionnaire.

First, it was necessary to formulate a set of administrative rules for the survey. I observed that respondents often conversed and consulted each other for their answers. The reasons for their exchange of answers resulted from confusion about certain questions and their genuine interests in others' answers. However, because the survey included confidential questions such as monthly family income,

[10] A recent study on South Korea finds that marriage postponement in Korea was evident until 2010. However, the average marriage age for both male and female has started to come back down since 2010, though slowly and still not for certain.

[11] The South Korean Government has faced an unforeseen extreme exasperation of the North-South Korean relationship recently. It currently focuses its agenda on the North Korean issue and foreign policies. However, as the popular press and the South Korean population have consistently emphasized and been concerned about potential problems caused by the demographic imbalance of its country, the government is pressured to present effective policy measures to preemptively deal with the problems in near future.

parents' education attainment levels, etc. and the respondents were simply uncomfortable sharing their answers to these questions, the summary statistics of the dataset showed that many of the confidential questions were omitted. Therefore, before the full-scale administration, an introductory speech was drafted, asking participants not to collaborate and focus on their own survey. The final version had 3 types of survey, each only differing by its amount of a hypothetical cash transfer from the government that an inserted passage would ask respondents to assume: Type A with KRW 455,000; Type B with KRW 633,000; Type C without any transfers.[12] The restriction on respondents' interaction was meant to keep them unaware of the difference in survey type at least for the duration of the session. In addition, the restriction was supposed to have respondents feel more secure answering questions as the final version included a greater number of confidential questions including College Entrance Exam (CEE) ranking, and parents' marital status and occupation. The final set of surveys contained a total of 40 questions that would ultimately yield 95 variables in the dataset.[13]

4.2 Sampling, Randomized Survey Administration and Data Entry

In order to obtain a dataset representative of the university student population in South Korea, the governmental units of South Korea were used to regionally divide the country into nine units.[14] The minimum number of four-year universities for Seoul was decided to be four. Then, minimum number of universities for each of the other eight regions was determined proportional to the ratio of total number of universities in Seoul and total number of universities in each region. From each institution, at least 50 samples were to be collected (ideally consisting of 50% survey type A and 50% survey type B) in order to ensure sufficient sample size. Further4more, Survey A and B were randomly mixed in the same proportion during the printing process. Survey type C was printed separately and conducted at three institutions randomly chosen from the institutions already selected for administration of survey A and B.[15]

[12] In terms of USD, the values of government tranfer asked to assume are approximately equivalent to $430 and $600; the currency exchange rate at the time of survey write-up was 1,058.33 KRW/USD.

[13] If interested in seeing the actual survey, contact the author at wookunkim@gmail.com

[14] 9 units are as follows: Seoul the capital of South Korea, Gyeonggido, Gyeongsangnamdo, Geongsangbukdo, Jeonlanamdo, Jeonlabukdo, Chungcheongdo, Jejudo, and Gandwondo. To better illustrate, a map of South Korea is provided in the Appendix.

[15] The author of this paper acknowledges that Survey C was drafted after Survey A and B were sent to each institution, thus randomly chose only three schools out of all the target universities for the administration of Survey C.

In principle, it is also possible to have asked people of their choice of desired family size if the propositions of a cash transfer the three survey types present were true and thus have not had to randomize. The advantages of not randomizing survey type are two-fold. First, it is possible to directly observe how a person choose his or her desired family size differently depending on which amounts of the cash transfer are given. Second, the survey administration could have been less costly. By condensing three types into a single survey, theoretically speaking, only one-third of the samples collected by randomization are necessary to produce the same results. It is also computationally less costly as less control variables need to be introduced. Fully acknowledging such advantages, this paper still chose to randomized the survey types primarily due to the strictly discrete, narrow-ranged manner in which desired family size is observed in data (In South Korea, it is especially true that most people choose their desired family size between 0 to 3). First, a randomized trial with different survey types was more effective in teasing out the causal effects of having different levels of a cash transfer. If encountered simutaneously with three different levels of a cash transfer to which they are asked to provide with their desired family size, it is less likely to see the variation across different levels because choosing one child whe offered no transfer and choosing two or more children when offered could be a huge jump for each individual. Second, administering a single survey with all three levels proposed automatically means that there is an information spillover effect. With the presence of different cash transfers, people may feel pressured to exaggerate their answers or to choose to be stringent with their choices across different amounts of cash transfer. These are precisely the reasons why strict survey administration procedure and environment were planned out before the full-scale administration.

The classroom setting was selected to administer the survey for the following reasons. First, it was ideal to conduct the survey to sufficient number of respondents at the same time because there was a variation in the survey types and it was important for the purpose of this study not to inform people of the variation. A class with more than 50 students was an ideal setting for the survey. Second, in a classroom it would be possible to effectively prevent exchange of knowledge among respondents. However, when choosing a class, it was also important to take into account the characteristics of a class being selected. If a class chosen for the survey happened to be, for instance, a genetic engineering course, male engineering concentrators would make up the majority

of the class in line with the results presented in Freeman's study (2004).[16] Therefore, in order to collect more generalizable data, it would be optimal for the survey to take place in a course or two offered by department of liberal arts.[17]

Initially, over 300 professors at 72 universities in South Korea were informed of the research and asked permission for my visit and the survey administration to their students. Professors from 21 institutions confirmed their participation. In order to attract a greater number of universities by providing a greater level of time flexibility, professors were given a choice to participate in either of the two rounds: the first round taking place during the final exam period before the summer recession and the second round taking place during the first week of the fall semester. As a result, professors from nine more universities confirmed their participation in the second round.[18] Of the universities in the second round, two were two-year colleges located both in Gyeongsangbukdo.

First, the survey was administered during a final exam at 21 universities, which participated in the first round. With permission, I personally went into the exam room 30 minutes prior to the official end time of the final examination. As students came forward to turn in their exam, they were randomly given either Survey A or B and asked to complete the form as thoroughly as possible before they left the room. When 15 minutes were left till the end of the exam, the professor present at the examination made an announcement asking students to participate in the survey before leaving the room and not to collaborate when completing the survey questionnaire. It generally took about 10 to 15 minutes maximum to complete the questionnaire.[19] Second, the survey was administered during a regular class for nine universities, which participated in the second round. Depending on each professor's preference, I visited the class either at the beginning or at the end of the class. Similar to the first rounds, the professors made an announcement asking their students to complete the survey without talking amongst themselves.[20] Because the respondents in the second round began the survey at the same time, it took considerably less time to collect each respondent's

[16]Especially it seems to be the case that the STEM fields are primarily pursed by male students in South Korea. See also "Causal Effects of Single-Sex Schools on College Entrance Exams and College Attendace: Random Assignment in Seoul High Schools" by Park, Behrman and Choi (2012).

[17]Fortuntately for this researcg, almost all the universities in South Korea require their students, regardless of their academic objectives, to complete a uniform set of liberal arts courses.

[18]In Appendix, a complete list of universities which participated in the survey is available.

[19]Depending on how strict each professor was in terms of test timing, the total duration of the survey administration ranged from 40 minutes to an hour.

[20]Compared to the stricter environment of the first round, students in the second round tended to initiate conversation amoung themselves during the session. Therefore, I occasionally made additional announcements reiterating that respondents were not to collaborate until everyone turned in their survey.

survey. There were some instances when a student had a question; however, their questions were often minor and not caused by the questionnaire per se. For example, the most common question was on their age. The survey included a question asking a respondent's American age, which is the standard in official documentation, but not used commonly in South Korea.[21] On August 27th 2012, the survey administration process was completed.

I entered the data and devised a set of rules for checking errors in the data. The data was first entered using Microsoft Excel spreadsheet, and then transferred to STATA. The process of data entry revealed some common errors in the dataset, most of which were caused by certain questions left unanswered. For example, respondents, who did not have any siblings, had a tendency to leave unanswered a question asking numbers of older brothers and sisters and younger brothers and sisters; often they left the question blank instead of filling in zeros. For this type of error, a STATA command was devised to fill the appropriate variables with zeros if a respondent filled over 95 percent of the all questions on the survey. 18 samples in which the respondents left unanswered for all the questions asking their gender, age, monthly family income, desired numbers of son and daughter and three other randomly chosen variables were excluded from the final dataset.[22]

4.3 Data Description

The final dataset contains 3141 samples with 95 variables, representing 30 four-year-universities and two-year-colleges in South Korea.[23] In terms of survey types, sample sizes of Survey A, B and C are 1460, 1443 and 228, respectively. Male and female are represented approximately in the same proportion. The range of age is from 17 to 30 for both female and male. Mean age for female is 20.32 years old, about 1.76 younger than that for male; this mean age gap between male and female roughly can be attributed to the length of the military service required for South Korean male.[24] The last three columns of Table 2 in the Appendix presents t-statistics for the differences between survey types to evaluate the success of randomization. For 11 variables out of 12, the differences

[21] The common system of presenting age in South Korea is age by year, not taking date of birth into consideration. In South Korea, everyone becomes one year older on the New Year's Day.

[22] Of 18 samples, there are 16 samples completely left blank and 2 samples with less than 6 variables answered.

[23] Table 1 in the Appendix presents the summary statistics for some of the key variables of interest, followed by Table 2 in which the summary statistics are presented by survey types.

[24] In addition, compared to female age distribution, male respondents in age 19-21 are considerably less represented almost certainly due to the cutomary choice of entering military service after a year of attending university.

between Survey A and B are found insignificant, confirming that the randomization was a success.[25] The one variable of which the difference was significant at the 95% confidence level is mother's level of education attainment, which should be controlled for when constructing an empirical model. As mentioned earlier, Survey C was only administered at 3 universities (no two-year-colleges), and thus has a comparatively small number of observations from only 3 regions of South Korea. Almost certainly for reason rising from unsuccessful randomization during the printing process with the other survey types, many of the t-statistics indicate that the differences between Survey A and C, and Survey B and C are significant. Like mother's level of education attainment, these variables with high statistical significance are to be controlled in order to account for the variations of Survey C from the other two.

Within the dataset, there are three variables of particular importance in order to test the hypotheses of this thesis proposal: desired family size, survey type, and monthly family income.[26] First, the most important variable is individuals' preference of desired family size. Note that this variable does not appear in the survey, instead desired family size is calculated by taking the sum of desired numbers of sons and daughters. Second, survey type is indicated as variable survey_type. This variable is determined by three different assumptions that respondents were asked to make about the amount of hypothetical government cash transfer, depending on the types of the survey given to them. To better illustrate, the passage inserted into Survey A is as follows:

"This survey assumes that a family with three children receives a card. This card allows the family to spend up to 455,000 KRW a month to cover the expenses related to childcare for three years for the birth of the third child."

The only difference in Survey B is the amount, 633,000 KRW instead. As described earlier, Survey C was drafted without the above passage and was only conducted at three institutions, while the other survey types were collected from all 30 institutions. Third, variable *income_current* indicates each respondent's monthly family income in increments of 10,000 KRW. The mean monthly family income is 473.0156, while the median is at 400. The range of this variable was from 0 to 10000, implying that there are some outliers in the upper percentile. This variable is particularly important

[25]The purpose of presenting this result is to ensure that receiving a certain type of survey is not correlated with the error term.

[26]Table 1 in the Appendix summarizes some of the variables that are particularly relevant to this paper.

to measure the responsiveness of desired family size to government transfer across different income levels. In addition to these variables discussed so far, there are other important variables, which have potential to be incorporated as covariates or control variables: gender, regional identification, College Entrance Examination Ranking, educational attainment levels and occupation categories for parents, parents' marital status, etc.

5 Empirical Methods

This section presents empirical methods used to test the hypotheses of this thesis presented in Section III. First, to verify the effect of government cash transfers, a simple OLS estimation model is given by:

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \varepsilon_i \tag{1}$$

where the LHS variable—desired family size (dfs)—is derived by taking the sum of expected number of son and daughter. The RHS variable, $grant_i$, is a dummy variable signifying whether an individual had the survey type A/B or C as type C does not include a passage asking respondents to assume any government transfer.

Since $grant_i$ is a binary variable taking 0 or 1, the constant α_0 and the coefficient α_1 in the OLS model on average can be written respectively as $\alpha_0 = E[dfs|grant_i = 0]$ and $\alpha_1 = E[dfs|grant_i = 1] - E[dfs|grant_i = 0]$. Note that the effects of both levels of cash transfers proposed in Type A and B are all together evaluated as the coefficient of the binary variable $grant_i$.

Equation (1) is further specified to observe the effects of each survey types by introducing dummy variables, D_i^A and D_i^B, each indicating if an indiviaul received Type A or B. The revised multivariate regression model including the dummies for Type and A and B is given by:

$$dfs_i = \beta_0 + \beta_1 D_i^A + \beta_2 D_i^B + \varepsilon_i \tag{2}$$

The coefficients β_0 and β_1 correspond to estimated effects of survey type A and B respectively on desired family size.

Both Equation (1) and Equation (2) are modeled to estimate the effect of simply including a hypothetical cash transfer in the survey. Furthermore, Equation (2) revised from Equation (1) takes into account different types of the survey; however, it still does not consider the amount of government transfer each survey type proposes. Alternative to Equation (2), a simple OLS regression model with a new variable called which takes the amount of cash transfer is presented below:

$$dfs_i = \gamma_0 + \gamma_1 ST_i + \varepsilon_i \tag{3}$$

ST_i is equal to 0, 455 or 633 for survey C, A and B respectively. According to this regression model, the coefficient represents the estimated effect of the different amounts of government transfer on desired family size approximately in terms of a dollar amount. The regression results of specification (1), (2) and (3) are discussed in the following section.

This section introduced some simple regression models to observe the effects of proposing a government cast transfer and of different transfer amounts being proposed on desired famiy size. Based on these models, the following sections proceed with a formal discussion of covariates (e.g. gender, family income, educational attainment level of parents, high school performance measured by CEE rankings, etc.) in order to verify possible effects of the interaction between personal background and one's exposure to different types of the survey on desired family size, and discuss the estimation results.

6 OLS Results: Effects of Cash Transfer on DFS

Regardless of the different levels of government support, how does the availability of cash transfer make individuals plan more children or less? Before evaluating on the relationship between the desired family size and hypothetical government transfer in an effort to promote population growth and stabilization, I note that estimations using the ordinary least square either linear or nonlinear are presented with non-discrete values. In general it is natural, and thus reasonable to talk about family size with discrete numerical values. However, as this paper attempts to evaluate the effects of implementing a nationwide cash transfer program targeting the current lowest-low fertility in South Korea, OLS estimations, although not in a discrete manner, provide valuable insights regarding the nationwide impacts of the government fertility encouragement program hypothesized in this paper.

The first and fourth columns of Table 3 in the Appendix summarize the regression results of the simple models proposed in the previous section. According to the first column, the effect of the cash transfer is significant on desired family size. With the government transfer regardless of the amounts, individuals on average choose to have 0.21147 more children than when they are not given any transfers; this is statistically significant at the 99% confidence level. With the constant term, α_0 (2.16667), it is possible to draw the following analysis. With the government transfer, the government should be able to increase the birthrate of a given period by 9.76%, assuming a one-to-one relationship between the actual fertility rates and the desired family size.

Specification (2) discussed in Section 5 includes the dummy variables for 2 different survey types with different amounts of cash transfer for having a third child. According to the fourth column of Table 3, the estimated coefficients for D_i^A and D_i^B are 0.2194787 and 0.2034229 respectively. Both are significant at the 99% confidence level. According to the result, providing greater amount of cash transfer yields less DFS although both still have positive effects on DFS. Possibly, there may be a substitution effect with greater cash transfer as individuals become more interested in improving the quality of their child or children they plan to have. In order to confirm this effect, the model should be modified to include and control for the variables which also affect DFS.

