# The Bottom, the Typical, and the Top: Distribution of Incomes among Households in South Korea

Yuri Mansury[1,2,*], Hun Joo Park[2]

[1] Cornell University

[2] KDI School of Public Policy and Management

* Corresponding author at: Cornell University Department of City and Regional Planning, 213 W. Sibley, Ithaca, NY 14850, USA Phone: +1-607-255-4271. E-mail: ysm3@cornell.edu

**ABSTRACT**

We explore the demographic characteristics of households at the bottom and at the top of South Korea's income distribution in 2005. At the bottom, we found poor households rely heavily on transfer incomes. At the top, well-to-do householders rely even more on labor income than a typical household, suggesting that top households were not members of the "propertied class." While there is substantial evidence on the distributional impact of income covariates, the evidence on the impact at different segments of the income distribution is scarce. This paper sheds light on the distributional impact differentials using quantile regressions, which reveal that both anti-discrimination policies and expansion of public sector are inequality reducing. Quantile regressions also indicate that higher-education policies are inequality neutral, while measures that encourage businesses to hire workers as long-term employees are inequality enhancing.

Keywords: Demographics; Household income inequality; Quantile regressions.

**I. Introduction**

Spectacular economic growth has transformed South Korea from a basket case in the aftermath of Japanese occupation and Korean War into a maturing OECD economy. Welfare has improved from a below subsistence living standard in the 1950s to an export-oriented powerhouse in 2005 with per capita income of nearly US$ 20,000. It is thus only natural that most early discussions of Korean economic performance centered on income growth. During the period of rapid take-off from 1962 to the mid 1990s, when growth rate averaged eight percent annually, the lack of concern for those at the bottom of the distribution was bolstered by the argument that the poor would gain more from the promotion of economic growth than from redistribution. According to this argument, any lingering inequality would not only motivate individuals to work harder, but also allow rich individuals' higher savings to generate more investments and thereby sustain growth (Kaldor 1957).

Sustained economic growth is an important indicator of economic development but does not guarantee welfare improvement for the masses. If growth has led to rising inequality, it likely has both positive and negative effects. On the positive side, rewarded performance provides incentives for individuals not only to work hard but also to innovate. On the negative side, differential rewards that are uncorrelated with performance – for example, those due to sexual discrimination – undermine the civil society and cause misallocation of resources. It is because of this ambiguity that, more recently, distributional concerns have spurred a vigorous debate about whether the gap between the poor and the rich has widened and if so, whether anything could be or should be done about it.

In a parallel work in progress, we show that income inequality in South Korea surged right after the 1997 financial crisis, which appears to have pushed the Korean economy out of its previous steady state characterized by relatively low income inequality into a new trajectory that is as stable but accompanied by significantly higher inequality. The extent to which income inequality has risen in South Korea probably took most economists by surprise. Throughout its rapid growth episode, income distribution in Korea had remained relatively stable over time as the strong gains accruing to those at the top of the distribution were accompanied by even stronger gains in the middle and at the bottom. Moreover, following Kuznets' (1955) inverted U-hypothesis, the level of inequality was supposed to *decrease* naturally over time as wealth accumulated and the economy matured.

It appears that the trend has not quite worked out that way. Figure 1 shows the evolution of income distribution in South Korea between 1990 and 2005 using Gini coefficient as the inequality measure.

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Insert Figure 1 about here

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The trend suggests two disjointed regimes of inequality demarcated by the 1997 Asian financial crisis. Before the 1997, the Gini coefficient ranged between 0.25 and 0.26. In 1998, the Gini dramatically jumped to well over 0.29 in 1998, and has stayed at that level since.

Numerous empirical studies have examined the distribution of income in South Korea. In general, the literature in this area can be broken down into two strands; namely those that seek to explain household or individual income disparities using covariate analysis (see, e.g., Fields and Yoo, 2000), and those that examine inequality trend using aggregate measures (e.g., Sato and Fukushige, 2009; Kwack and Lee, 2007; Yoo and Kwon, 1987). That inequality in Korea has been trending up recently is also the subject of some of these studies. Among the latest studies that we are aware of, Sato and Fukushige (2009) conclude that beyond the threshold per capita income of US$ 9,200, in South Korea a further increase in per capita income leads to a concomitant increase in inequality. Also consistent with our calculations, Kwack and Lee (2007) found that the distribution of gross income across Korean households has deteriorated since 1998.

The present study examines whether Korea follows recent trend in other developed economies that also have experienced surges in inequality, marked by well-to-do professionals replacing the propertied class at the top of the distribution. Complementing the inter-temporal analysis, the present study looks at a cross section of Korean households in 2005, and compares the demographic characteristics of a typical household representing the entire population with those at the bottom and the top of the distribution. The primary purpose of our analysis is descriptive: we want to understand whether there are systematic differences between the poor and the rich. In addition, our analysis aims to help policymakers identify the target groups of social policies.

Other studies have also looked at cross sections. Using Occupational Wage Survey Data, Fields and Yoo (2000) compare covariates of wage differentials in 1986 with those in 1993. Unlike the present study, however, Fields and Yoo focus only on labor income, and do not take into considerations other components of an individual's income or the

contributions of other household members. Thus the present study employs household income as the main welfare indicator because an examination of wages alone often misses large disparities in non-labor income, and because an individual's welfare depends in large part on his or her family's economic performance.

The present study also focuses on income as the source of disparities rather than wealth because income remains the primary indicator of well-being for the overwhelming majority of individuals and households in any society. Although both income and consumption data are available, there has been no evidence that consumption is a better predictor of welfare changes than income (Chaudhuri and Ravallion, 1994). For our purpose here, income is a more appropriate indicator capturing the impact of labor market structure (industries, occupations, etc.), capital ownership, and household demographics on welfare. Further, income and wealth are positively (if imperfectly) correlated since it is accumulated savings out of income that builds up wealth, which in turn enables its owners to generate even more income in the future.

