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INEQUALITY OF OPPORTUNITY AND HOUSEHOLD RISKY ASSET INVESTMENT: EVIDENCE FROM PANEL DATA IN CHINA

Abstract: Based on the household panel data over three waves in China, this paper investigates how inequality of opportunity within a region affects household risky asset investment. The empirical results show that inequality of opportunity raises both the probability and the share of household risky asset investment. Accordingly, creating more equal opportunities for people will generate larger policy effects than we normally expected.

Key Words: Income inequality; Inequality of opportunity; Risky asset investment; Stock market participation

1. Introduction

The determinants of household portfolio decisions have attracted much attention in economics and finance literature. In particular, previous studies have focused on micro-level factors that can affect household risky asset investment. These factors typically include demographic characteristics (age, gender, etc), resources available to the household (indicators for wealth and income), health status, financial literacy, and so on (Barber and Odean, 2001; Carroll, 2002; Rosen and Wu, 2004; Berkowitz and Qiu, 2006, van Rooij et al, 2011). Such variables are generally statistically significant and quantitatively important in regressions explaining portfolio decisions in different countries. These studies have important implications given the close link between stock market participation and financial development, and consequent economic growth as found in existing studies (Levine, 1997; Calvet et al., 2007).

However, studies on how regional characteristics can affect household portfolio decisions are still in its infancy. While several relevant studies have identified the effects of country-specific economic environments, including the presence, or lack thereof, of an economic crisis, on household portfolio choices (Chai et al., 2011; Christelis et al., 2013), little attention has been paid to regional factors within a country at a given time.

Our paper will utilize a panel dataset from China to examine the effect of within-region inequality, especially inequality of opportunity on household risky asset investment. The concept of inequality of opportunity is not new in economics literature. Arneson (1989) and Sen (1985) are among a number of influential authors who have argued that inequality of opportunity, rather than inequality of outcome (such as income) should be used as the appropriate criterion for assessing the fairness of a given allocation. In their opinions, inequality resulting from lack of individual effort may help purport a harder working society, while inequality caused by factors outside of individual control, such as poor family background, raises concern and are ethically unacceptable.

Roemer (1998) incorporates the concepts above into a model and divides the factors determining income into two categories: those people can control (called "efforts"), and those beyond people's control (called "circumstances"). Given this distinction, he defines "inequality of opportunity" essentially as the extent to which important outcomes—such as income—are determined by circumstances beyond people's control (Ferreira and Gignous, 2011). According to

this definition, economists have developed a set of methods to empirically measure inequality of opportunity in different countries (Ferreira and Gignoux, 2011, Marrero and Rodriguez, 2012; Bourguignon et al., 2013; Ramos and Van de gaer, 2016).

Inequality of opportunity within a region may affect whether and how much a household invests in risky assets through several possible channels. First, higher inequality of opportunity may increase people's material aspiration which may increase a household's risky asset investment. Early studies have proposed the concept of material aspiration which depends on a person's income or wealth as well as within-group inequality (Easterlin, 1974; Stutzer, 2004). Second, inequality of opportunity may affect people's risk preferences. If inequality is largely determined by factors beyond people's control (i.e., higher inequality of opportunity), then people may choose to take more risks and invest in risky assets.

We will employ the tracking survey (China Family Panel Studies, CFPS) in three waves (2010, 2012 and 2014) to investigate how inequality of opportunity within a region affects household risky asset investment. The empirical results show that inequality of opportunity increases both the probability and the share of household risky asset investment.

The paper proceeds as follows. Section 2 reviews the previous literature and specifies our contributions. Section 3 describes the dataset and introduces the measures for inequality of opportunity used in this paper. Models and results are provided in Section 4. Section 5 concludes.