The results of the simple linear models presented above inevitably suffer from the omitted variable bias. The grant dummy variable is assumed random assignment, as described earlier in a greater detail. For this reason, theoretically any other personal background variables would be uncorrelated or have at least significantly low correlations with the grant dummy. However, there is one obvious instance where this does not hold. Of the three universities selected to administer the control survey ($grant_i = 0$), one university had a relatively homogeneous group of survey pool, with everyone majoring in Engineering and the majority being male. For this reason, the OLS model should include dummy variables for Engineering major and gender to control for possible plague.[27]

6.1 Modifications

With respect to the dependent variable, desired family size, it is impossible to identify all the variables, which are the determinants of the dependent variable, and to modify the linear regression

[27] This problem is pronounced in the last two columns of Table 2, particularly for the number of engineering majors and the indicator for female of which the t-statistics are highly significant.

accordingly. Here I discuss possible determinants that could be introduced to the model as regressors to tease out the "pure" effects of cash transfer on desired family size.

6.1.1 Current Family Income

The main interest of this paper is to see what effects and how much effect an additional income opportunity enabled by government cash transfer has on the private decision of number of children to have in the future. Every individual in the dataset is currently a university student. Considering the cultural and social context in South Korea, it is unlikely that a respondent is a full-time student and full-time employee of any kind at the same time. There are in fact some cases where full-time workers do attend university; however, the survey pool of the dataset does not include such a case.[28] Here I make note that the survey does not include any questions regarding their labor activity. Students may engage in some activities that could generate some income for their own use in addition to the allowance provided by their parents. However, as observed during the pilot study, the extra income generated by engaging in minor labor activity was almost negligible. For this reason, the paper uses current family income measured in 1000 KRW instead as a proxy for general economic characteristics of each individual. In other words, current family income for an individual is assumed as a current economic status based on which a person reports his or her desired family size. Because it may be quite a confidential question or simply because they are not aware of it at all, some individuals chose not to provide their monthly family income; however, there are still a significant number of observations with the family income answered.[29]

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 high_{75,i} + \alpha_3 grant_i * high_{75,i} + \varepsilon_i \tag{4}$$

$$dfs_i = \beta_0 + \beta_1 high_{75,i} + \beta_2 D_i^A + \beta_3 D_i^A * high_{75,i} + \beta_4 D_i^B + \beta_5 * D_i^B * high_{75,i} + \varepsilon_i \tag{5}$$

In order to examine the effects of income shock caused by the government transfer, I introduce a dummy variable for high-income group, $high_i$, and interaction terms with $grant_i$, D_i^A and D_i^B in order to observe how an individual from a high or low income group responds differently to the

[28] One of the instructions before administering the survey was to ask if anyone was currently employed full-time.

[29] In fact, students are not often aware of their family income in exact amount, thus provided rough estimates of it based on their reasonable conjecture. This is why a majority of the values for family income seem rounded off. Also, it is possible that this variable has measurement error. For this reason, the monthly family income variable is not used directly in this paper. Instead, several dummy variables for different percentiles of mothly family income are introduced.

income shock. The term $high_{75,i}$ indicates whether or not an individual belongs to the upper 75th percentile of monthly family income in the dataset.

6.1.2 Personal Characteristics: Age, Gender, CEE Ranking, etc.

Again, I emphasize that the relationship between desired family size (DFS) and actual fertility rate (AFR) is not clearly defined at this moment. For this reason, it is also difficult to judge whether DFS converges or abruptly jumps to AFR as an individual approaches his or her marriage. On the other hand, it is reasonable to assume that people at different ages do not think uniformly about their future family after marriage and its composition. Similarly, gender should in some degree influence DFS, especially true in South Korea with its military obligation for males. Differences in age and gender mean that each individual has experienced and consequently exposed to different economic and social environment. In order to control for possible variability of DFS caused by age and gender, I include the age and gender variables in the regression model.[30]

It is logical to assume that the number of siblings of an individual has influences how one plans his or her own family in the future. The experience of living without any or with 2, 3 or more siblings should influence people to think in a certain way about family size they desire. Moreover, every college/university student must have taken CEE (College Entrance Examination) as the CEE is universally used in South Korea in college admissions. The CEE is considered to serve as a proxy for academic performance/aptitude of a student, although it is disputable whether the CEE is an appropriate measure for such a proxy just like the SAT, ACT and any other standardized tests. I include total number of siblings and CEE Rankings in the regression models. I also include a dummy variable indicating whether or not an individual currently resides in the capital city of Seoul or in one of the 6 metropolitan cities in South Korea. Compared to the other parts of the country, these regions are more populated and concentrated with industries, and thus have different living conditions and standard of living. It is also true that these regions are different from each other. However, the purpose of including the dummy variable for there more developed regions, namely $urban_i$, is to differentiate individuals who are likely to have experienced different environments

[30]The Appendix presents graphs of mean desired family size by the personal characteristics discussed in this section.

primarily due to the characteristics of the region they currently reside.

$$dfs_i = \alpha_0 + \alpha_1 grant_i + X_i\omega + \varepsilon_i \tag{6}$$

$$dfs_i = \beta_0 + \beta_1 D_i^A + \beta_2 D_i^B + X_i\omega + \varepsilon_i \tag{7}$$

$$dfs_i = \gamma_0 + \gamma_1 ST_i + X_i\omega + \varepsilon_i \tag{8}$$

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 high_{75,i} + \alpha_3 grant_i * high_{75,i} + X_i\omega + \varepsilon_i \tag{9}$$

$$dfs_i = \beta_0 + \beta_1 high_{75,i} + \beta_2 D_i^A + \beta_3 D_i^A * high_{75,i} + \beta_4 D_i^B + \beta_5 D_i^B * high_{75,i} + X_i\omega + \varepsilon_i \tag{10}$$

, where $\vec{X_i} = [\ age_i\ gender_i\ CEE_i\ tosib_i\ urban_i\ college_i\ engineering_i\ \vec{R}\ ]$.

There are 2 two-year-colleges included in the dataset. It is possible that university students and two-year-college students behave differently. For this reason, I introduce a dummy variable indicating 2-year-college students in the dataset. In addition, I would like to control for different universities. However, the characteristics of each institution are uncertain. Instead, it would be better to group universities in terms of the 9 regions in South Korea. In South Korea, universities are ranked roughly in line with the population density of the regions where they are located. For example, in general, universities in Seoul are ranked higher than those in Busan (the second largest city in South Korea). Moreover, universities in the same region share common economic and social characteristics. Moreover, interactions among geographically proximate universities are common in South Korea. For these reasons, I decide to include dummy variables for 8 different regions denoted by vector $\vec{R}$ (a dummy for Seoul is ommited as a base), instead of each institution.

6.1.3 Parents' Education Attainment Level and Profession

In addition to the personal characteristics discussed above, I introduce variables for Parents' Education Attainment Level and Profession to the model. Parents also take a vital role in influencing their children's decision on DFS. Above all, parents are responsible for "giving" one of their children the number of sibling he/she has. Also, they are primarily responsible for the environment in which

their children have grown up.

$$dfs_i = \alpha_0 + \alpha_1 grant_i + X_i\omega + Y_i\delta + \varepsilon_i \tag{11}$$

$$dfs_i = \beta_0 + \beta_1 D_i^A + \beta_2 D_i^B + X_i\omega + Y_i\delta + \varepsilon_i \tag{12}$$

$$dfs_i = \gamma_0 + \gamma_1 ST_i + X_i\omega + Y_i\delta + \varepsilon_i \tag{13}$$

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 high_{75,i} + \alpha_3 grant_i * high_{75,i} + X_i\omega + Y_i\delta + \varepsilon_i \tag{14}$$

$$dfs_i = \beta_0 + \beta_1 high_{75,i} + \beta_2 D_i^A + \beta_3 D_i^A * high_{75,i} + \beta_4 D_i^B + \beta_5 D_i^B * high_{75,i} + X_i\omega + Y_i\delta + \varepsilon_i \tag{15}$$

, where $\vec{Y_i}$ = [edu_mo_i $dummy\_edu\_fa_i$ $prof\_mo_i$ $prof\_fa_i$]. The regression results of the specifications (11), (12) and (13) are discussed in the rest of this section, while the next section presents the results of the other specifications above and develops a discussion of the elasticity of desired family size to the hypothetical cash transfers by presenting linear OLS models including dummy variables that divide the sample population into three or four groups by level of monthly family income, and the appropriate interaction terms.

The regression results of the specifications modified with the personal and family characteristics variables and regional effects are summarized in Table 3 and 4 in the Appendix. The rest of this section focuses on Column (2), (3), (5) and (6) of Table 3 and Column (3) of Table 4. According to Column (3), the estimated effect of receiving either types of survey which proposes a cash transfer is 0.196 when including controls for the personal and family variables and regional effects; the magnitude of the effect is significantly less compared to the estimation in Column (1), 0.211. However, the reason for including the control variables is to treat the omitted variable bias and sample selection bias (engineering major and male dominant control dataset) the simple regression, of which the result is summarized in Column (1), inherently suffers from. As both the coefficient for *grant* and the constant term in Column (3) are less of those in Column (1), the results of the simple regression overestimated how many children people desire without the grant as well as the effect of a cash transfer. Now focusing on the estimations represented in Column (3), people given no cash transfer on average choose to have 1.944 children, slightly less than 2 children. Proposing some levels

of a hypothetical cash transfer induces people to choose 0.196 greater number of children, thus 2.14 children.

Based on the results presented above, one may erroneously conceive that providing some levels of cash transfer could potentially recover the 2.1 replacement level, which the fertility rate of South Korea has never reclaimed since 1985. First, the relationship between desired family and total fertility rate has not been defined. For this reason, it is unjust to simply assume one-to-one relationship and agree that South Korea is going to be free from the problems posed by its low fertility rate. Second, the marginal change in desired family size with respect to the amount of cash transfer has to be further elaborated. The latter can be examined in this paper. For this reason, I return to the simple regression model including the two dummy variables for Survey A and B and discuss the results of the controlled version of the model; the relevant results are summarized in Column (4), (5) and (6) of Table 3. Column (4) shows that the effect of receiving Survey A (offering 455,000 KRW) is greater than that of survey B (offering 633,000 KRW). This result implies that the correlation between the amount of cash transfer and desired family size is negative. However, like the estimation results in Column (1), the simple OLS regression not including any control variables is likely to suffer from omitted variable bias. Column (6) presents the estimation results after controlling for the personal and family characteristics and regional effects. The effects of receiving Survey A and B are 0.184 and 0.212 respectively. These results imply a positive correlation between the amount given to an individual and his or her desired family size in contrast to the results presented in Column (4).

Table 4 presents the results of the regression including variable ST_i, which combines Surveys A, B and C by taking the amount of cash transfer each proposes. With the results presented in Table 4, how much certain amount of cash transfer increases desired family size can be assessed. According to Column (3) of Table 4, a transfer worth of 100,000 KRW on average yields 0.0304 more children. Variable ST_i makes it convenient to retroactively speculate how large the effect would have been if survey respondents were given transfers with amounts different from the ones proposed in the actual survey. The model presented in Table 4 assumes desired family size linearly depends on the amount of cash transfer to be given.

7 OLS Results: Current Income and Elasticity of DFS

The hypothesized cash transfer from the government serves as an income shock and manipulates individual's prospect family income. Along the intensive margin, the government transfer influences an individual decision of how many children to have in the future. From the regression results discussed in the previous section, a positive effect of cash transfer on desired family size was found; the more cash transfer is given, the more children a person desires. In this section, the OLS models including interaction terms are evaluated to shed light on how current economic status of a family effects desired family size 1) when a cash transfer is proposed and 2) when individuals are introduced with two levels of cash transfers from government.

Table 5 in the Appendix summarizes the regression results including the dummy variable indicating those individuals in the upper 75th percentile. In particular, Columns (3) and (6) show the results after controlling for the personal and family characteristics and regional effects. First, according to Column (3), the effect of receiving either of the amounts of cash transfer for those people who are not in the high income group is 0.239, statistically significant at the 95% confidence level. Compared to the result from Column (3) of Table 3, the effect of receiving a cash transfer is significantly higher as the behavior of the high income group is separated out. This implies that individuals not in the high income group, more precisely those who belong to the lower three quartiles of monthly family income, respond more positively to the cash transfer. The coefficient for the high income indicator implies that individuals in the high income group not given any grant on average tend to choose 0.247 more children than those people not in the high income group, nor given any grant. The coefficient estimation of the interaction term ($grant*high_{75}$) is -0.277, of which the magnitude surpasses the effect of providing a cash transfer. According to this result, desired family size of those in the high income group decreases as the cash transfer is proposed. However, the t-statistics for each one of $high_{75}$ and $grant*high_{75}$ fail to reject the null at the 95% confidence level. In order to test the joint significance, Table 5 includes the F-statistics. The F-statistics for $grant$, $high_{75}$ and $grant*high_{75}$ is 1.81, confirming that they are not significant jointly either.

The results summarized in Column (6) are similar to the discussion above in that the behavior of the high income group is not clear due to statistical insignificance. However, with the results presented in Column (6), the following analysis can be drawn. First, it is not clear how people in the high

income group choose their desired family size when not given any grant. However, it is clear that these individuals are inelastic to the cash transfer. The coefficients of the interaction terms with the survey types are both negative enough to offset the effects of providing either of the grant levels. Intuitively speaking, people in the high income group are less constrained by financial resources to start with; therefore, their choice of desired family size stays relatively constant with the presence of possible additional income. Second, individuals not in the high income group are consistent with the hypotheses. The greater the amount of a cash transfer they are offered, the higher number of children they desire to have. In order to further identify which income group is most or least affected by the hypothetical cash transfer, this paper introduces the following specifications:

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 middle_i + \alpha_3 grant_i * middle_i + \alpha_4 high_i + \alpha_5 grant_i * high_i + \varepsilon_i \tag{16}$$

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 middle_i + \alpha_3 grant_i * middle_i + \alpha_4 high_i + \alpha_5 grant_i * high_i + X_i\omega + \varepsilon_i \tag{17}$$

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 middle_i + \alpha_3 grant_i * middle_i + \alpha_4 high_i + \alpha_5 grant_i * high_i + X_i\omega + Y_i\delta + \varepsilon_i \tag{18}$$

$$dfs_i = \beta_0 + \beta_1 D_i^A + \beta_2 D_i^B + \beta_3 middle_i + \beta_4 D_i^A * middle_i + \beta_5 D_i^B * middle_i + \beta_6 high_i + \beta_7 D_i^A * high_i + \beta_8 D_i^B * high_i + \varepsilon_i \tag{19}$$

$$dfs_i = \beta_0 + \beta_1 D_i^A + \beta_2 D_i^B + \beta_3 middle_i + \beta_4 D_i^A * middle_i + \beta_5 D_i^B * middle_i + \beta_6 high_i + \beta_7 D_i^A * high_i + \beta_8 D_i^B * high_i + X_i\omega + \varepsilon_i \tag{20}$$

$$dfs_i = \beta_0 + \beta_1 D_i^A + \beta_2 D_i^B + \beta_3 middle_i + \beta_4 D_i^A * middle_i + \beta_5 D_i^B * middle_i + \beta_6 high_i + \beta_7 D_i^A * high_i + \beta_8 D_i^B * high_i + X_i\omega + Y_i\delta + \varepsilon_i \tag{21}$$

The above specifications basically include dummy variables indicating two different income groups, the middle and high income group; the low income group is omitted from the model for multicollinearity. Monthly family income is divided into these three groups. The interaction terms between each one of the survey indicators ($grant$, D_A or D_B) and each one of the income group indicators are introduced to the models. The results using the above specifications are provided in Table 6. Moreover, this paper futher divides the income group into four categories using the quartiles of

monthly family income as cutoffs. The estimation results of using the four income groups and their interaction terms with one of the survey indicators and relevant F-statistics are summarized in Table 7 in the Appendix.

According to Column (3) of Table 6, the effect of receiving either kind of cash transfer (*grant*) is 0.267 for those people in the low income group. However, this estimation result suffers from a large standard deviation relative to its coefficient (the coefficient is not statistically different from 0 even at the 90% confidence level). Intuitively, two opposing statements can be conjectured about the behavior of those in the low income group. First, people in the low income group respond more rigorously to the hypothetical government program simply because they are on average most restrained by their budget when compared to those people in the middle and high income groups. The coefficient estimation is relatively large possibly because these people were more drawn to the financial incentives than their desire to have additional children. If this is the case in reality, then the result is at least correct in estimating positive effects, although statistically insignificant. Second, it may be that the estimation is completely inaccurate. It is possibly the case that desired family size of those in the low income group is in fact inelastic without and even with the additional income shock. These people are more likely concerned about improving their living conditions. When it comes to having children, they may have a stronger desire to provide the very best growing environment to their children. In order to achieve their goals regarding raising children, people in the low income group may tend to stay relatively consistent with the number of children to have in the future. In this case, these people and the high income group of the previous regression behave similarly in that their choice of desired family size is sticky, but driven by different economic motivations. However, the result cannot confirm either of the scenarios.