For our formal analysis, we employ quantile regressions to determine whether the impact of income covariates is stable across different segments of the household income distribution, in addition to traditional OLS techniques. As introduced by Koenker and Bassett (1978, 1982), quantile regressions are more sensitive than OLS to observations in both tails of the distribution, and thus are suitable for the present study, which compares the effects of income covariates at the bottom with those at the top of the conditional distribution. To our knowledge, our study is among the first that applies quantile regressions to Korea household income data.

Unlike least-squares regressions, which assume distributional invariance, quantile regressions are appropriate when covariates influence income differently at different segments of the distribution. This is the case, for example, when higher educational attainment increases not only householder's income level, but also the dispersion of income. In that case, quantile regressions can then be deployed to capture the differential impact of education. By estimating the covariate parameters separately for every segment (quantile) of interest, quantile regressions facilitate comparisons of the impact of covariates across different segments of the distribution.

The rest of the paper is organized as follows. Section II describes the data. Section III presents the exploratory analyses. Section IV reports the results of our formal empirical estimations. We close in Section V with concluding remarks.

**II. Data**

We use the 2005 data from the Household Income and Expenditure Survey, which has been conducted *monthly* by the Korea National Statistical Office (NSO) since 1963. The data for every household are available in three main categories, namely household demographic characteristics, income sources, and expenditure breakdown. The survey excludes single-member households.

The demographic indicators include householder's characteristics such as region of residence (Seoul vs. Non Seoul), employment type, number of household members, marital status, gender, educational attainment, industry of employment, occupation, as well as demographic characteristics of the spouse and a maximum of four other household members. Education is divided into five categories of householder's

maximum attainment: less than primary school, primary school, middle school, high school, and college graduates.

The income data is organized in a hierarchical format as follows. At the top level, household gross income is sub-divided into income flows, changes in asset position (other income), and previous month's balance forward. In turn, income flows can be broken down into regular income and irregular income, which include cash gifts and proceeds from used-good sales, while asset changes into asset decrease and debt increase. At the next level, detailed regular income sources were disaggregated into four categories, namely wage earnings, self-employment incomes, capital incomes, and transfers. Finally, wage earnings are decomposed into household members' contributions (head, spouse, and other members), while capital incomes into those from interests, dividends, real-estate, and other properties.

The original 2005 data contains the survey of more than 11 thousand households. Prior to analyses, however, we introduce a number of data-cleaning procedures that reduce the sample size considerably. First, we exclude the so-called imputed households, which are surveyed households that failed to report for at least one month, in which case the NSO use data from similar households to supplement those in the original sample. We restrict our sample to urban households to lessen measurement errors associated with subsistent, rural households. Next, we also exclude households that reported a change in householder's gender during the survey period. From the pool of households that pass the first two procedures, we select those that reported for at least six months (out of 12) in order to minimize seasonal bias.

Note that during the 12-month sampling period, many households reported changes in characteristics. Some of these changes doubtlessly are legitimate. For example, if a household relocated from Seoul to another city, its region indicator would change accordingly. Other changes may be due to reporting inaccuracies. In order to minimize measurement errors, we select the indicator value that appeared most frequently (the maximum mode). For example, if a household claimed to be Seoul resident in seven out of 12 months of observation, then in our analysis this household is recognized as a Seoul resident for the entire year. The final result is our working sample of 5,984 urban households.

## III. Exploratory Analyses

The demographic characteristics of households in the entire sample, at bottom 10 percent and top 10 percent, as well as the propertied class are summarized in **Table 1**. We discuss first the characteristics of households in the full sample. Seoul City is home to 13 percent of all respondents, while the rest live in the rest of the country. The median age of householders is 45, and over 80 percent are male. Well over 80 percent are married, and more than 70 percent of householders completed at least 12 years of schooling, of which about half have college degrees or higher. High educational attainment is indeed an impressive feature of Korean society.

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About a tenth of householders were unemployed, while seven percent were temporarily employed during the survey. Among those employed, a third fell into the miscellaneous category that includes the self-employed (small retails), business owners, and free lancers, while another third comprises blue-collar householders. The modal industry of employed householders were Manufacturing (20 percent), while the modal occupation is Production (17 percent). Employment composition thus mirrors the structure of production in 2005 (Economist Intelligence Unit, May 2006), where manufacturing contributes to over a quarter of aggregate income. Manufacturing thus continues to maintain its dominance in the Korean economy as a source of both employment and income.

Households at the bottom 10 percent differ in important respects from the typical household in the entire sample. First, the lowest-income households are less likely to live in Seoul (7 percent vs. 13 percent for households at the bottom and in the entire sample, respectively), and more likely to be female headed (37 percent vs. 20 percent). The typical householders are 15 years older with a median age of 67. Compared to entire sample, there is a greater likelihood among the bottom households (28 percent vs. 12 percent) to find a single head without a spouse. It may come as no surprise to find that the lowest-income householders, on average, attain significantly less education than the typical Korean householder. Specifically, 1/5 of the bottom householders did not complete primary school, while only 1/3 completed 12 years of education.

Unemployment rate at the bottom is five times as high as in the full sample. Specifically, more than half of the householders claimed to be unemployed, while another 14 percent were employed temporarily during the survey. The modal industry of employment for the poor is retail trade (10.7 percent), which suggests that many of the poor are small

traders in the informal sector. The modal occupations are Simple, manual work (14 percent), Services (10 percent) and Sales (8 percent).

There are also important distinctions between households at the top 10 percent and the typical ones in the entire sample. Male householders are even more dominant than in the entire sample, making up 92 percent of the top households, and virtually all of them are married (97 percent vs. 88 percent). The highest-income householders are well educated. Among the top householders, over 90 percent completed at least 12 years of education, of which two-thirds are college educated and beyond.