2. Literature review and our contributions

Many studies have explored various determinants of household portfolio decisions, both theoretically and empirically. A rich theoretical literature demonstrates how portfolio decisions depend on factors such as risk aversion and investment opportunities (Gollier, 2002). Theoretical studies suggest that resources available to the household (e.g., wealth and income) have large impacts on portfolio choices because they can influence risk aversion and because of fixed costs to owning certain assets (Rosen and Wu, 2004). Several recent studies investigated the determinants of stock market participation. Christelis et al. (2010) show that the propensity to invest in stocks is strongly associated with cognitive abilities, and van Rooij et al. (2011) find that financial literacy affects the investment in the stock market. Those with low literacy are much less likely to invest in stocks.

However, studies on how regional characteristics can affect household portfolio decisions are very scarce. Almost no existing studies have examined the effect of within-region inequality on portfolio choices. One relevant strand of literature is related to studying how within-region income inequality can affect household expenditures and savings. Jin et al. (2011) find that within-region income inequality measured by the provincial Gini coefficient has a positive effect on household savings and a negative effect on household consumption in urban China. Their explanation is the so-called status seeking hypothesis. That is, as income inequality rises, people may save more and invest more in education in order to strengthen their ability to seek high social status in the future. Increase in income inequality makes entering a high-status club more attractive because differences in resources between the high- and low-status groups widen (Stutzer, 2004). In contrast, Sun and Wang (2013) adopt the measure of village-level income inequality to obtain the opposite results in rural China. They find that household savings are negatively correlated with the magnitude of income inequality of their home village.

Our paper makes at least two contributions to the existing literature. First, to the best of our knowledge, this paper is the first attempt to examine the effect of within-region inequality, especially inequality of opportunity, on household risky asset investment, compared to the numerous existing studies focusing on micro-level determinants of portfolio decisions. Second, we first explore the effects of inequality of opportunity on people's economic behavior at the micro level. The existing literature overwhelmingly measured the level of inequality of opportunity in different countries but rarely examined its economic consequences empirically. The exceptions to this are scarce; Marrero and Rodriguez (2013), for example, investigate whether inequality of

opportunity can affect economic growth. Their findings suggest that this component of inequality is negatively associated with economic growth in the United States between 1970 and 2000.

3. Data and descriptive statistics

This section explains the data sources used in this paper and presents the summary statistics of key variables.

3.1 Data sources

This paper explores the relationship between inequality of opportunity and household risky asset investment using the household-level data from China Family Panel Studies (CFPS). The county-level variables come from the China City Statistical Yearbook and the China Statistical Yearbook for the Regional Economy. CFPS is a tracking survey conducted every two years by the Institute of Social Science Survey at Peking University. In order to keep track of China's economic development and social change, CFPS designs questionnaires on three different levels of aggregation: communities, households, and individuals.

We use the household as the unit of our analysis because financial decisions are usually made at the household-level in China; furthermore, it is hard to separate the investments of different household members. Specifically, we will use two measures for the risky asset investment: the total investment in risky asset (including stocks and funds) and the investment in stocks at the household level.

Moreover, we restrict our sample into the urban residents (who live in urban areas more than 6 months last year) because households in rural areas rarely invest in risky assets given the large urban-rural disparity.¹ The final sample used in our paper includes 4,005 tracked households for each of the three waves in 2010, 2012, and 2014.

3.2 Estimation procedure of inequality of opportunity

Inequality of opportunity is estimated as the between-type (ex-ante) inequality component following the parametric procedure of Ferreira and Gignoux (2011), Marrero and Rodriguez (2013), and Song (2017), which allows for the inclusion of a larger set of circumstances in the database. Specifically, following the convention of the literature, we divide the determinants of individual income (denoted by w) into two categories, including circumstances (denoted by C) and efforts (denoted by E). Since circumstances are economically exogenous by definition, and efforts may be influenced by circumstances, we can write the following equation.

$$w=f[C,E(C,v),u] \quad (1)$$

u and v represent other stochastic factors affecting income, such as fortuity (Lefranc et al., 2009). For the purpose of measuring inequality of opportunity—rather than of estimating any causal relationship between circumstances, efforts, and income—we can simply estimate a log-linearized version of the reduced form equation by OLS:

$$\ln w = C\varphi + \varepsilon \quad (2)$$

We follow three steps to construct the index for inequality of opportunity. First, we estimate equation (2) and obtain the predicted income denoted as \hat{w} . In the Mincer-type wage regressions, we follow the literature convention and include the following circumstances variables such as gender, hukou status at 3 years old, paternal and maternal education (Marrero and Rodriguez, 2013; Song, 2017). Hukou means household registration system in China, which determines people's access to a variety of public services. People inherit at birth the hukou status from their parents, so the hukou status at 3 years old is generally beyond one's own control (Song, 2014).