The coefficients measuring desired family size in the high income group are not statistically significant both separately and jointly. However, it is still important to note that the estimated coefficients for *grant*, $Income_h$ and their interaction term are in like with the regression results when dividing income groups into only two (presented in Table 5). Desired family size of the people in the high income group is inelastic to the cash transfers, on average staying relatively constant at the size larger than the other groups when these groups are not given a cash transfer. For the middle income group, the estimations are jointly significant at the 99% confidence level, although the coefficients

by themselves are not statistically significant. Based on the estimations and their joint significance, the behavior of the middle income group can be described more clearly than the other groups. The middle income group on average has the lowest desired family size at 1.973 without the cash transfers. When the cash transfers are introduced, the desired family size for the middle income group improves by 10.593% to 2.182. When the indicators for Survey A and B are introduced to the model, the F-statistics for coefficient estimations for each of the survey indicator, the middle group and their interaction terms are only significant at the 90% confidence level, while the F-statistics for the other joint hypotheses and the coefficients individually are not significant. According to Column (6) of Table 6, the effects of each survey type for the low and high income groups, on the one hand, are ambiguous due to their statistical insignificance. On the other hand, the signs and magnitude of the coefficients are in line with what the paper found in Table 5: inelastic desired family size to cash transfer. The effect of providing 455,000 KRW a month (Survey A) is greater than that of 633,000 KRW (Survey B) for the low income group. Because of the statistical insignificance, it is hard to describe precisely the behavior of the low income group. However, based on the estimation results, it may be the case that for the low income group the rate of change in desired family size is at least greater than zero given the transfer proposed in Survey A and less than zero given the amount of transfer proposed in Survey B. The middle income group behaves differently. Their coefficient estimations are more in line with the previous findings. Effects of both Survey A and B are positive and giving more grant induces people to desire more children.

Table 7 in the Appendix summarizes the effects of the cash transfers on desired family size in terms of quartiles of monthly family income. Strong positive effects of proposing cash transfers on desired family size are found except in the fouth quartile of family income. However, the effects in only the second and third quartiles are statistically siginificant at the 90% and 95% confidence levels, respectively. The first and the fouth quartiles behave similarily to the low and high income groups when monthly family income is divided into three groups; the effects in both income groups are statistically not significant, implying that their choice of family size is relatively inelastic to the income shock introduced by the government transfers. The effects of different survey types are positive across all quartiles; only the effects of Survey B in the second and third quartiles are significant at the 95% confidence level. As hypothesized, proposing a greater amount of a cash transfer is found with greater positive effects in the second and fourth quartiles , while this is not

the case for the first and third quartiles. As mentioned, the first quartile behaves analogously to the low income group when income groups are divided into three groups. Therefore, the same reason can be applied to explain the behavior of the first quartile income group. This inconsistency of the result of the third quartile to the hypothesis is possibly caused by relative higher standard errors for the coefficients relevant in measuring the effect of Survey A (the joint hypothesis testing for D_A, $Q3$ and their interaction term fails to reject the null at the 95% confidence level).

8 The Effects of Cash Transfer by Personal Characteristics

Bongaarts (2011) presents some of the determinants of desired family size in the context of Sub-Saharan Africa.[31] However, although somewhat relevant in that his study and this paper focus on desired family size rather than total fertility rate, his findings cannot be directed toward this study for the following reasons. First, the prime focus of his paper is high desired family size and he attempts to evaluate the effects of family planning programs on reducing high desired family size. In contrast, this paper focuses on South Korea and its low fertility rate and desired family size preference. Second, his study and many other studies discuss desired family size in developing countries, while South Korea is a developed country with significantly different social and economic conditions on which people based their fertility choice. Third, this study only looks at the university student population in South Korea as supposed to the aggregate population regardless of having already had children or not. In Section 6, some of the personal characteristics that affect the DFS choice are briefly outlined for the purpose of controlling for those variables in analyzing the effects of different levels of a cash transfer from the government. In Section 7, the effects of government transfer are studied in terms of monthly family income, divided into two and three groups and quartiles. This section examines how some of the personal characteristics influence desired family size when people are proposed with three different amounts of a government transfer. In this section, the discussion is presented in two parts. First, dummy variables indicating some of the personal characteristics variable are examined, followed by the variables that take continuous values.

[31] The determinants are divided into macro-level and micro-level characteristics. First, he finds that desired family size is negatively correlated with "standard measures of socioeconomic development ".The correlation between desired family size and percentage of women schooled, the percentage of children surviving to age 5, and gross domestic product per capita is negative and highly significant. With respect to individual characteristics, more schooling, higher survival and higher incomes are negatively correlated with desired family size.

8.1 Personal Characteristics Variables Indicating Female, Engineering Major and Urban Resident

Column (3) and (6) of Table 3 in the Appendix present the estimated effects of being female, an engineering major and from urban areas, controlling different survey types. The estimation results indicate that being female or an engineering major have a negative impact on desired family size, whereas people from urban areas on average are likely to choose more children. However, none of the effects are highly significant. With these estimations with relatively high standard errors, it is difficult to clearly see what the effects are on desired family size. In fact, it may be the case that these variables in fact do not influence the DFS decision in a clear way. As this paper is interested in evaluating the effect of cash transfer, these personal characteristics are evaluated separately by introducing interaction terms with Variable *grant*, D_A and D_B to the regression models used in Table 3:

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 female_i + \alpha_3 grant_i * female_i + X_i^f \omega + Y_i \delta + \varepsilon_i \tag{22}$$

$$dfs_i = \beta_0 + \beta_1 female_i + \beta_2 D_i^A + \beta_3 D_i^A * female_i + \beta_4 D_i^B + \beta_5 D_i^B * female_i + X_i^f \omega + Y_i \delta + \varepsilon_i \tag{23}$$

, where $\vec{X_i^f} = [\ age_i\ CEE_i\ tosib_i\ urban_i\ college_i\ engineering_i\ \vec{R}\ ]$.

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 engineering_i + \alpha_3 grant_i * engineering_i + X_i^e \omega + Y_i \delta + \varepsilon_i \tag{24}$$

$$dfs_i = \beta_0 + \beta_1 engineering_i + \beta_2 D_i^A + \beta_3 D_i^A * engineering_i + \beta_4 D_i^B + \beta_5 D_i^B * engineering_i + X_i^e \omega + Y_i \delta + \varepsilon_i \tag{25}$$

, where $\vec{X_i^e} = [\ age_i\ gender_i\ CEE_i\ tosib_i\ urban_i\ college_i\ \vec{R}\ ]$.

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 urban_i + \alpha_3 grant_i * urban_i + X_i^u \omega + Y_i \delta + \varepsilon_i \tag{26}$$

$$dfs_i = \beta_0 + \beta_1 urban_i + \beta_2 D_i^A + \beta_3 D_i^A * urban_i + \beta_4 D_i^B + \beta_5 D_i^B * urban_i + X_i^u \omega + Y_i \delta + \varepsilon_i \tag{27}$$

, where $\vec{X_i^u} = [\ age_i\ gender_i\ CEE_i\ tosib_i\ college_i\ engineering_i\ \vec{R}\ ]$.

The results of the above regression models are summarized in Table 9 in the Appendix and discussed below.

8.1.1 Being Female

Of course it is true that the private decision of family size is not solely dictated by either gender; instead, both male and female together decide on how many children to have, although differing in how much influence each gender has on the decision. For this reason, it is important to understand the role of gender in first desired family size itself and second the effects of cash transfer. When the difference in the amount of cash transfer is not specified, the F-statistics for the grant variable, female indicator and their interaction term are significant at the 90% confidence level according to Column (1). The coefficient estimation for the female indicator is -0.060, implying that on average women choose a lower number of desired family size compared to males when given no grant. Recall Lee's evaluation of the FB plan (2009) in South Korea. Many components of the FB plan were concerned about the labor environment for females in South Korea. His study finds a strong policy effect in compatibility between work and home. However, the negative effect of being female indicates that female university students in South Korea consider having children more costly than male students.

The hypothetical cash transfer is effective in inducing more children for females as well as males. On the one hand, with the presence of cash transfer, male students still choose slightly more children than female students by 0.021. On the other hand, cash transfer compensates the opportunity costs perceived by female students if having more children. Taking into account the differing amounts of the transfer, the greater the amount offered, the more children both males and females plan to have. Desired family size of females is less in terms of not only quantity, but also elasticity to changes in the amount of cash transfer.

8.1.2 Majoring in Engineering and Living in Urban Areas

In contrast to the result summarized in Table 3 that finds a negative effect of majoring in engineering, Column (3) and (4) show a positive effect of majoring in engineering. On average, without cash transfer, students majoring in engineering choose 0.064 higher number of desired family size than those not majoring in engineering. Although cash transfers have positive effects for them, engineering students are less responsive to the transfer offers. The coefficients for all the interaction terms are

negative, implying that engineering students in general choose a greater number of desired family size, but respond less positively to cash transfers. This analysis is particularly important because Type C was only administered at 3 institutions and had a substantially high proportion of its population whose major is engineering. The omitted preferences are positive correlated with both Type C and the RHS variable in Tables 3, 4, 5, 6 and 7. With this result, it can be concluded that the previous estimation results testing the effects of cash transfer are conservative and likely to have been underestimated. Students living in urban areas also choose slightly greater desired family size (by 0.019) without any transfers. The desired family size for them is in general more elastic to the cash transfers than that for those not living in urban areas.

8.2 Continuous Personal Characteristics Variables: Age, CEE Rank and Total Number of Siblings

Assuming a linear relationship between desired family size and age, College Entrance Exam (CEE) rank and total number of siblings, the regression results presented in Table 3 show that age and total number of siblings positively affect desired family size while the effect of CEE rank is negative. In particular, the estimation for the effect of total number of siblings on desired family size is relatively strong and significant at the 95% confidence level. Here, this paper attempts to further analyze the effects of these variables that take continuous values on desired family size when individuals are given different amounts of cash transfers. In order to do so, the specifications used in Columns (3) and (6) of Table 3 are modified as follows:

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 age_i + \alpha_3 grant_i * age_i + X_i^a \omega + Y_i \delta + \varepsilon_i \tag{28}$$

$$dfs_i = \beta_0 + \beta_1 age_i + \beta_2 D_i^A + \beta_3 D_i^A * age_i + \beta_4 D_i^B + \beta_5 D_i^B * age_i + X_i^a \omega + Y_i \delta + \varepsilon_i \tag{29}$$

, where $\vec{X_i^a} = [\ female\ CEE_i\ tosib_i\ urban_i\ college_i\ engineering_i\ \vec{R}\ ]$.

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 CEE_i + \alpha_3 grant_i * CEE_i + X_i^c \omega + Y_i \delta + \varepsilon_i \tag{30}$$

$$dfs_i = \beta_0 + \beta_1 CEE_i + \beta_2 D_i^A + \beta_3 D_i^A * CEE_i + \beta_4 D_i^B + \beta_5 D_i^B * CEE_i + X_i^c \omega + Y_i \delta + \varepsilon_i \tag{31}$$

, where $\vec{X_i^c} = [\ age_i\ gender_i\ engineering_i\ tosib_i\ urban_i\ college_i\ \vec{R}\ ]$.

$$dfs_i = \alpha_0 + \alpha_1 grant_i + \alpha_2 tosib_i + \alpha_3 grant_i * tosib_i + X_i^t\omega + Y_i\delta + \varepsilon_i \tag{32}$$

$$dfs_i = \beta_0 + \beta_1 tosib_i + \beta_2 D_i^A + \beta_3 D_i^A * tosib_i + \beta_4 D_i^B + \beta_5 D_i^B * tosib_i + X_i^t\omega + Y_i\delta + \varepsilon_i \tag{33}$$

, where $\vec{X_i^t} = [\ age_i\ gender_i\ CEE_i\ urban_i\ college_i\ engineering_i\ \vec{R}\ ]$.

The results of the above regression models are summarized in Table 10 in the Appendix and discussed below.

8.2.1 Age and College Entrance Examination Rank

Before this paper proceeds with the analysis, it is important to note the specifications above rely on a extensive assumption that desired family size is linearly dependent on age, College Entrance Examination (CEE) rank and total number siblings. [32] First, according to Columns (1) and (2) of Table 10, age has positive effects on desired family size. In fact, considering the age range from 17 to 29, the estimated effect is large. However, none of the joint hypothesis testing rejects the null at the 95% confidence level. Therefore it is again also hard to understand how the cash transfer affects desired family size differently as age changes. As mentioned earlier in Section 6, it is yet to be clearly understood whether desired family size converges to actual fertility choice of a couple or abruptly jumps up or down. The regression result confirms that the relationship between age and desired family size requires a study of its own. Second, the regression results studying the effects of cash transfer on desired family size by CEE rank are provided in Column (3) and (4).[33] When not given any grants, CEE rank has a positive effect on desired family size; the lower the rank (closer to 10), the more children one desires. The cash transfers also have positive effects of desired family size across all CEE ranks. However, the magnitudes of the effect are not the same. On the one hand, students in the higher ranks seem to value the cash transfer more, and respond more actively to it by choosing a greater number of children than if they were not given any transfers. On the other hand, desired family size for students in the lower ranks is less elastic to the government transfers.

[32] It is beyond the scope of this paper to fully investigate how desired family size is determined depending on personal characteristics.

[33] College Entrance Exam rank ranges from 1 to 10; 1 being the highest rank and 10 being the lowest.

8.2.2 Total Number of Siblings

Total number of siblings is found to affect desired family size negatively. However, the hypothetical cash transfer successfully mitigates the negative effect of having more siblings; the F-statistics are all significant at least at the 95% confidence level. The regression results do not provide a full story of how a person with many siblings behaves in a certain way when it comes future family size. But here are possible explanations: the experience of living with greater number of siblings for a person may have been unpleasant, financially tight, or simply crowded. Thus, the person would prefer providing a different living environment to his or her children by choosing to have less number of children. In this situation, the regression results show that the government can intervene and compensate people for their past experience of living with many siblings, thereby promoting them to choose a greater number of children, which they would not do if not given cash transfer.

9 Conclusion

So far, this paper has examined the effects of cash transfer on desired family size in South Korea. As noted often, the relationship between desired family size and actual fertility rate has not been clearly defined in this paper and in other relevant studies. However, based on the results presented in this paper, this section discusses possible explanations for the gap between desired family size and actualized fertility choice in the context of South Korea. Furthermore, possible policy measures are evaluated by performing a cost benefit analysis of implementing the cash transfer program hypothesized in this research.

9.1 Desired Family size (DFS) vs. Total Fertility Rate (TFR)

The TFR in South Korea was at 1.23 births per woman in 2012, the lowest among the countries having experienced a persistent, low fertility rate in modern history. On average, the DFS size of the university student population in South Korea is higher than the current TFR. In fact, the average DFS is well above the TFR of South Korea in 2012. Moreover, with cash transfers, people choose a DFS above the 2.1 replacement level. However, it would be erroneousat this point to conclude that birth rate will improve gradually in the future and that the cash transfer program would stabilize the South Korean population because the clear relationship between DFS and TFR has not been established. Instead, one of the lessons to take off with the results presented so far in this paper

is that the university population in South Korea is found positively respond to the cash transfers proposed during the survey administration by choosing higher levels of desired family size.