More than a third of the top were white collar households, while another quarter were self-employed (small retails), business owners, and free lancers. Only five percent of top householders claimed to be unemployed, and only one percent were temporarily employed. The preponderance of Manufacturing is even more evident among the top 10 percent than in the entire sample, employing over a quarter of highest-income householders. The other modal industries are education (11.15 percent) and public administration (10.3 percent). The modal occupations are Professionals (19 percent), Office Clerks (18 percent), and Semi-Professionals (15.3 percent)

The median number of children is two. Less than a sixth of the top householders had no child, while over half have at least two children. Among those that with at least one child, the median age of children is 13 years. Combined with the age and gender profile, this suggests that the majority of the top households are headed by prime-age males who had at least two teenage children.

B. Household Incomes

- All Households

The gross income breakdown of households in the entire sample, at bottom 10 percent and top 10 percent, as well as the propertied class are summarized in **Table 2**.

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Insert Table 2 about here

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Median gross income for the full sample is 5,181,350 Korean Won (KRW for brevity, which is roughly equal to US$ 5,000 at the 2005 average exchange rate of 1,024 Won to the US Dollar) per month, while the mean is 6,189,570 KRW. At the top level, mean gross income is divided almost evenly between income flows (50 percent) and asset changes (47 percent), while balance forward accounted for only three percent of the total.

At the second level, it turns out that well over 90 percent of income flows are accounted for by regular incomes, which in turn can be subdivided further into wage earnings (66 percent), income from self-employment or secondary job (24 percent), capital income (two percent), and transfer income (eight percent). Fully 4/5 of all householders derived income from salary or wages, while less than half derived income from self-employment or secondary jobs, and only a fifth derived income from capital. The typical salaried worker therefore effectively relies on wages as the source of regular incomes. Furthermore, capital income, which is the hallmark of the propertied class, with zero median does not appear to be an important source of income for the typical Korean household. It is also noteworthy that asset decrease, i.e. the proceeds from asset

liquidations, accounted for 83 percent of asset changes. This suggests that the typical Korean household relies heavily on the sale of existing assets to supplement their main income.

The intra-household distribution of wage income is as follows. Heads on average contribute 3/4 of household's total wage earnings, while their spouses about 15 percent, and other family members the rest. Over 65 percent of householders (4012 households) contribute through salaried or wage earnings. Only about 1/3 of householders, however, have a spouse that contributes to their household's wage earnings, which is why the median spouse's wage income is zero, while only 1/4 of all surveyed households have family members (other than the head or its spouse) that contribute to their household's wage earnings. The typical spouse (and other family member), therefore, does not contribute to the household's wage earnings.

At the same time, 2/5 of householders earn income through self-employment or a second job. Less than a tenth of householders (10 percent) have a spouse that contributes through self employment. Spouses therefore, typically, do not contribute through self-employment. When they are self employed, spouse's average contribution is relatively small. On average, heads accounted for 85 percent of self-employment income, while their spouses 12 percent, and other family members the rest. All these suggest that the Korean households typically rely on a single income earner.

- Bottom 10 percent

The bottom (10$^{th}$ percentile) households in 2005 earned a maximum gross total income of 1,971,954 KRW per month (US$ 1,925). By construction, there are 598 households (10 percent of total) that belonged to this category. The median gross income of this

group is less than 1/3 of the median income of the entire sample. Income flows accounted for 60 percent of gross income, while asset changes 27 percent and balance forward the rest. The poor thus rely more on income flows, and less on asset changes, than the typical Korean householder. The composition of their income flows, however, differs from that for a typical household in the full sample.

Specifically, wage earnings on average account for only 1/3 of the bottom 10 percent's regular incomes. The median wage of the bottom 10 percent is only a tiny fraction (two percent) of the median wage of the typical Korean household. Further, less than 2/3 derive income from wages (compared to 4/5 in the entire sample). The bottom 10 percent therefore rely to a lesser extent on wage income than the typical case. Instead, transfer incomes play a much larger role, accounting for 2/5 of the bottom 10 percent's regular incomes (compared to eight percent in the entire sample). Thus, the bottom 10 percent rely on transfers five times as much as the typical Korean household.

Among the poor, the intra-household distribution of wage income is as follows. Heads, on average, contribute 80 percent of their households total wage earnings, their spouses seven percent, and other members the rest. However, only 45 percent of the lowest-income householders earned salaries or wages, because over half of them were unemployed. Further, less than a fifth have a spouse that contributes wage earnings, and about the same proportion have family members that contribute wage earnings. As a result, the median head's, spouse's, and other members' wage earnings are all zero.

By contrast, half of householders earn income through self-employment or a second job. However, less than five percent (3 percent) of the spouses of the bottom 10 percent householders contributed through self-employment. Note that across asset incomes,

asset sales accounted for over well over 90 percent of asset changes, while new debts only about 6 percent. This suggests the difficulties lowest-income households may have had in tapping the credit market to obtain debt loans

- Top 10 percent

The highest-income households in 2005 earned a minimum gross income of 11.2 million Won per month (about US$ 11,000) and a maximum of 97 million Won (about US$ 95,000) per month. The median gross income is 13.8 million Won (US$ 13,500) per month, almost three times the median income of the entire sample. Income flows accounted for only 40 percent of gross income, while asset changes effectively the rest. The rich therefore rely much more on asset changes – the proceeds from asset liquidations or the take-out of new loans – and somewhat less so on income flows, than the typical Korean householder.

Like in the typical case, over 90 percent of income flows are accounted for by regular incomes, which in turn can be subdivided further into wage earnings (76 percent), income from self-employment or secondary job (16 percent), capital income (3 percent), and transfer income (5 percent). The highest-income householders in Korea therefore do not rely heavily on capital income. Thus, even among the richest households, capital is not an important source of income. At the same time, more than 90 percent are wage or salary earners, while 2/5 derived income from self-employment or secondary jobs.

As for asset changes, liquidation accounted for 80 percent, while new debts the rest. These figures are virtually identical to those in the full sample, which means that in absolute terms the rich rely more on asset changes but without changing the asset decrease/ debt increase composition, which in turn suggests that the rich does not tap

into the credit market (hence increasing their debts) more than the typical Korean householder.

The intra-household distribution of wage income is as follows. Heads contribute 3/4 of household's total wage earnings, while their spouses a fifth. These figures are similar to those for the entire sample. Unlike the typical case, however, over 80 percent of householders contribute through salary or earnings, while two-fifths of their spouses earn wages/salaries. Thus, compared to the average Korean in the sample, a high-income householder and the spouse are *more* likely to be wage earners.

- The propertied class.

It has been argued that the distribution of property income is significantly less egalitarian than the distribution of labor income (Yoo and Kwon, 1987). In Korea, a potential source of property income disparities is the highly unequal distribution of real estate assets. Thus, given the booming real-estate market, particularly in the capital city of Seoul, we expect households at the top of the distribution to derive significant portions of their income from property ownerships. We examine next whether top households indeed belong to the "propertied class."

Our notion of the "propertied class" combines both the absolute level (it has to exceed a minimum threshold) and relative importance of capital income (measured by its share in regular income). Specifically, we define the "propertied class" as those households whose income from capital exceeds one-tenth of the median *regular* incomes from all sources and whose ratio of capital income to regular income is at least 10 percent. In 2005 there are 308 households that belong to this category, with total gross income that ranges from 1,057,505 Won (about US$ 1,000) to 97 million Won (about US$ 95,000)

per month. The propertied class thus includes members of *both* the lowest-income and highest-income households. The mean gross pay is about six million Won per month, significantly less than 1/2 of the highest decile's mean. Therefore, a typical member of the propertied class does not have the purchasing power of the highest-income households. As in the United States (Piketty and Saez, 2003), members of the propertied class in Korea are not the "working rich" or the well-compensated executives.

Seoul is home to one-fifth of all propertied households, almost more than double the proportion for the entire sample. A propertied household thus is more likely to reside in the capital city, even more so than the highest-income group. About 2/5 claimed to be unemployed in 2005, while a quarter were self-employed, business owners, free lancers, or others. Only three percent of the propertied householders were temporarily employed, and only three percent were civil servants.

As in the entire sample, propertied householders are predominantly married male, with similar educational attainment. Unlike in the entire sample, however, propertied households are older with median age of 57. Two-fifths claimed to be unemployed in 2005, while for those employed the modal industries are manufacturing and wholesale/retail trade. Unemployment, however, appears to be voluntary, as the median income is 3,948,306 Won per month (US$ 3,900) among those unemployed. Both the age profile and the hefty unemployment income suggest that many propertied householders were retirees.

Asset changes accounted for over half of gross income, while income flows two-fifths. In this regard, the propertied class is similar to the richest 10 percent. Still, 2/3 of propertied households earned their income from salaries or wages, while the majority

also derived additional income from self-employment or a secondary job. Thus, the properties class has a diversified portfolio of income sources, with only a tenth did not receive any labor income (from either primary or secondary or self-employment). Unlike in the richest group (or in the entire sample), however, wages contributed only to two-fifth of regular income, while self-employment one-fifth. Instead, capital income accounted for 1/3 of regular income. Of course, by construction the ratio of capital income to regular income of the propertied class is at least 10 percent. The prevalence of unemployment and capital income indicates that the members of the propertied class are very similar to the "coupon-clipping rentiers" in the United States (Piketty and Saez, 2003).

**IV. Formal Identification Analysis**

The exploratory analysis suggests that households at different segments of the income ladder respond differently to a change in income determinants. The analysis is only exploratory, however, because it does not control for other changes that might occur simultaneously. Further, such exploration cannot compare the importance of a particular covariate relative to others. This section employs formal statistical analysis to examine why equilibrium income is so much higher among households at the top than among those at the bottom of the distribution.

Previous covariate analyses of household incomes in South Korea employ conventional least-squares methods. Our exploratory analysis, however, suggests that the impact of various covariates is not uniform across different segments of the income strata. Thus, and in addition to standard ordinary least squares, we perform quantile regressions to

reveal the effects of covariates on the median, bottom 10 percent, and top 10 percent of the income distribution.[1]

As Bedi and Edwards (2002) summarize, quantile regressions have several advantages over OLS, particularly for distributional analysis. First, quantile regressions can easily detect the presence of scale-dependent dispersion (i.e., heteroskedasticity). Perhaps more importantly for the purpose of the present study, quantile regressions allow the entire distribution to be explored by estimating the model parameters for every segment (quantile) of interest. In addition, quantile regressions are more resistant to outliers because it is based on minimization of the absolute sum of errors rather than minimization of the sum of squares. It is because quantile regression results are robust to unusual fluctuations in the tails of the distribution (i.e., outliers), that the approach can also be used to evaluate the appropriateness of least squares estimates.

Before proceeding further, we note the important distinction between, say, the bottom households identified in section III, and the bottom households implied by quantile regressions. In section III, households are segmented according to their income levels. In quantile regressions the dependent variable is household income, which means the sample must be segmented according to the conditioning covariates (Koenker and Hallock, 2001). Thus, in the extreme case where none of the poorest householders was college educated, there should still be households in the bottom 10 percent *conditional* on college education. Nonetheless, it is reasonable to expect significant overlaps, in the sense that households at the bottom of the *unconditional* income distribution are also likely to be those at the bottom of the conditional distribution.

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[1] For a gentle introduction to quantile regressions, see Koenker and Hallock (2001).

**Figure 2** reveals that the unconditional distribution of income is uni-modal with a clear mode around 5,000,000 Won per month. The distribution also indicates a strong positive skew, indicating the appropriateness of log-income as the dependent variable in our identification analysis. In all our estimates here, the covariates comprise continuous, discrete, and categorical variables. Continuous variables are age, age squared, and average age of children, while discrete variables are family size and number of children. The categorical variables used here are re-coded as standard 0/1 dummies.