9.2 Implications

Here, this paper proposes possible policy measures that could potentially raise the fertility rate in South Korea by making an assumption that DFS and TFR have a one-to-one direct relationship. As discussed earlier, a firm institutional setting could act strongly to overcome even the cultural causes. In addition, there has not been any uniform set of pronatalist policies implemented nationwide. For these reasons, the prime feature of the pronatalist policy this paper argues is its uniform nature across the nation. First, just like the hypothetical cash transfer, the South Korean government could choose to provide cash transfers at a certain level uniformly across its population regardless of personal characteristics including income level, gender, etc. Second, the results presented in this paper indicate that the cash transfer program can be tailored to serve particularly those who are more affected. The relationships between desired family size and some of the important personal characteristics and the elasticity of desired family size are summarized below.

First, economic status proxied by monthly family income in the survey data causes people to choose different levels of DFS. In terms of monthly family income, people in the high income group on average choose a greater DFS, compared to the other groups. The behavior of those in the lower income group cannot be described with certainty due to high standard errors in estimating their choice based on their monthly family income. Lastly, the middle income group seems to choose the least DFS. When hypothetically given cash transfers, the DFS choice of the middle income group was most elastic compared to that of the high income group (again, the low income group suffers from statistical insignificance in their results). The high income group chooses a relatively higher level of DFS with or without cash transfer, implying that the cash transfer is not effective in providing sufficient incentives to those in the income group so that they would choose to have even more children. For those in the middle income group who are relatively more tightly subject to budget contraint than those in the high income group, the cash transfer program has a strong positive effect on DFS. In sum, the DFS is relatively elastic to cash transfers in the middle income group compared to the high income group (which choose a high DFS regardless of transfer) and the low income group (intuitively speaking, to which the cash transfer program is not successful in

delivering enough fianancial incentives to offset the tight budget contraint).

Gender also plays a role in desired family size. Female students were found to choose a lower number of children to have on average than male students. This implies that the perceived costs of having children for female students are higher than those for male students. This is almost certainly not caused simply by the physical costs of giving births to children. One of the factors influencing female students to choose fewer children is increased female labor participation. Many times, women may feel overwhelmed by the thought of having children, raising them and working the very best at the same time. This is precisely the reason why the first FB plan in South Korea focused on improving compatibility between work and home and other areas where females were to benefit in particular. The hypothetical government transfers seem to compensate for these cost and improves the DFS for the female population. Those who major in engineering on average choose a greater number of children to have without the grants and continue to choose relatively high when given the cash transfers. However, the effects of cash transfer are strong for those who do not major in engineering and also for those people with a greater number of sibilings.

Instead of providing cash transfers to every couple having a third child and on, it would be possible to focus on the middle income group whose desired family size is elastic to the additional income shock introduced by the cash transfers. The problem rises with the lower income group. It is true that the purpose of this section is to devise a cost-effective program that promotes more births. However, it is important to realize that this is not merely for more children; the low fertility rate in South Korea poses threats to its population with problems caused by the demographic imbalance. In this spirit, it would not be just to simply leave out the lower income group for not knowing their behavior fully from the results of this study. Although not statistically significant, the effects of cash transfer for the low income group are in fact the greatest in magnitude. Besides, common sense tells us that the low income group people are most strictly restrained by their financial conditions and thus the government transfer may help them more than what they perceive. Moreover, as discussed above, desired famiy size for female students is strongly affected by the cash transfer. However, extending the dicussion of desired family size to total fertility rate requires taking into consideration that the former is decided individually, while the latter is most likely determined via bargaining between female and male. For both genders, the effects of cash transfer are found

effective; therefore, targeting a couple would also yield a positive effect.

9.3 Cost Benefit Analysis

First, it is important to define what would be the benefits of having a child. For doing so, I turn to Jungho Kim's article (2009) in which he estimates the externalities to childbearing in South Korea based on Ronald Lee's methodology (1991). Kim finds negative externalities for public wealth, which takes into account the net government debt, government land and other assets, mineral wealth rights, coastal fishery and foreign aid. Positive externalities are found for public goods (primarily including national defense, weather forecasting, support for research, art and space programs, transportation system and public utilities) and intergenerational transfer (including health, education and pension systems). Overall, there are positive externalities to childbearing that amount to approximately 4,590,000 KRW per additional birth. However, because his results are based on 2005 data, the current socioeconomic conditions are likely to have greater positive externalities in South Korea where the low fertility rate and ageing population have furthered the demographic imbalance posing greater threats to the health and pension system. In other words, the economic burden of supporting the elderly must have increased since 2005. Moreover, Kim's estimation does not take into consideration 1) the psychological benefits for those people who prefer a greater number of children, but cannot actualize their preference due to tight budget constraints and 2) technological innovation more likely to occur when there are a greater number of people. However, these factors are difficult to numerically measure and take into account when calculating the externalities. This paper elects Kim's estimation result of 4,590,000 KRW as a minimum benefit of having additional children.

Second, I turn to the cost side of the analysis. Taking the fertility rate of South Korea in 2012 (1.23) as a base level from which the government aims to recover the 2.1 replacement level, this section calculates the cost of implementing a cash transfer by using the results presented in this paper. Assuming that the cash transfer is given uniformly to the South Korean population, the cost of recovering the 2.1 replacement level can be calculated by the coefficient estimations presented in Column (3) of Table 4. Approximately providing 351,974 KRW per month for three years when a couple has a third child would recover the 2.1 replacement level. Moreover, there is another way of estimating the cost, although slighly more complicated. By taking the estimated coefficients for Survey A (offering 455,000 KRW a month) in Column (6) of Table 3, approximately 407,105 KRW

a month is required to improve the fertility rate to 2.1. Considering that the cash transfers are given for three years (proposed in this research) disregarding the discount factor for simplicity, the total cost of recovering the 2.1 level is about 12,791,000 KRW or 14,656,000 KRW depending on which estimations are used. Only 39.34% of the population chooses to have more than two children. Therefore if providing approximately 5,032,000 KRW or 5,766,000 KRW worth of a cash transfer, the policy can achieve its goal. These estimated costs exceed the benefit.

However, it is unclear yet to conclude that the cash transfer program is not cost effective as the externality is not big enough. First, the benefit this paper assumes is calculated using the 2005 data. As noted, this benefit is a minimum benefit of an additional childbirth. South Korea suffers from population ageing as well as a persistent, low fertility rate. Since 2005, the low fertility rate has continued and must have increased the positive externalities for intergenerational transfer. Considering this, the inflation since 2005 and the discount factor (cash transfer is given monthly for 3 years), the cash transfer policy proposed in this paper may actually be cost-effective. In addition, as the relationship between South and North Korea has been severely undermined, the South Korean government is likely to focus on strengthening its national defense; this in turn creates greater positive externalities to childbearing in South Korea. Second, the benefit is strictly based on externalities that an additional birth creates. Thus, this benefit does not take into consideration possible benefits at the individual level coming from personal satisfaction and other important factors that are not measurable. Third, the cost is calculated using the results using desired family size, but not actual fertility rate. These reasons may obscure whether the cash transfer program proposed in this paper is cost-effective or not.

9.4 Concluding Remarks

This paper studies desired family size and evaluates the cash transfer program by using the randomized survey data designed as a part of this research. Children can be considered as a private good from which their parents derive "utility, satisfaction and income" (Bacci 287). However, they are a public good at the same time. Without children, there is literally no future ahead of the current living generations. In other words, younger generations replace older generations by assuming what the older generations have provided to the societies: innovation, economic growth, improvement in standard of living, and securing the health, education and pension systems. The current South

Korea is soon to face the problems caused by the lack of children in its country. With the ageing population, the current population in South Korea is expected to live much longer and will require support from the younger generation (dependency ratio is predicted to increase substantially). If the current fertility rate persists, the socioeconomic burden for the newer generations will certainly increase. In this regard, it is necessary for the South Korean government to intervene and incentivize people to have more children. This will help the nation, but also ultimately help each individual to be less pressured by the burden discussed so far.

The current South Korean government is in the process of proposing a new set of pronatalist policies. The results of this paper provide some guidelines:

- A uniform set of pronatalist policies should be devised as supposed to the borough-level fertility grants currently available in South Korea.
- There is a gap between the actual fertility rate and desired family size, signaling that people are restrained from actualizing their fertility preferences.
- According to the survey data, cash transfer is effective in increasing birth choice. Furthermore, taking the results seriously, a cash transfer of 140,000 KRW is predicted to increase the fertility rate to the 2.1 replacement level.
- According to the results, the pronatalist policy can focus on the low and middle income groups for greater efficiency.
- In addition to the cash transfer, the government should continue to improve the labor condition for females by promoting compatibility between work and home (providing more generous maternity leave, etc), so women feel less overwhelmed to perform both of their roles as a mother and an employee.

Finally, it is true that encouraging people to have more children is not the only solution to solve the current demographic problems in South Korea. For example, one of the possibilities is to loosen its immigration policy and let more people in from abroad. South Korea has been traditionally relatively strict with its immigration policy. On the one hand, changing the immigration policy all of sudden may cause many other social problems in South Korea, which has not clearly prepared to welcome immigrants. On the other hand, opening the nation to the influx of people from abroad

gradually may not be effective in dealing with the imminent problems in time. The low fertility rate is an urgent problem in South Korea that cannot be solved overnight. This thesis presented the results of analyzing desired family size of the university student population in South Korea and proposes that the cash transfer can in fact improve the birth rate and still be cost-effective. In the near future the South Korean government is expected to present its policy agenda regarding the issue of the low fertility rate for the second time after the firt trial which has been assessed as a failure. Whichever form, cash/in-kind transfers or other indirect measures, the government chooses, it is essential at this point to substantiate its efforts to solve the low fertility concerns in order to envision further policies by learning from mistakes and successes.

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11 Appendix

Map of South Korea

Introductory Figures

Table 1. Summary Statistics

Table 2. Summary Statistics by Survey Types and T-stats for Difference

Table 3. OLS Model Results: Effects of Cash Transfer on Desired Family Size

Table 4. Regression Results: Effects of Cash Trasnfer in 1,000 KRW on Desired Family Size

Table 5. Effects of Cash Transfer on Desired Family Size: High Income Group vs. Low Income Group

Table 6. Effects of Cash Transfer on Desired Family Size: Monthly Family Income in Trentiles

Table 7. Effects of Cash Transfer on Desired Family Size: Monthly Family Income in Quantiles

Table 8. Marginal Rates of Change in Desired Size with respect to $grant$, D_A and D_B

Table 9. Effects of Cash Transfer on Desired Family Size by Gender, Engineering Major, or from Urban Area

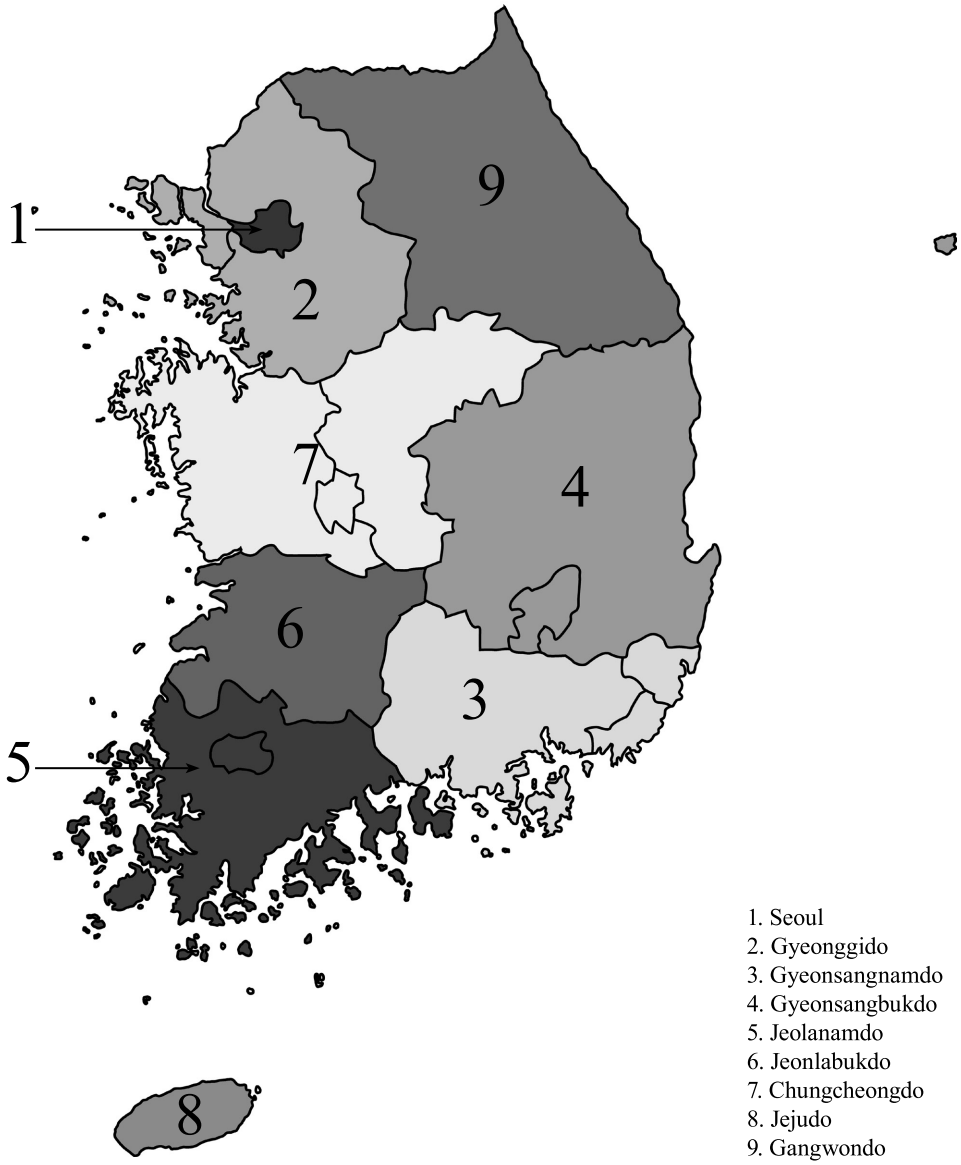
Table 10. Effects of Cash Transfer on Desired Family Size by Age or College Entrance Exam Rank

Table 11. Robustness Check by Only Including Three Regions with All Survey types

Table 12. List of Universities Presented in the Data by Region

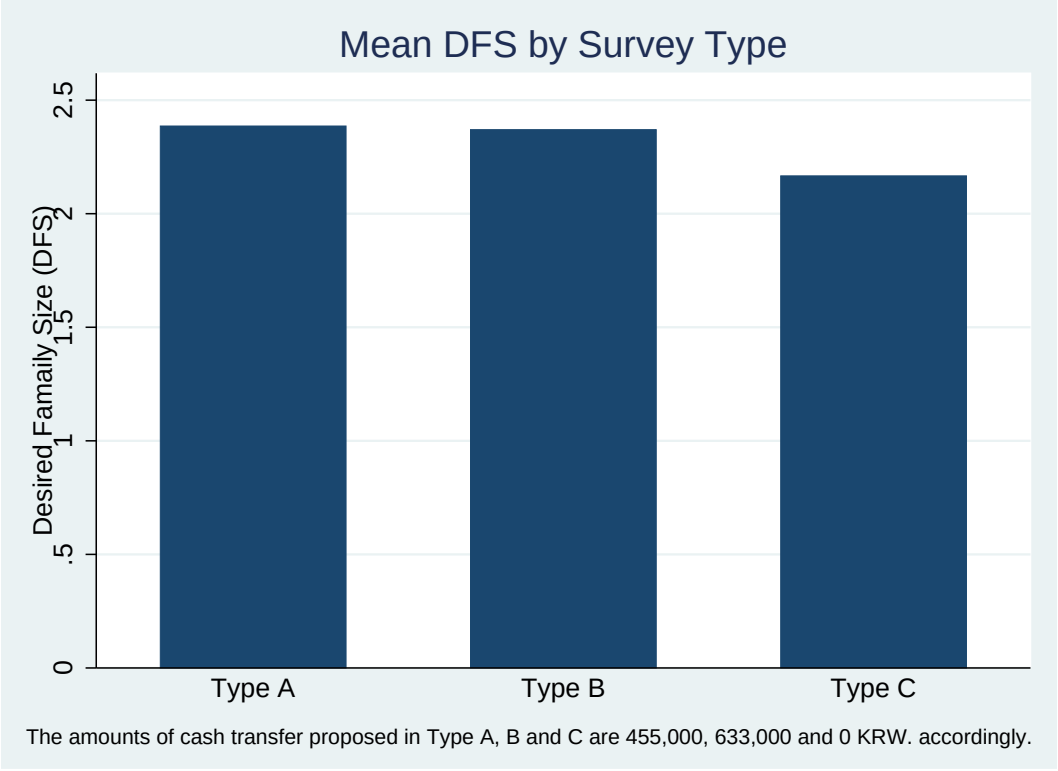
Table 13. Population Density by Region

Map of South Korea and Regional Identifications



Refer to Table 13 for detailed information about population density by region.