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Insert Figure 2 about here

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More specifically for the categorical variables, the omitted categories (dummy=0) in our regressions stand for households headed by single females with less than a primary-school education who lived outside Seoul, and employed temporarily in the Transportation sector as Service Workers. The regression intercepts thus can be thought of as representing the baseline income of households that satisfy all the omitted categories.

Table 3 compares results from mean (OLS) fit with those from median (50th percentile) fit. To guard against the possibility of arbitrary heteroskedasticity (Wooldridge, 2002), for OLS we report the results from robust standard-error estimations. For both OLS and median regressions, we estimate two models: the first does not control for industry and occupational characteristics (OLS (1) and QR (1)), while the second includes them (OLS (2) and QR (2)).

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Insert Table 3 about here

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In general, the covariates appear with anticipated signs. With a few, notable exceptions,

the magnitude and signs on the estimated coefficients from OLS and median regressions

are very similar. The close outcome is a welcomed indicator that – for the most part –

OLS is not driven by outliers. We discuss select covariates of interest next.

Householder's age exerts a quadratic impact on income. For all regressions, the

coefficients for age and age squared suggest that householder's age increases income

from age 18 to mid-40s, but decreases income when household head is older than 45.

Older children tend to increase household income – possibly reflecting the parents'

lifecycle effects not already captured by age, but more children tend to decrease income.


Householder's gender has a large impact, and for precision therefore the percentage

difference between female- and male-headed household incomes should be calculated as

$\exp(b_G) - 1$, where $b_G$ is the estimated coefficient for gender. OLS results suggest that,

controlling for industries and occupations, male-headed households earned 13 percent

more than female-headed households, while median regressions suggest 17 percent

income differential in favor male-headed households. It appears that the significant

disparity between OLS and median regression results is due to the former being

influenced by a few outliers, but at the moment it is not clear whether those outliers

belong to lower or upper tail of the distribution. We shall return to this point below. For

now, we note that gender income differentials in Korea remain highest among OECD

countries, and studies have attributed them to persistent sexual discrimination in favor

of males (e.g., Monk-Turner and Turner, 2004).

The estimates for job security also indicate the influence of outliers on OLS, which suggest that temporarily-employed householders earned 20 percent less than otherwise after controlling for industries and occupations. By contrast, median regression suggests that such householders earned 24 percent less.

Spousal status is another variable with a large estimated impact, but this time OLS and median regressions are in close agreement. Controlling for industries and occupations, both OLS and median regressions suggest that the presence of a spouse tends to increase household income by about 19 percent.

Education at *any* level is associated with higher income, but the returns to human capital investments increase substantially with higher attainment. College premium appear to be exceptionally high compared to the returns to lower attainment. Both OLS (2) and QR (2) suggest that, other things equal, the income of college-educated householders is almost 40 percent higher than that for high-school-educated householders, which in turn earned over 50 percent more than householders with less than primary school.

Thus far, we have limited our analyses to the impact of covariates on the center (mean or median) of the distribution. Quantile regressions, however, also allow us to explore the impact at both tails of the distribution. **Table 4** reports results from quantile regressions for bottom (10th percentile) and top (90th percentile) households. For comparison purposes, results from the median (50 percent) regression are reproduced in the middle column. All regressions reported in **Table 4** control for industry and occupational characteristics.

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Insert Table 4 about here

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As in least-squares, the estimated coefficients can be interpreted as the impact of a one-unit change of the variable on gross household income. At any quantile, we can ask how much lower (or higher) is household income, conditional on the explanatory variables. We shall focus our discussion only on select number of covariates.

The positive effect of householder's age diminishes most rapidly at the bottom quantile (10th percentile). Among households at the bottom, the head's age increases income until age 39, then decreases income afterwards. The turning point is postponed to a later age, however, at higher quantiles. Thus at the median (50th percentile), it occurs at 43, and at the top (90th percentile), it occurs at over 47.

The effects of gender, public-sector employment, education, and job security are of substantial policy interests, and will be discussed next. First, **Table 4** shows that there is a dramatic decrease in "male premium" from 31 percent at the bottom, to 18 percent at the median, and finally to a mere four percent at the top. The muted effect of gender at the top suggests that male premium is highest among households in the lower tail of the income distribution. The policy implication is straightforward. To the extent that income differentials reflect employers' preferences for males, then female-headed households at the bottom quintile benefit the most from anti-discrimination measures. That is, anti-discrimination policies are expected to be *inequality reducing*.

Similarly among householders that are employed in the public sector, the coefficient on Public Services is highest at the bottom quintile. Bottom households whose heads are civil servants earned almost 50 percent more than bottom households whose heads are transportation workers (the baseline). By contrast, relative to transportation workers publicly-employed heads of median households earned 30 percent more, while publicly-employed heads of top households 25 percent more. Thus, increasing public-sector employment is also expected to be *inequality reducing*.

Going back to our earlier point, OLS estimates (**Table 3**) clearly also reveals that male-headed households earn more than female-headed ones. Two comments are in order. First, quantile regressions show that the disparity is considerably higher at the bottom and much smaller at the top. In this case, even the 90-percent OLS confidence interval does not contain this range of disparities. OLS thus fails to capture the impact of gender differentials at the lower and upper tails of the distribution. Second, OLS estimates suggest that male householders earn 13 percent more income than female householders. Quantile regressions reveal that the mean male premium is mainly captured by households at the bottom of the income distribution (i.e., outliers in the lower tail). OLS thus does a poor job of characterizing the mean impact of gender.

Turning now to the effects of schooling, we have seen that college education (and beyond) is associated with substantial increase in household income. Across quantiles, however, college education has the strongest effect among median households. Specifically, median households with college-educated heads earned 38 percent more income than those with high-school-educated heads, while bottom and top households whose heads have similar qualifications earned about 30 percent more. Promoting

higher education therefore will benefit all households, but the typical (median) households will benefit the most. Thus, higher education is *inequality neutral*.