Figure 1.



The amounts of cash transfer proposed in Type A, B and C are 455,000, 633,000 and 0 KRW. accordingly.

Figure 2.

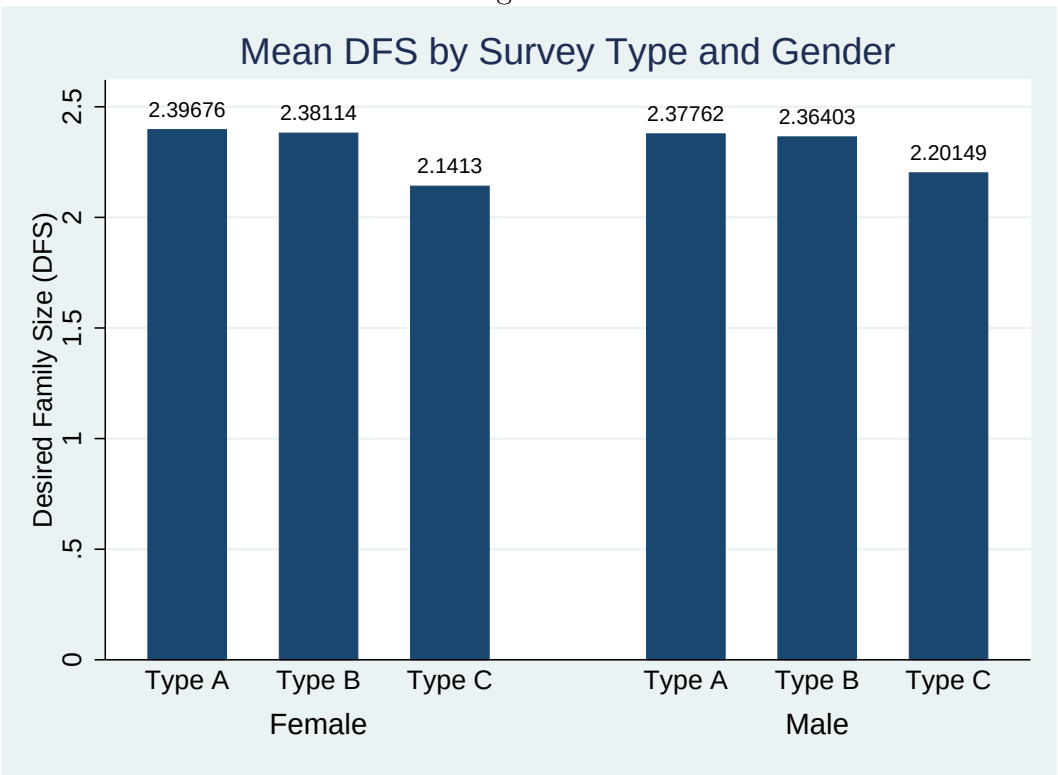


Figure 3.

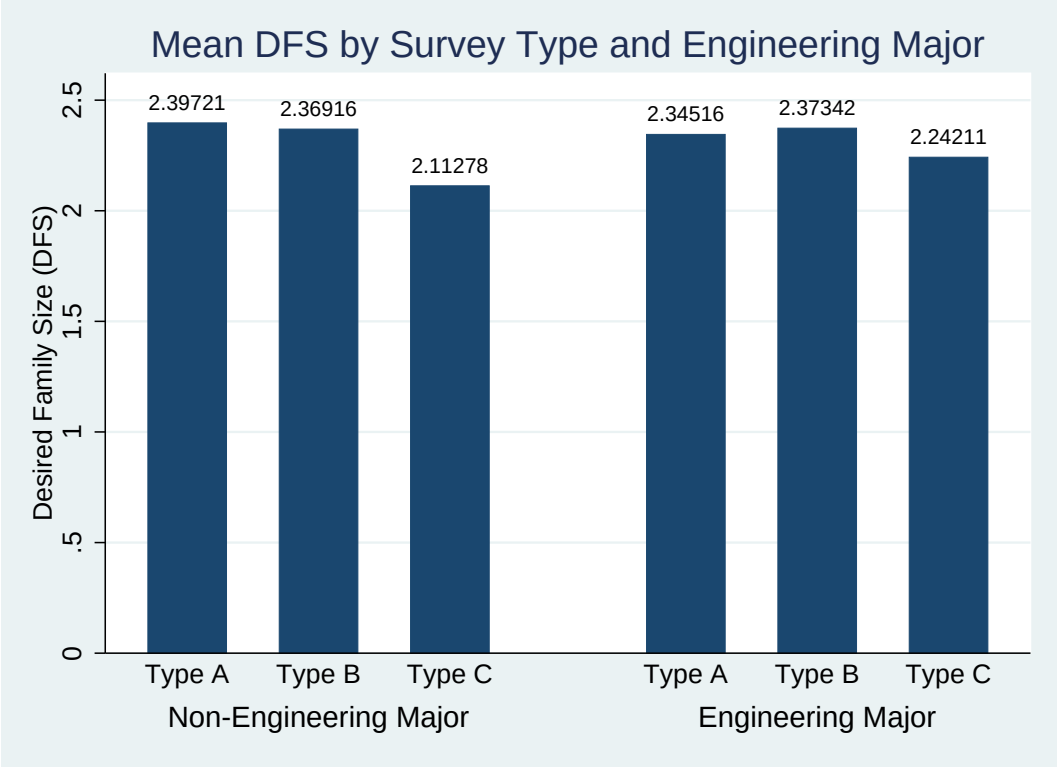


Figure 4.

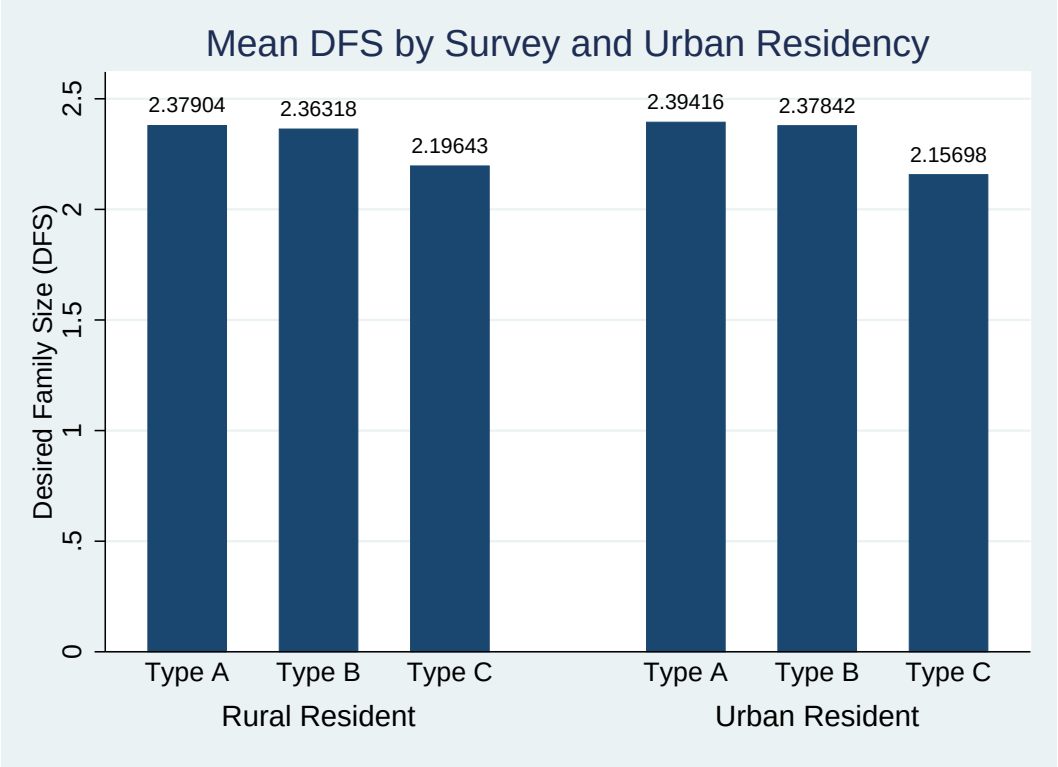


Figure 5.

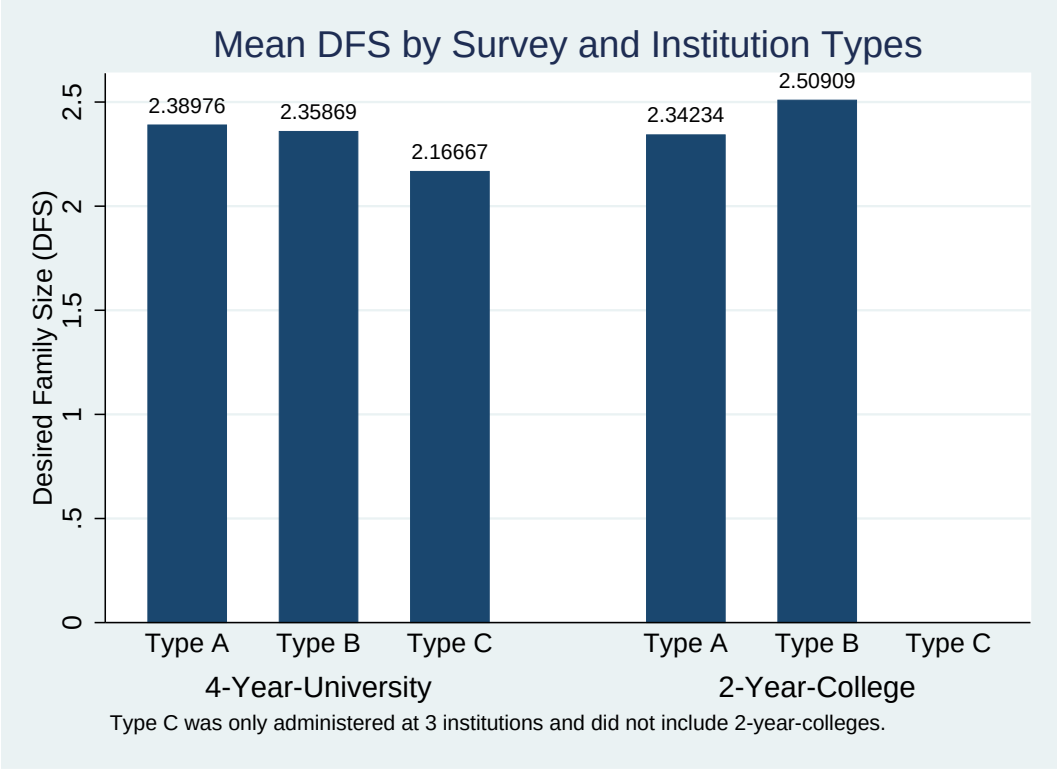


Figure 6.

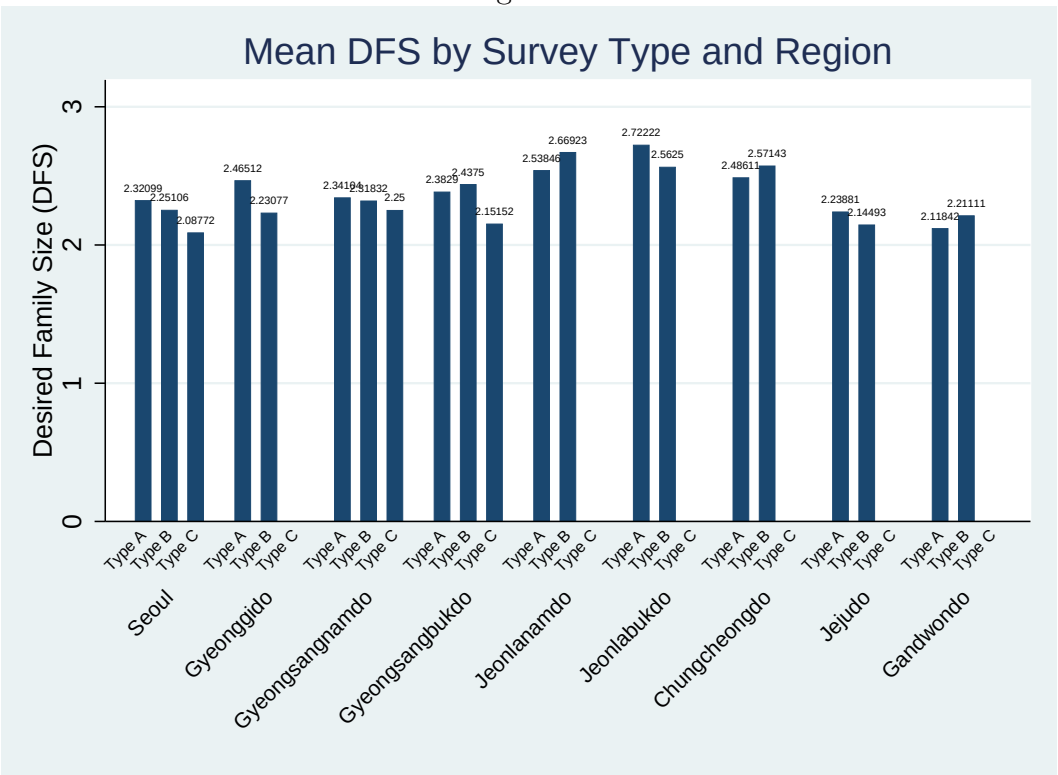


Figure 7.

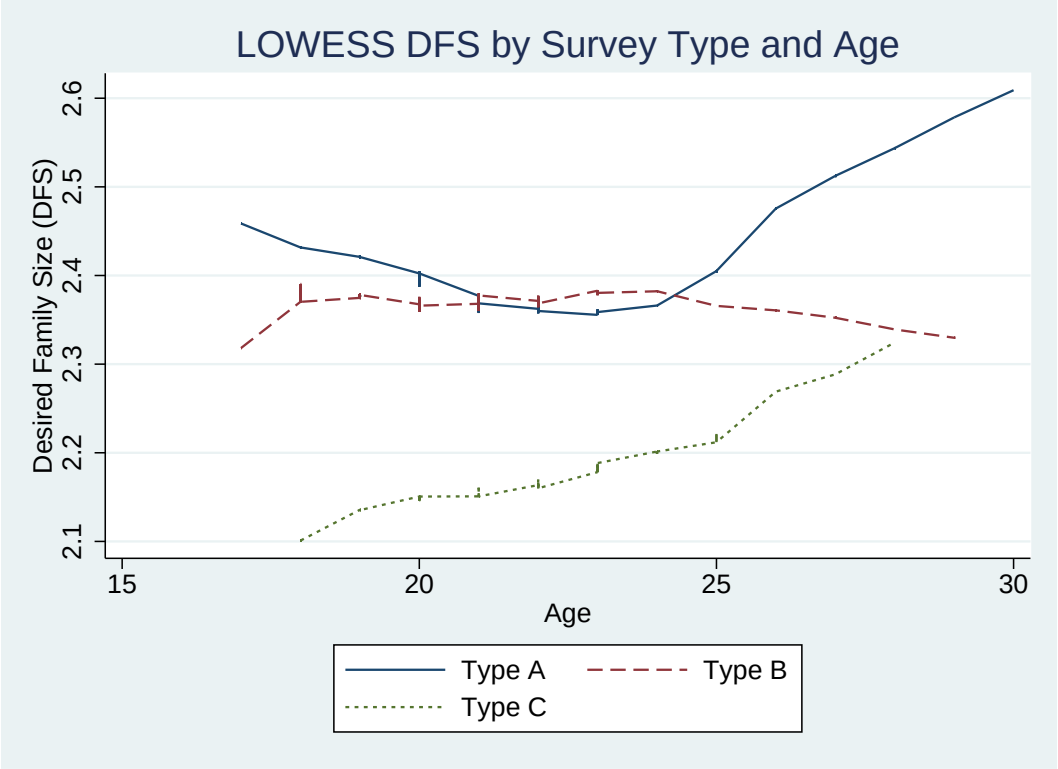


Figure 8.

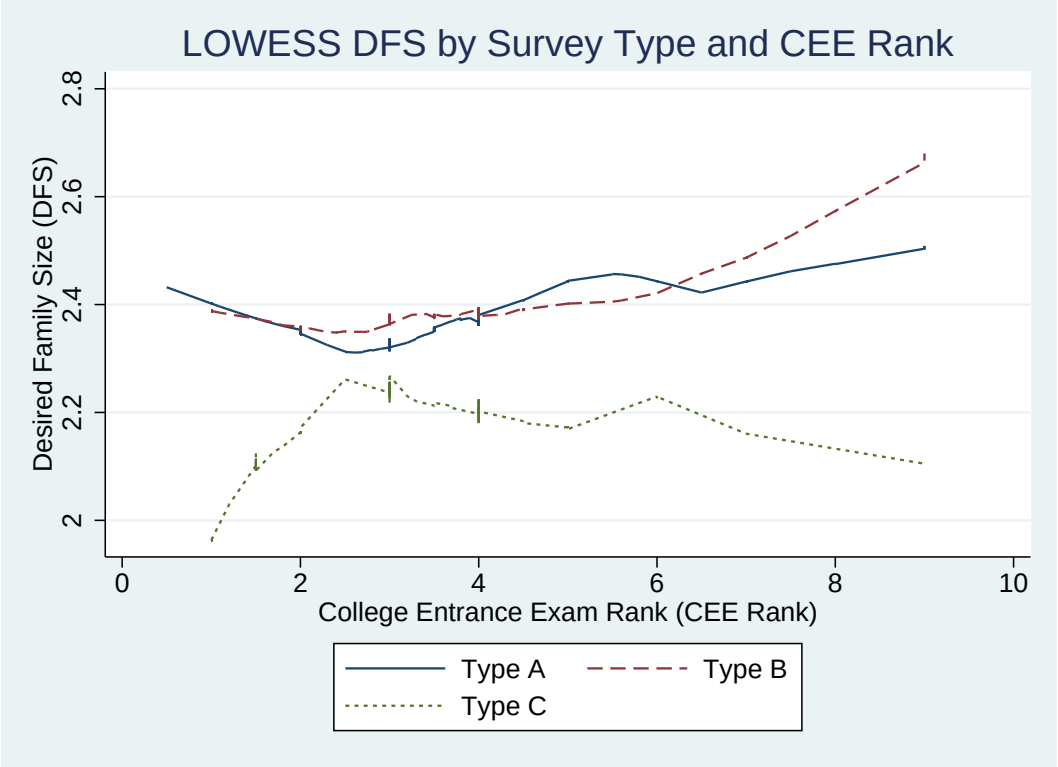


Figure 9.

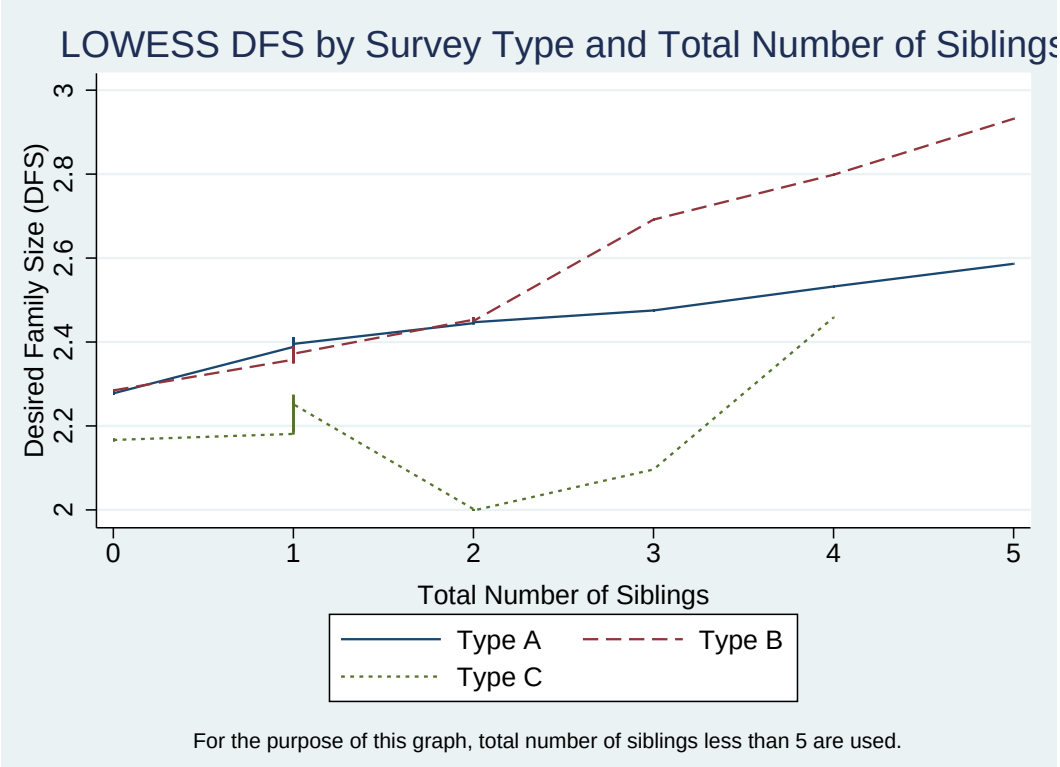


Figure 10.

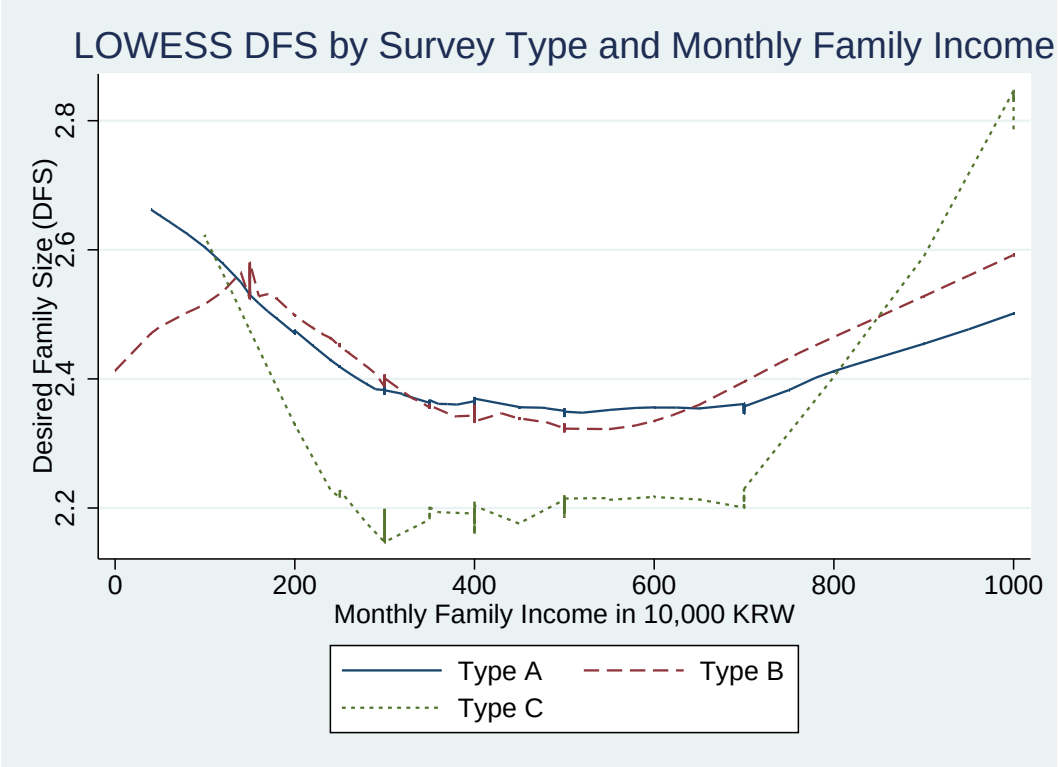


Figure 11.

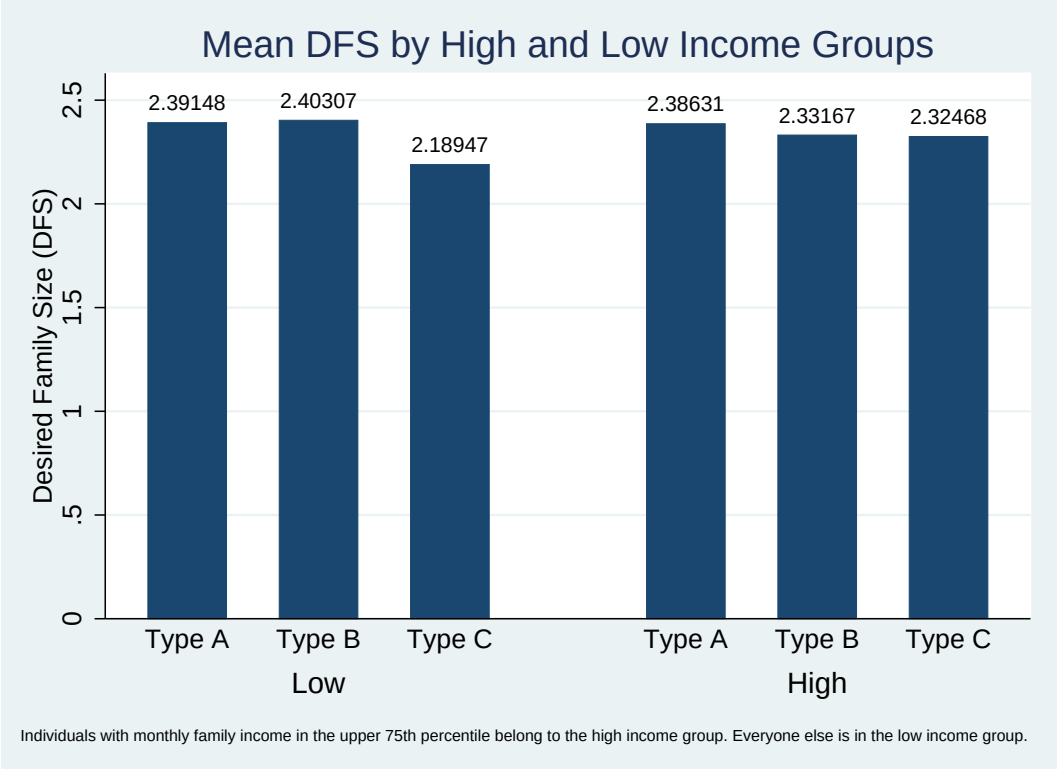


Figure 12.

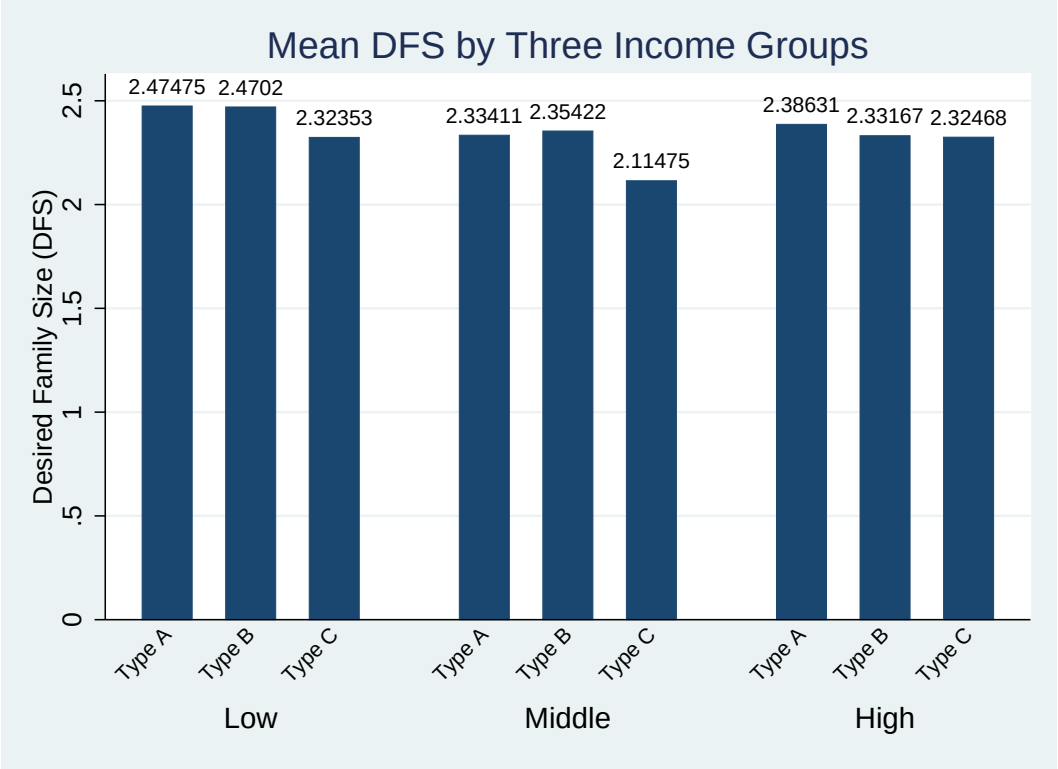


Figure 13.

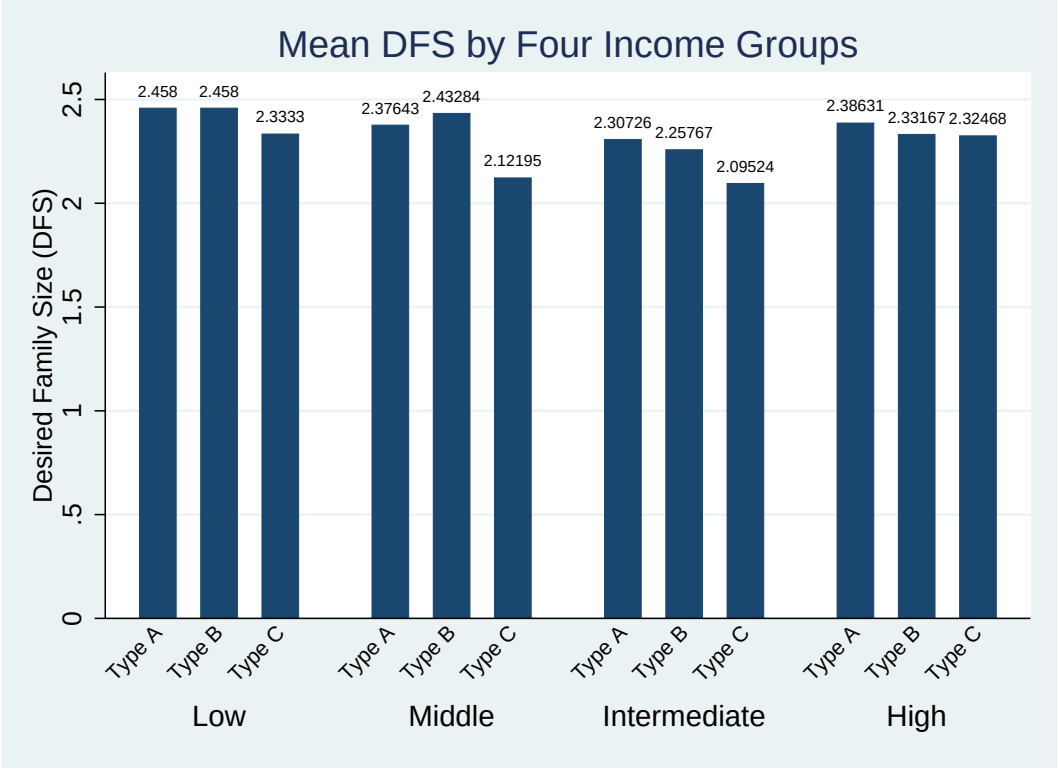

Mean DFS by Four Income Groups
Desired Family Size (DFS)
0
.5
1
1.5
2
2.5
2.458
2.458
2.3333
2.37643
2.43284
2.12195
2.30726
2.25767
2.09524
2.38631
2.33167
2.32468
Type A
Type B
Type C
Low
Middle
Intermediate
High

Table 1: Summary Statistics

	Obs	Mean	Std. Dev.	Min	Max
Survey Types					
Survey A	1460				
Survey B	1443				
Survey C	228				
Regional Distribution					
Seoul	535				
Gyeonggi	272				
Gyeongsangnamdo	752				
Gyeongsangbukdo	624				
Jeonlanamdo	262				
Jeonlabukdo	102				
Chungcheongdo	292				
Jejudo	136				
Gangwondo	166				
Personal Characteristics Variables					
Desired Family Size (dfs)	3136	2.362767	0.9068848	0	7
Age	3133	21.1398	2.414355	17	30
Female Indicator	3134	0.5070198	0.5000305	0	1
College Entrance Examination	2471	3.342372	1.425809	0.5	9
Total Number of Siblings	3092	1.178849	0.6943169	0	11
Number 2 Year College Student	211				
Indicator for 2 Year College Student	3141	0.0703598	0.2557931	0	1
Number of Engineering Major Student	721				
Indicator for Engineering Major Student	3141	0.2295447	0.420607	0	1
Family Characteristics Variables					
Monthly family income	2429	473.0156	460.2094	0	10000
Education Attainment Category (Father) [a]	3059	2.993789	1.281871	0	5
Education Attainment Category (Mother)	3063	2.63304	1.156519	0	5
Occupation Category (Father) [b]	2987	2.487446	1.20257	0	5
Occupation Category (Mother)	3002	1.493338	1.503341	0	5

[a]Level of education attainments for each parent discretely takes a value from 0 to 5: 0-elementary schooling or lower; 1-middle school; 2-high school; 3-college; 4-university; 5-graduate level.