Finally, job security appears to have an *inequality-enhancing* effect, which can be seen most easily from the dummy coefficient that is highest for top (10th percentile) households. At the top quintile, households whose heads have secured a long-term contract earned over 30 percent more than those whose heads are temporarily employed. By contrast, relative to households whose heads are temporarily employed, bottom households earned 25 percent more, and median households 22 percent more. Thus, policies that encourage employers to place workers in long-term positions are expected to exacerbate the existing inequality.

## V. Concluding Remarks

Our analyses found that, not surprisingly, lowest-income households in South Korea are disproportionately non-married, female-headed, less educated, and either unemployed or employed as simple, manual workers. They are also more likely to live outside of the capital city than a typical household in the entire sample, and mostly headed by older householders whose children had left home. Because unemployment was pervasive, households at the bottom of the distribution rely much less on wage earnings, and instead derive a significant portion of their income from transfers.

Also as expected, a typical high-income householder is a married male at his prime age with two young children at home, and educated with at least 12 years of schooling. Households at the top of the distribution are also more likely to live in the capital city and employed in executive (white-collar) positions.

Not anticipated in post-industrial South Korea is the continuing role of manufacturing as the main source of employment for top householders.[2] Unlike in other advanced economies, it appears that the high-end service sectors (which include finance, insurance, and real-estate) are not yet the main industry of occupation for high-income households in South Korea. It is also surprising that capital income counts very little (two percent) towards household income at the top, while labor income represents an even larger contributor than in the typical case.

Our findings thus do not support the hypothesis that capital assets are an important source of income for highest-income households, let alone the primary one. In fact, the top 10-percent households received a zero median capital income in 2005. By contrast, the propertied class received over a tenth of their median gross income from capital, but that is by construction. Thus, the Korean households at the top of the distribution in 2005 typically did not belong to the propertied class. The preponderance of labor income among the highest-income households is also found in the U.S. (Raffalovich et al., 2009). Piketty and Saez (2003) attribute rising labor income among the top to managerial compensation that has increased rapidly in recent years.

Yet another unanticipated finding is the role of age and location as a key factor that distinguishes between households at the top of the distribution and the propertied class. Specifically, a typical propertied householder is a decade older and more likely to live in Seoul than the typical high-income householder. Nevertheless, it is consistent with the life-cycle hypothesis where high-performing, mobile executives pursued well-paid

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[2] Manufacture accounted for less than 40 percent of South Korea's output in 2008.

employment during their prime age, then retired in the place that offers the most amenities (the capital city of Seoul) while living off their accumulated savings.

Turning to impact analysis, we have employed quantile regressions to describe more fully the effect of select covariates over the entire range of the conditional household income distribution. The results suggest that both anti-discrimination policies and expansion of public sector are inequality reducing. By contrast, we found that higher-education policies are inequality neutral, while measures that encourage businesses to hire workers as long-term employees are inequality enhancing.

We hasten to add that, while quantile regressions describe the entire distribution more completely than OLS, the present approach does not allow us to shed light on the factors that are responsible for the distributionally-dependent effects of gender, public employment, and job security. We may speculate, for example, that male premium is highest (and sexual discrimination strongest) at the bottom quintile because the current institutional arrangements (e.g., the legal system) fail to provide adequate protection to the most vulnerable households. Testing such hypothesis, as well as exploring potential endogeneity problems, requires proxy and instrumental variables that are beyond the scope of the present study.

Finally, it is important to recognize the limitations of our data set. It is well known that household survey data significantly understate the share of income accruing to the top households. In the US case, Krueger (2003) argues that there is substantial underreporting of the incomes of top households in household survey data. In the Korean case, Kwack and Lee (2007) point out that the Household Income and Expenditure Survey often excludes very rich households headed by, for example,

medical doctors and lawyers. Another potential source of bias is the exclusion of single-member households. These serious limitations of the data set must be borne in mind when interpreting our results.

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**Table 1**. Characteristics of households in the entire sample, at the bottom, and at the top of the household income distribution.

|  | Entire Sample | Bottom 10% | Top 10% | Propertied Class |
|---|---|---|---|---|
| Residence (%) |  |  |  |  |
| Seoul | 12.7 | 6.7 | 15.1 | 20.5 |
| Gender (head, %) |  |  |  |  |
| Male | 83.4 | 67 | 92.4 | 85.4 |
| Age (head, years) |  |  |  |  |
| Median | 45 | 62.7 | 44.75 | 57 |
| Marital (head, % married) | 88.2 | 72 | 96.5 | 91.2 |
| No. of children (median) | 1 | 0 | 2 | 1 |
| Median age of children | 9 | 0 | 13 | 6 |
| Education (max. attainment, %) |  |  |  |  |
| Less than primary | 3.5 | 19.9 | ... | 3.6 |
| Primary school | 10.2 | 27.8 | ... | 15.6 |
| Middle school | 12.6 | 18.7 | 7 | 12.7 |
| High school | 39.9 | 25.1 | 32 | 37.3 |
| College/beyond | 33.8 | 8.5 | 61 | 30.8 |
| Employment type (%) |  |  |  |  |
| Head: |  |  |  |  |
| Unemployed | 13 | 52.3 | 5.3 | 40.9 |
| Self-employed | 29 | 17.7 | 20.8 | 25.6 |
| Employed: |  |  |  |  |
| White collar | 17.9 | ... | 36.1 | 9.7 |
| Blue collar | 25.7 | 14 | 18.3 | 17.2 |
| Civil servants | 6.3 | ... | 18.5 | 3.3 |
| Temporary | 7.4 | 14 | 1 | 3.3 |

| | | | | |
|---|---|---|---|---|
| Modal industry (%) | | | | |
| Head: | | | | |
| | Manuf. (20) | Trade (10.7) | Manuf. (26.9) | Manuf. (11) |
| | Trade (13.4) | Accomm. (6.3) | Educ. (11.2) | Trade (10.4) |
| | Construct. (9.2) | Repair (5.9) | Pub. Ad. (10.3) | Construct. (8.1) |
| | | | | |
| Modal occupation | | | | |
| Head (%): | Production (17.1) | Manual (13.9) | Professional (18.8) | Sales (8.4) |
| | Crafts (14.2) | Service (9.7) | Office (17.5) | Crafts (8.1) |
| | Office (10.5) | Sales (7.7) | Semi-prof. (15.3) | Production (8.1) |
| | | | | |
| No. obs. | 5984 | 598 | 601 | 308 |

Notes:

Accomm. = Accommodation and restaurants, Construct. = Construction, Educ. = Education, Pub. Ad. = Public administration, national defense, and social security administration, Trade = Wholesale and retail trade.