[b]Using the Korean Labor Institute classification of occupations in Korea, I assigned integers from 0 to 5 for the unployed/housewife, Production (agriculture, fishery, transporting), Sales(salesclerk, hairdresser), Office (banker, company staff) and Professional (scientist, physician, businessman), respectively. Unlike education attainment category, by no means, I assigned the values in an ordinal sense.

Table 2: Summary Statistics by Survey Types and T-stats for Difference[a]

	Survey A			Survey B			Survey C			Difference		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	A-B (SE)	A-C (SE)[b]	B-C (SE)
Regional Distribution												
Seoul	243			235			57					
Gyeonggi	129			143			.					
Gyeongsangnamdo	346			334			72					
Gyeongsangbukdo	269			256			99					
Jeonlanamdo	131			131			.					
Jeonlabukdo	54			48			.					
Chungcheongdo	145			147			.					
Jejudo	67			69			.					
Gangwondo	76			90			.					
Personal Characteristics Variables												
Desired Family Size (dfs)	1458	2.39	0.92	1451	2.37	0.91	228	2.17	0.80	-0.016	-0.219***	-0.203***
										(0.339)	(0.058)	(0.058)
Age	1457	21.04	2.41	1450	21.07	2.38	226	22.23	2.46	0.038	1.194***	1.156***
										(0.0887)	(0.175)	(0.175)
Female Indicator	1485	0.51	0.50	1450	0.52	0.50	226	0.41	0.49	0.010	-0.103***	-0.113***
										(0.019)	(0.035)	(0.035)
College Entrance Examination	1150	3.38	1.47	1154	3.33	1.39	167	3.14	1.40	-0.048	-0.246*	-0.198*
										(0.059)	(0.116)	(0.115)
Total Number of Siblings	1441	1.19	0.68	1427	1.18	0.72	224	1.90	0.61	-0.013	-0.103**	-0.090**
										(0.026)	(0.044)	(0.045)
Number College Student	111			110			.					
Indicator for 2 Year College Student	1460	0.08	0.27	1453	0.08	0.26	.	.	.	-0.0003	-0.076***	-0.076***
										(0.010)	(0.007)	(0.007)
Number of Engineering Major Student	310			316			95					
Indicator for Engineering Major Student	1460	0.21	0.41	1453	0.22	0.41	228	0.42	0.50	0.005	0.204***	0.199***
										(0.015)	(0.034)	(0.034)
Family Characteristics Variables												
Monthly family income	1139	471.92	492.76	1118	472.88	447.99	172	481.16	283.33	0.953	9.240	8.287
										(19.816)	(26.075)	(25.421)
Education Attainment Category (Father)	1425	2.98	1.28	1412	3.01	1.28	222	3.99	1.34	0.027	0.011	-0.017
										(0.048)	(0.096)	(0.096)
Education Attainment Category (Mother)	1426	2.58	1.13	1415	2.67	1.17	222	2.73	1.17	0.087**	0.148*	0.060
										(0.043)	(0.084)	(0.084)
Occupation Category (Father)	1379	2.46	1.20	1388	2.51	1.21	220	2.51	1.22	0.054	0.055	0.001
										(0.0457)	(0.088)	(0.088)
Occupation Category (Mother)	3297	1.55	1.49	1415	2.67	1.17	1415	1.16	1.45	-0.071	-0.395***	-0.324***
										(0.057)	(0.106)	(0.106)

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

[b]Compared to Survey A and B, Survey C was administered at significantly less number of institutions, thus has relatively small sample size. If the randomization was successful, differences should not be significant. Regression models include control variables for those variables with statistically significant differences. The last section of the paper reflects on the randomized survey and its implications.

Table 3: OLS Model Results: Effects of Cash Transfer on Desired Family Size[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)	(4)	(5)	(6)
Receiving Either Survey A or B ($grant$)	0.211***	0.176**	0.196**			
	(0.055)	(0.075)	(0.076)			
Receiving Survey A (D_A)				0.219***	0.173**	0.181**
				(0.058)	(0.077)	(0.078)
Receiving Survey B (D_B)				0.203***	0.180**	0.212***
				(0.058)	(0.077)	(0.079)
Age		0.009	0.007		0.009	0.007
		(0.009)	(0.010)		(0.009)	(0.010)
Female		-0.013	-0.022		-0.013	-0.023
		(0.042)	(0.043)		(0.042)	(0.043)
College Entrance Exam Rank		-0.017	-0.020		-0.017	-0.020
		(0.016)	(0.016)		(0.016)	(0.016)
Total Number of Siblings		0.066**	0.068**		0.066**	0.068**
		(0.029)	(0.030)		(0.029)	(0.030)
Residing in Urban Area		0.052	0.058		0.052	0.059
		(0.039)	(0.039)		(0.039)	(0.039)
Attending a 2-Year-College		0.091	0.082		0.091	0.079
		(0.097)	(0.098)		(0.098)	(0.098)
Majoring in Engineering		-0.027	-0.029		-0.027	-0.030
		(0.047)	(0.049)		(0.047)	(0.048)
Gyeonggido		0.064	0.070		0.064	0.068
		(0.079)	(0.082)		(0.079)	(0.082)
Gyeongsangnamdo		0.082	0.067		0.082	0.065
		(0.057)	(0.060)		(0.057)	(0.060)
Gyeongsanbukdo		0.088	0.065		0.088	0.064
		(0.070)	(0.073)		(0.070)	(0.073)
Jeonlanamdo		0.342***	0.280***		0.342***	0.278***
		(0.088)	(0.088)		(0.088)	(0.088)
Jeonlabukdo		0.452***	0.419***		0.452***	0.420***
		(0.133)	(0.136)		(0.133)	(0.136)
Chungcheongdo		0.237***	0.199**		0.236***	0.197**
		(0.083)	(0.086)		(0.083)	(0.086)
Jejudo		-0.124	-0.111		-0.124	-0.112
		(0.082)	(0.083)		(0.082)	(0.083)
Gangwondo		-0.045	-0.085		-0.045	-0.087
		(0.097)	(0.098)		(0.097)	(0.098)
Level of Education Attainment (Mother)			0.002			0.001
			(0.021)			(0.021)
Level of Education Attainment Higher			-0.036			-0.037
than Primary Schooing (Father)			(0.049)			(0.049)
Occupation Category (Mother)			0.018			0.018
			(0.013)			(0.013)
Occupation Category (Father)			-0.010			-0.010
			(0.017)			(0.017)
Constant	2.167***	1.886***	1.944***	2.167***	1.886***	1.947***
	(0.053)	(0.243)	(0.262)	(0.053)	(0.243)	(0.262)
Obs	3137	2442	2310	3137	2442	2310

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

Table 4: Regression Results: Effects of Cash Trasnfer in 1,000 KRW on Desired Family Size[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)
$ST_i = 0$ or 455 or 633	0.0002599***	0.0002363**	0.000304**
	(0.0000902)	(0.000116)	(0.0001184)
Age[b]		0.008	0.006
		(0.009)	(0.009)
Female		-0.014	-0.023
		(0.042)	(0.043)
College Entrance Exam Rank		-0.017	-0.020
		(0.016)	(0.016)
Total Number of Siblings		0.067**	0.069**
		(0.029)	(0.030)
Residing in Urban Area		0.050	0.057
		(0.038)	(0.039)
Attending a 2-Year-College		0.098	0.084
		(0.097)	(0.098)
Majoring in Engineering		-0.030	-0.031
		(0.047)	(0.048)
Gyeonggido		0.067	0.070
		(0.080)	(0.083)
Gyeongsangnamdo		0.082	0.065
		(0.057)	(0.060)
Gyeongsanbukdo		0.080	0.059
		(0.069)	(0.072)
Jeonlanamdo		0.344***	0.278***
		(0.088)	(0.088)
Jeonlabukdo		0.455***	0.421***
		(0.133)	(0.136)
Chungcheongdo		0.239***	0.198**
		(0.083)	(0.085)
Jejudo		-0.121	-0.111
		(0.082)	(0.083)
Gangwondo		-0.045	-0.087
		(0.097)	(0.098)
Level of Education Attainment (Mother)[c]			0.000
			(0.021)
Level of Education Attainment Higher			-0.036
than Primary Schooing (Father)			(0.049)
Occupation Category (Mother)			0.019
			(0.013)
Occupation Category (Father)			-0.010
			(0.017)
Constant	2.232***	1.950***	1.993***
	(0.048)	(0.237)	(0.254)
Obs	3137	2442	2310

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

[b]Personal characteristics variables discussed in section 6 include age, gender, college entrance exam rank, total number of sibling, urban, college, engineering and the regional dummy variables. From here on, the estimation results for the dummy variables for regions are shrunk to a row, which indicates whether or not regional variation is controlled in the regression.

[c]The Family Characteristics Variables include parents' level of education attainment and their occupation categories. Next time when there variables are introduced, they are presented in a single row indicating whether or not the regression model includes them for control purposes.

Table 5: Effects of Cash Transfer on Desired Family Size: High Income Group vs. Low Income Group[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)	(4)	(5)	(6)
Receiving Either Survey A or B ($grant$)	0.208***	0.221**	0.239**			
	(0.077)	(0.103)	(0.106)			
Receiving Survey A (D_A)				0.202**	0.225**	0.225**
				(0.081)	(0.106)	(0.109)
Receiving Survey B (D_B)				0.214***	0.217**	0.254**
				(0.081)	(0.107)	(0.109)
High Income Indicator ($high_{75}$)[b]	0.135	0.196	0.247	0.135	0.196	0.247
	(0.121)	(0.150)	(0.151)	(0.121)	(0.150)	(0.151)
Interaction term ($grant$*$high_{75}$)	-0.173	-0.238	-0.277*			
	(0.127)	(0.156)	(0.157)			
Interaction term (D_A*$high_{75}$)				-0.140	-0.266*	-0.279*
				(0.133)	(0.161)	(0.163)
Interaction term (D_B*$high_{75}$)				-0.207	-0.209	-0.274*
				(0.133)	(0.162)	(0.164)
Control for Personal Characteristics	No	Yes	Yes	No	Yes	Yes
Regional Effect	No	Yes	Yes	No	Yes	Yes
Contonrl for Family Characteristics	No	No	Yes	No	No	Yes
Constant	2.189***	1.957***	2.004***	2.189***	1.956***	2.009***
	(0.073)	(0.260)	(0.290)	(0.073)	(0.261)	(0.290)
Obs	2427	2018	1929	2427	2018	1929
F-stat for coefficient estimations for $grant$, $high_{75}$, and/or the interaction term	2.58*	1.67	1.81			
Prof> F	0.0522	0.1715	0.1437			
F-stat for coefficient estimations for D_A, $high_{75}$ and/or the interaction term				2.25*	1.69	1.53
Prof> F				0.0810	0.1668	0.2039
F-stat for coefficient estimations for D_B, $high_{75}$ and/or the interaction term				2.25*	1.40	1.86
Prof> F				0.0563	0.2403	0.1340

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

[b]This dummy variable indicates individuals in the upper 75th percentile of monthly family income.

Table 6: Effects of Cash Transfer on Desired Family Size: Monthly Family Income in 3 groups[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)	(4)	(5)	(6)
Receiving Either Survey A or B (*grant*)	0.149	0.131	0.267			
	(0.142)	(0.199)	(0.210)			
Receiving Survey A (D_A)				0.151	0.153	0.280
				(0.148)	(0.204)	(0.216)
Receiving Survey B (D_B)				0.147	0.111	0.253
				(0.146)	(0.203)	(0.214)
Middle Income Indicator ($Income_m$)[b]	-0.209	-0.279	-0.107	-0.209	-0.279	-0.107
	(0.160)	(0.218)	(0.229)	(0.160)	(0.218)	(0.230)
Interaction term ($grant$*$Income_m$)	0.080	0.127	-0.058			
	(0.167)	(0.225)	(0.236)			
Interaction term (D_A*$Income_m$)				0.068	0.095	-0.099
				(0.175)	(0.231)	(0.244)
Interaction term (D_B*$Income_m$)				0.093	0.158	-0.016
				(0.174)	(0.231)	(0.242)
High Income Indicator ($Income_h$)	0.001	0.008	0.166	0.001	0.007	0.167
	(0.167)	(0.229)	(0.234)	(0.167)	(0.222)	(0.234)
Interaction term ($grant$*$Income_h$)	-0.114	-0.144	-0.302			
	(0.174)	(0.229)	(0.241)			
Interaction term (D_A*$Income_h$)				-0.090	-0.188	-0.331
				(0.182)	(0.236)	(0.249)
Interaction term (D_B*$Income_h$)				-0.140	-0.101	-0.272
				(0.181)	(0.236)	(0.248)
Control for Personal Characteristics	No	Yes	Yes	No	Yes	Yes
Regional Effect	No	Yes	Yes	No	Yes	Yes
Control for Family Characteristics	No	No	Yes	No	No	Yes
Constant	2.324***	2.234***	2.080***	2.324***	2.235***	2.087***
	(0.136)	(0.312)	(0.347)	(0.136)	(0.315)	(0.347)
Obs	2427	2031	1929	2427	2031	1929
F-stat for coefficient estimations for $grant$, $Income_m$, and/or the interaction term	5.74***	5.26***	4.77***			
Prof> F	0.0007	0.0013	0.0026			
F-stat for coefficient estimations for $grant$, $Income_h$ and/or the interaction term	2.04	2.00	1.90			
Prof> F	0.1061	0.1119	0.1276			
F-stat for coefficient estimations for D_A, $Income_m$ and/or the interaction term				3.28**	2.50*	2.50*
Prof> F				0.0376	0.0823	0.0823
F-stat for coefficient estimations for D_B, $Income_m$ and/or the interaction term				3.74**	2.39*	2.69*
Prof> F				0.0238	0.0679	0.0679
F-stat for coefficient estimations for D_A, $Income_h$ and/or the interaction term				0.69	0.33	0.33
Prof> F				0.5000	0.7720	0.7220
F-stat for coefficient estimations for D_B, $Income_h$ and/or the interaction term				0.50	0.15	0.15
Prof> F				0.6041	0.8608	0.8608

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

[b]This dummy variable indicates individuals in the middle third of monthly family income, while $Income_h$ indicates those on the high third of monthly family income.