**Table 2**. Components of mean gross household income in South Korea, 2005.

|  | Full Sample | Bottom 10% | Top 10% | Propertied Class |
|---|---|---|---|---|
| Gross total income | 6,189 | 1,348 | 16,200 | 8,047 |
| I. Income | 3,041 | 819 | 6,492 | 3,384 |
|   1. Regular | 2,864 | 750 | 9,482 | 3,096 |
|     a. Wages | 1,887 | 264 | 4,497 | 1,274 |
|     b. Self-employment | 690 | 141 | 970 | 589 |
|     c. Capital | 61 | 28 | 192 | 935 |
|     d. Transfer | 226 | 317 | 269 | 299 |
|   2. Irregular | 177 | 69 | 565 | 289 |
| II. Asset changes | 2,929 | 373 | 9,482 | 4,403 |
|   1. Asset decrease | 2,445 | 352 | 7,604 | 3,642 |
|   2. Debt increase | 483 | 483 | 1,878 | 761 |
| III. Balance forward | 219 | 156 | 266 | 260 |
| No. Obs. | 5984 | 598 | 601 | 308 |

Note: All figures are in thousands of Korean Won

**Table 3**. Results from OLS and median (50th percentile) regressions.

Dependent Variable: Log of Gross Household Income.

| Explanatory Variable | OLS (1) | OLS (2) | QR (1) | QR (2) |
|---|---|---|---|---|
| Age | 0.0663 | 0.0520 | 0.0696 | 0.0548 |
| | (0.0049) ** | (0.0049) ** | (0.0047) ** | (0.0058) ** |
| Age$^2$ | -0.00077 | -0.00058 | -0.00082 | -0.00063 |
| | (0.00005) ** | (0.00005) ** | (0.00005) ** | (0.00006) ** |
| Average age of children | 0.0162 | 0.0150 | 0.0174 | 0.0176 |
| | (0.0011) ** | (0.0011) ** | (0.0010) ** | (0.0012) ** |
| Family size | 0.0983 | 0.0809 | 0.0950 | 0.0968 |
| | (0.0146) ** | (0.0141) ** | (0.0149) ** | (0.0181) ** |
| Householder's gender (deviation from "Female") | 0.1843 | 0.1331 | 0.2173 | 0.1708 |
| | (0.0256) ** | (0.0268) ** | (0.0232) ** | (0.0301) ** |
| Region (deviation from "Non-Seoul") | 0.0858 | 0.0737 | 0.0699 | 0.0478 |
| | (0.0207) ** | (0.0207) ** | (0.0215) ** | (0.0262) |
| Spousal Status(deviation from "Spouse absent") | 0.2140 | 0.1975 | 0.1831 | 0.1914 |
| | (0.0306) ** | (0.0293) ** | (0.0280) ** | (0.0339) ** |
| Education (deviation from "Less than primary") | | | | |
| Primary School | 0.1606 | 0.1884 | 0.1427 | 0.1992 |
| | (0.0503) ** | (0.0488) ** | (0.0456) ** | (0.0551) ** |
| Middle School | 0.2741 | 0.3072 | 0.2256 | 0.2863 |
| | (0.0509) ** | (0.0497) ** | (0.0462) ** | (0.0560) ** |
| High School | 0.4636 | 0.4594 | 0.4151 | 0.4342 |
| | (0.0504) ** | (0.0493) ** | (0.0451) ** | (0.0546) ** |
| College | 0.7911 | 0.6707 | 0.7642 | 0.6569 |
| | (0.0513) ** | (0.0509) ** | (0.0462) ** | (0.0573) ** |
| Job Security (deviation from "Temporary") | 0.2923 | 0.2435 | 0.2895 | 0.2020 |
| | (0.0257) ** | (0.0287) ** | (0.0281) ** | (0.0383) ** |
| Employment (deviation from "Unemployed") | | -0.1502 | | -0.1174 |
| | | (0.0427) ** | | (0.0524) |
| Industry (deviation from "Transportation") | | | | |
| Manufacturing | | 0.1884 | | 0.1873 |
| | | (0.0255) ** | | (0.0358) ** |
| Construction | | 0.0105 | | -0.0112 |
| | | (0.0296) | | (0.0415) |

| | | | | |
|---|---|---|---|---|
| Trade | | 0.0096 | | 0.0449 |
| | | (0.0356) | | (0.0491) |
| Tourism | | -0.0682 | | -0.1106 |
| | | (0.0434) | | (0.0575) |
| Business Services | | 0.0915 | | 0.0992 |
| | | (0.0317) ** | | (0.0437) |
| Public Services | | 0.2982 | | 0.2591 |
| | | (0.0361) ** | | (0.0528) ** |
| Social Services | | 0.1698 | | 0.2132 |
| | | (0.0400) ** | | (0.0529) ** |
| Others | | -0.0086 | | 0.0186 |
| | | (0.0334) | | (0.0446) |
| Occupation (deviation from "Service Workers") | | | | |
| Professionals | | 0.1965 | | 0.1519 |
| | | (0.0366) ** | | (0.0476) ** |
| Office Workers | | 0.2057 | | 0.1401 |
| | | (0.0364) ** | | (0.0493) ** |
| Sales | | -0.0201 | | -0.0809 |
| | | (0.0474) | | (0.0599) |
| Skilled Operators | | -0.0052 | | -0.0540 |
| | | (0.0358) | | (0.0475) |
| Others | | -0.0711 | | -0.1322 |
| | | (0.0391) | | (0.0511) ** |
| | | | | |
| Number of observations | 5984 | 5984 | 5984 | 5984 |
| Intercept | 12.5913 | 12.9040 | 12.5660 | 12.8981 |
| | (0.1269) | (0.1315) ** | (0.1222) ** | (0.1634) ** |
| *Goodness of fit* | 0.3810 | 0.4326 | 0.2229 | 0.2600 |

Notes:

[1] OLS (1) and OLS (2) report least-squares regression results, while QR (1) and QR (2) report median (50th percentile) quantile regression results.