Table 7: Effects of Cash Transfer on Desired Family Size: Monthly Family Income in Quantiles[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)	(4)	(5)	(6)
Receiving Either Survey A or B (*grant*)	0.125	0.081	0.248			
	(0.146)	(0.197)	(0.209)			
Receiving Survey A (D_A)				0.125	0.104	0.254
				(0.152)	(0.202)	(0.216)
Receiving Survey B (D_B)				0.125	0.060	0.242
				(0.150)	(0.201)	(0.214)
Second Quantile Indicator (Q_2)	-0.211	-0.273	-0.104	-0.211	-0.273	-0.104
	(0.172)	(0.232)	(0.243)	(0.172)	(0.232)	(0.243)
Interaction term (*grant**Q_2)	0.158	0.202	0.029			
	(0.180)	(0.240)	(0.250)			
Interaction term (D_A*Q_2)				0.130	0.139	-0.027
				(0.188)	(0.247)	(0.259)
Interaction term (D_B*Q_2)				0.186	0.264	0.085
				(0.187)	(0.247)	(0.257)
Third Quantile Indicator (Q_3)	-0.238	-0.293	-0.121	-0.238	-0.294	-0.121
	(0.205)	(0.261)	(0.273)	(0.205)	(0.262)	(0.274)
Interaction term (*grant**Q_3)	0.064	0.084	-0.097			
	(0.214)	(0.269)	(0.281)			
Interaction term (D_A*Q_3)				0.087	0.108	-0.083
				(0.223)	(0.278)	(0.291)
Interaction term (D_B*Q_3)				0.038	0.057	-0.111
				(0.223)	(0.276)	(0.288)
Fouth Quantile Indicator (Q_4)	-0.009	-0.005	0.161	-0.009	-0.006	0.162
	(0.170)	(0.223)	(0.233)	(0.170)	(0.223)	(0.234)
Interaction term (*grant**Q_4)	-0.090	-0.111	-0.286			
	(0.177)	(0.230)	(0.241)			
Interaction term (D_A*Q_4)				-0.063	-0.152	-0.307
				(0.185)	(0.237)	(0.249)
Interaction term (D_B*Q_4)				-0.118	-0.069	-0.263
				(0.184)	(0.237)	(0.247)
Control for Personal Characteristics	No	Yes	Yes	No	Yes	Yes
Regional Effect	No	Yes	Yes	No	Yes	Yes
Control for Family Characteristics	No	No	Yes	No	No	Yes
Constant	2.333***	2.229***	2.066***	2.333***	2.224***	2.074***
	(0.140)	(0.321)	(0.346)	(0.140)	(0.322)	(0.347)
Obs	2427	2018	1929	2427	2018	1929
F-stat for coefficient estimations for *grant*, Q_2, and/or the interaction term	3.43**	2.18*	2.33*			
Prof> F	0.0165	0.0883	0.0726			
F-stat for coefficient estimations for *grant*, Q_3 and/or the interaction term	3.93***	4.30***	4.25***			
Prof> F	0.0083	0.0050	0.0053			
F-stat for coefficient estimations for *grant*, Q_4 and/or the interaction term	1.53	1.43	1.59			
Prof> F	0.2051	0.2325	0.1889			
F-stat for coefficient estimations for D_A, Q_2 and/or the interaction term				2.90**	2.29*	2.06
Prof> F				0.0337	0.0763	0.1031
F-stat for coefficient estimations for D_A, Q_3 and/or the interaction term				2.23*	2.23*	2.19*
Prof> F				0.0826	0.0824	0.0874
F-stat for coefficient estimations for D_A, Q_4 and/or the interaction term				0.65	1.27	1.11
Prof> F				0.558	0.2833	0.3430
F-stat for coefficient estimations for D_B, Q_2 and/or the interaction term				3.40**	2.49*	2.66**
Prof> F				0.0172	0.0585	0.0464
F-stat for coefficient estimations for D_B, Q_3 and/or the interaction term				2.84**	2.49*	2.84**
Prof> F				0.0366	0.0584	0.0368
F-stat for coefficient estimations for D_B, Q_4 and/or the interaction term				0.94	1.37	1.39
Prof> F				0.4186	0.2496	0.2454

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

Table 8: Marginal Rates of Change in Desired Size with respect to *grant*, D_A and D_B and Difference between the effects of D_A and D_B

Income Group Indicators	High vs. Low	Trentiles	Quantiles
Using the Results from Table (5)			
Low Income Group -base	$\partial dfs/\partial grant > 0$ $\partial dfs/\partial D_A > 0$ $\partial dfs/\partial D_B > 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A > 0$		
High Income Group	$\partial dfs/\partial grant \lesssim 0$ $\partial dfs/\partial D_A \lesssim 0$ $\partial dfs/\partial D_B \lesssim 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \approx 0$		
Using the Results from Table (6)			
Low Income Group ($Income_{low}$ - base)		$\partial dfs/\partial grant \gtrsim 0$ $\partial dfs/\partial D_A \gtrsim 0$ $\partial dfs/\partial D_B \gtrsim 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \lesssim 0$	
Middle Income Group ($Income_{middle}$)		$\partial dfs/\partial grant > 0$ $\partial dfs/\partial D_A > 0$ $\partial dfs/\partial D_B > 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A > 0$	
HIgh Income Group ($Income_{high}$)		$\partial dfs/\partial grant \approx 0$ $\partial dfs/\partial D_A \approx 0$ $\partial dfs/\partial D_B \approx 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \approx 0$	
Using the Results from Table (7)			
Low Income Group (Q_1 - base)			$\partial dfs/\partial grant \gtrsim 0$ $\partial dfs/\partial D_A \gtrsim 0$ $\partial dfs/\partial D_B \gtrsim 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \lesssim 0$
Intermediate Income Group (Q_2)			$\partial dfs/\partial grant \gtrsim 0$ $\partial dfs/\partial D_A \gtrsim 0$ $\partial dfs/\partial D_B > 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \gtrsim 0$
Middle Income Group (Q_3)			$\partial dfs/\partial grant > 0$ $\partial dfs/\partial D_A \gtrsim 0$ $\partial dfs/\partial D_B > 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \lesssim 0$
High Income Group(Q_4)			$\partial dfs/\partial grant \lesssim 0$ $\partial dfs/\partial D_A \lesssim 0$ $\partial dfs/\partial D_B \lesssim 0$ $\partial dfs/\partial D_B$ - $\partial dfs/\partial D_A \approx 0$

Table 9: Effects of Cash Transfer on Desired Family Size by Gender, Engineering Major, or from Urban Area[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)	(4)	(5)	(6)
Receiving Either Survey A or B (*grant*)	0.182**		0.240**		0.165	
	(0.088)		(0.105)		(0.161)	
Receiving Survey A (D_A)		0.157*		0.230**		0.144
		(0.092)		(0.107)		(0.163)
Receiving Survey B (D_B)		0.205**		0.251**		0.186
		(0.093)		(0.107)		(0.163)
Female Indicator	-0.060	-0.062	-0.022	-0.022		
	(0.151)	(0.152)	(0.043)	(0.043)		
Interaction Term (*grant*female*)	0.039					
	(0.152)					
Interaction Term (D_A**female*)		0.058				
		(0.157)				
Interaction Term (D_B**female*)		0.024				
		(0.157)				
Majoring in Engineering (*engineering*)	-0.032	-0.030	0.064	0.064	-0.029	-0.030
	(0.048)	(0.048)	(0.137)	(0.137)	(0.049)	(0.049)
Interaction Term (*grant*engineering*)			-0.102			
			(0.141)			
Interaction Term (D_A**engineering*)				-0.124		
				(0.147)		
Interaction Term (D_B**engineering*)				-0.081		
				(0.148)		
Residing in Urban Area (*urban*)	0.080	0.077	0.077	0.076	0.019	0.020
	(0.099)	(0.099)	(0.098)	(0.099)	(0.172)	(0.172)
Interaction Term (*grant*urban*)					0.041	
					(0.176)	
Interaction Term (D_A**urban*)						0.053
						(0.181)
Interaction Term (D_B**urban*)						0.029
						(0.181)
Control for Age, College Entrance Exam Rank, Total Number of Siblings and College	Yes	Yes	Yes	Yes	Yes	Yes
Regional Effect	Yes	Yes	Yes	Yes	Yes	Yes
Control of Family Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.947***	1.970***	1.922***	1.921***	1.973***	1.975***
	(0.272)	(0.272)	(0.266)	(0.266)	(0.293)	(0.293)
Obs	2310	2310	2310	2310	2310	2310
F-stat for coefficient estimations for *grant*, *female*, and/or the interaction term	2.34*					
Prof> F	0.0716					
F-stat for coefficient estimations for D_A, *female* and/or the interaction term		1.75				
Prof> F		0.1550				
F-stat for coefficient estimations for D_B, *female* and/or the interaction term		2.56*				
Prof> F		0.0537				
F-stat for coefficient estimations for *grant*, *engineering* and/or the interaction term			2.49*			
Prof> F			0.0585			
F-stat for coefficient estimations for D_A, *enginerring* and/or the interaction term				2.14**		
Prof> F				0.0931		
F-stat for coefficient estimations for D_B, *engineering* and/or the interaction term				2.58*		
Prof> F				0.0517		
F-stat for coefficient estimations for *grant*, *urban* and/or the interaction term					2.64**	
Prof> F					0.0482	
F-stat for coefficient estimations for D_A, *urban* and/or the interaction term						2.05
Prof> F						0.1045
F-stat for coefficient estimations for D_B, *ubran* and/or the interaction term						2.30*
Prof> F						0.0756

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

Table 10: Effects of Cash Transfer on Desired Family Size by Age, College Entrance Exam Rank or Total Number of Siblings[a]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)	(3)	(4)	(5)	(6)
Receiving Either Survey A or B (*grant*)	1.421**		0.297		-0.029	
	(0.664)		(0.185)		(0.153)	
Receiving Survey A (D_A)		0.157*		0.262		-0.017
		(0.092)		(0.191)		(0.157)
Receiving Survey B (D_B)		0.205**		0.335*		-0.044
		(0.093)		(0.193)		(0.159)
Age (*age*)	0.058**	0.006	0.007	0.007	0.006	0.006
	(0.028)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Interaction Term (*grant***age*)	-0.055*					
	(0.029)					
Interaction Term (D_A**age*)		0.058				
		(0.157)				
Interaction Term (D_B**age*)		0.024				
		(0.157)				
College Entrance Exam Rank (*CEE*)	-0.020	-0.020	0.011	0.011	-0.020	-0.020
	(0.016)	(0.016)	(0.051)	(0.051)	(0.016)	(0.016)
Interaction Term (*grant***CEE*)			-0.033			
			(0.053)			
Interaction Term (D_A**CEE*)				-0.027		
				(0.055)		
Interaction Term (D_B**CEE*)				-0.040		
				(0.055)		
Total Number of Siblings (*tosib*)	0.068**	0.068**	0.068**	0.068**	-0.135	-0.136
	(0.030)	(0.030)	(0.030)	(0.030)	(0.128)	(0.128)
Interaction Term (*grant***tosib*)					0.213	
					(0.132)	
Interaction Term (D_A**tosib*)						0.189
						(0.135)
Interaction Term (D_B**tosib*)						0.241*
						(0.136)
Control for Age, Gender, Engineering Major, Urban and College	Yes	Yes	Yes	Yes		
Regional Effect	Yes	Yes	Yes	Yes		
Control of Family Characteristics	Yes	Yes	Yes	Yes		
Constant	0.803	1.970***	1.856***	1.859***	2.168***	2.171***
	(0.663)	(0.272)	(0.300)	(0.300)	(0.285)	(0.285)
Obs	2310	2310	2310	2310	2310	2310
F-stat for coefficient estimations for *grant*, *age*, and/or the interaction term	2.34*					
Prof> F	0.0716					
F-stat for coefficient estimations for D_A, *age* and/or the interaction term		1.75				
Prof> F		0.1550				
F-stat for coefficient estimations for D_B, *age* and/or the interaction term		2.56*				
Prof> F		0.0537				
F-stat for coefficient estimations for *grant*, *CEE* and/or the interaction term			2.49*			
Prof> F			0.0585			
F-stat for coefficient estimations for D_A, *CEE* and/or the interaction term				2.14**		
Prof> F				0.0931		
F-stat for coefficient estimations for D_B, *CEE* and/or the interaction term				2.58*		
Prof> F				0.0517		
F-stat for coefficient estimations for *grant*, *tosib* and/or the interaction term					4.59***	
Prof> F					0.0033	
F-stat for coefficient estimations for D_A, *tosib* and/or the interaction term						2.65**
Prof> F						0.0473
F-stat for coefficient estimations for D_B, *tosib* and/or the interaction term						4.60***
Prof> F						0.0032

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

Table 11: OLS Model Results: Robustness Check By Only Including Regions All 3 Surveys Are Administered[a b]

Dependent Variable: Desired Family Size (dfs)	(1)	(2)
Receiving Either Survey A or B (*grant*)	0.216***	
	(0.078)	
Receiving Survey A (D_A)		0.198**
		(0.081)
Receiving Survey B (D_B)		0.236***
		(0.082)
Gyeongsangnamdo	0.063	0.062
	(0.065)	(0.065)
Gyeongsanbukdo	0.072	0.072
	(0.074)	(0.074)
Control for Personal Characteristics	Yes	Yes
Regional Effect No	No	
Control for Family Characteristics	Yes	Yes
Constant	1.398***	1.400***
	(0.312)	(0.313)
Obs	1424	1424

[a]Robust standard errors in parenthesis: * p<0.1, ** p<0.05, ***p<0.01.

[b]This table is presented in order to check the robustness of the results presented in the paper because Type C was only collected from three regions. The regression results indicate that the previous estimations are conservative.

Table 12: List of Universities Represented in the Dataset

Seoul	Seoul National University	Yonsei University
	Sogang University	Kukmin University
	Jeongang University	Sangmyung University
Gyeonggido	Catholic University	Gyeonggi University
	Jangshin University	Yongin University
Gyeongsangnamdo	Dongah University	Dongeui University
	Gyeongnam University	Haeyang University
	Inje University	Ulsan University
Gyeongsangbukdo	Ahndong Science College	Ahndong University
	Handong University	Kyemyung College
	Yeongnam University	
Jeonlanamdo	Chodang University	Daebul University
	Mokpo University	
Jeonlabukdo	Wooseok University	
Chungcheongdo	Baeksuk University	Hanseo University
	Keokdong University	
Jejudo	Jeju University	
Gangwondo	Gwandong University	Yonsei University

Table 13: Population of South Korea: Age 20-29 by Region [a]

Region	Age	Population	% within Region	% within Nation
Seoul	20-24	684,026	7.10	1.43
	25-29	898,900	9.33	1.87
	All Age	9,631,482		20.07
Gyeonggido	20-24	859,223	5.07	1.79
	25-29	1,021,163	6.03	2.13
	All Age	16,947,659		35.31
Gyeongsangnamdo	20-24	450,276	10.08	0.94
	25-29	525,180	11.76	1.09
	All Age	4,464,864		9.30
Gyeongsangbukdo	20-24	314,590	6.28	0.66
	25-29	328,370	6.56	0.68
	All Age	5,007,144		10.43
Jeonlanamdo	20-24	187,977	5.88	0.39
	25-29	189,536	5.93	0.39
	All Age	3,194,892		6.66
Jeonlabukdo	20-24	104,713	5.93	0.22
	25-29	102,874	5.83	0.21
	All Age	1,766,044		3.68
Chungcheongdo	20-24	342,884	6.88	0.71
	25-29	346,348	6.95	0.72
	All Age	4,986,615		10.39
Jejudo	20-24	27,731	5.25	0.06
	25-29	32,113	6.08	0.07
	All Age	528,411		1.10
Gangwondo	20-24	92,984	6.35	0.19
	25-29	85,501	5.84	0.18
	All Age	1,463,650		3.05

[a]The data comes from the KNSB 2010 Population Census. The population of South Korea used to calculate percentages is 47,990,761. The population of South Korea used to calculate percentages is 47,990,761. This table is followed by a map of South Korea indicated with each region's population and its density.