[2] Robust standard errors for OLS, and standard errors for the median (50th percentile) regressions are reported in parentheses.

[3] The goodness of fit measures are $R^2$ for OLS and pseudo-$R^2$ for the quantile regressions.

** Significant at 1-percent level.

**Table 4**. Results from quantile regressions using a common set of explanatory variables.
Dependent Variable: Log of Gross Household Income.

| | 10% | 50% | 90% |
|---|---|---|---|
| Age | 0.0323 | 0.0548 | 0.0736 |
| | (0.0070)** | (0.0058)** | (0.0075)** |
| Age$^2$ | -0.00041 | -0.00063 | -0.00077 |
| | (0.00007)** | (0.00006)** | (0.00007)** |
| Average age of children | 0.0158 | 0.0176 | 0.0120 |
| | (0.0016)** | (0.0012)** | (0.0015)** |
| Family size | 0.1074 | 0.0968 | 0.0233 |
| | (0.0219)** | (0.0181)** | (0.0235) |
| Householder's gender (deviation from "Female") | 0.2705 | 0.1708 | 0.0390 |
| | (0.0396)** | (0.0301)** | (0.0368) |
| Region (deviation from "Non-Seoul") | 0.0950 | 0.0478 | 0.0214 |
| | (0.0322)** | (0.0262) | (0.0330) |
| Spousal Status(deviation from "Spouse absent") | 0.1830 | 0.1914 | 0.2107 |
| | (0.0407)** | (0.0339)** | (0.0431)** |
| Education (deviation from "Less than primary") | | | |
|   Primary School | 0.1750 | 0.1992 | 0.1606 |
| | (0.0679)** | (0.0551)** | (0.0699) |
|   Middle School | 0.2934 | 0.2863 | 0.2705 |
| | (0.0684)** | (0.0560)** | (0.0714)** |
|   High School | 0.3983 | 0.4342 | 0.4111 |
| | (0.0675)** | (0.0546)** | (0.0691)** |
|   College | 0.5891 | 0.6569 | 0.5902 |
| | (0.0717)** | (0.0573)** | (0.0716)** |
| Job Security (deviation from "Temporary") | 0.2263 | 0.2020 | 0.2836 |
| | (0.0502)** | (0.0383)** | (0.0472)** |
| Employment (deviation from "Unemployed") | -0.3365 | -0.1174 | 0.0554 |
| | (0.0640)** | (0.0524) | (0.0650) |
| Industry (deviation from "Transportation") | | | |
|   Manufacturing | 0.2140 | 0.1873 | 0.2098 |
| | (0.0431)** | (0.0358)** | (0.0460)** |
|   Construction | 0.0789 | -0.0112 | 0.0019 |
| | (0.0508) | (0.0415) | (0.0524) |
|   Trade | -0.0309 | 0.0449 | 0.0186 |

|  |  |  |  |
|---|---|---|---|
|  | (0.0563) | (0.0491) | (0.0621) |
| Tourism | -0.0742 | -0.1106 | 0.0161 |
|  | (0.0676) | (0.0575) | (0.0706) |
| Business Services | 0.1467 | 0.0992 | 0.1220 |
|  | (0.0515) ** | (0.0437) | (0.0547) |
| Public Services | 0.3921 | 0.2591 | 0.2236 |
|  | (0.0647) ** | (0.0528) ** | (0.0664) ** |
| Social Services | 0.1111 | 0.2132 | 0.1999 |
|  | (0.0616) | (0.0529) ** | (0.0654) ** |
| Others | -0.0443 | 0.0186 | 0.0096 |
|  | (0.0522) | (0.0446) | (0.0569) |
| Occupation (deviation from "Service Workers") |  |  |  |
| Professionals | 0.1115 | 0.1519 | 0.2447 |
|  | (0.0587) | (0.0476) ** | (0.0586) ** |
| Office Workers | 0.1652 | 0.1401 | 0.2567 |
|  | (0.0600) ** | (0.0493) ** | (0.0604) ** |
| Sales | -0.1290 | -0.0809 | 0.0470 |
|  | (0.0711) | (0.0599) | (0.0759) |
| Skilled Operators | -0.0476 | -0.0540 | 0.0053 |
|  | (0.0578) | (0.0475) | (0.0575) |
| Others | -0.1458 | -0.1322 | -0.0938 |
|  | (0.0624) ** | (0.0511) ** | (0.0619) |
| Number of observations | 5984 | 5984 | 5984 |
| Intercept | 12.7042 | 12.8981 | 13.1870 |
|  | (0.1925) ** | (0.1634) ** | (0.2111) ** |
| *Goodness of fit* | 0.3444 | 0.2600 | 0.1695 |

Notes:

[1] Standard errors are in parentheses.

[2] The goodness of fit measure is pseudo-$R^2$.

** Significant at 1-percent level.

**Figure 1**. Inequality Trend, South Korea, 1990-2005 (Gini Coefficients).

Inequality Trend, South Korea, 1990-2005 (Gini)

**Figure 2**. Distribution of gross household income in South Korea, 2005.