Second, given that the Theil (0) index (mean log deviation) is additively decomposable, we calculate the Theil (0) index for the predicted income denoted by $T(\hat{w})$ in order to estimate the extent to which the total income inequality can be attributed to inequality of opportunity

(Bourguignon et al., 2007; Ferreira and Gignoux, 2011). Third, we calculate the index for inequality of opportunity (denoted by IO) as the ratio of the Theil (0) index for predicted income to that for the actual income.

$$IO = \frac{T(\hat{w})}{T(w)} \quad (3)$$

We will use the measure above, throughout the paper, to investigate the effect of inequality of opportunity on household risky asset investment decisions. We calculate this index for inequality of opportunity at the county level; this aggregation level is chosen because lower-level inequality may have larger effects on household behavior within a closely knit social comparison group (Sun and Wang, 2013).¹ The use of county as the aggregation level in our study creates more variations than that of the country or state level, which has been used by others (Marrero and Rodriguez, 2013; Ferreira et al., 2014). We include commonly-used circumstances variables in the literature, such as gender, hukou status at 3 years old, and each parents' education level (Marrero and Rodriguez, 2013; Song, 2017).

We adopt two different measures for the risky asset investment, including the total investment in risky asset (stocks and funds) and the investment in stocks at the household level. Moreover, for each measure, we examine both the participation and the investment magnitude of each investment. We design two dummy variables, one for the stock market participation, and the other for whether to hold the risky assets; we also employ two ratios to measure the intensity, including the ratio of stocks to the total household financial asset, and the ratio of risky asset investment to the total household financial asset.

3.3 Summary statistics

Table 1 presents the summary statistics of the key variables used in this paper for all three waves. From this table, we can find that both of total income inequality (measured by the Theil (0) index) and inequality of opportunity reach a peak in 2012. The percentage of total income inequality that is attributed to inequality of opportunity increases from 22% in 2010 to 28% in 2012, and decreases slightly to 27% in 2014. Coincidentally, the shares of households investing in stocks as well as in risky assets also reach the peak in 2012. The participation rate in stocks in 2012 is 8%, and 11% of households hold some risky assets in the same year. In terms of the intensity, we focus on the data in 2010 and 2012 because the CFPS dataset does not ask the total amount of financial assets in 2014. As can be seen, the ratio of risky asset to the total financial asset (mostly deposits in a bank) is around 4%, and the ratio of stocks to the total financial asset remains at 3%.

In addition, we present summary statistics for several county-level variables, household-level control variables, and characteristics of the head of the household (called householder throughout the paper). We also include most of the variables in existing studies on the determinants of household portfolio decisions, such as measures for household income and wealth, measures for household members' health status and financial literacy, householder's education level and marital status, etc.

Table 1. Summary Statistics (Obs.=4,005)

Variables	Definition	2010		2012		2014	
		Mean	Std.	Mean	Std.	Mean	Std.
Key Variables							
Theil	Theil (0) Index	0.33	0.16	0.40	0.24	0.28	0.13
Oppo Ineq	Opportunity Inequality Index	0.22	0.13	0.28	0.15	0.27	0.14
Stock	Dummy Variable for Stock Investment (1=Yes)	0.07	0.26	0.08	0.27	0.07	0.26
Risky Asset	Dummy Variable for Risky Asset Investment (1=Yes)	0.10	0.30	0.11	0.32	0.09	0.29

Stock Ratio	Stock Value/Total Financial Asset	0.03	0.14	0.03	0.13	\	\
Risky Asset Ratio	Risky Asset Value/Total Financial Asset	0.04	0.16	0.04	0.16	\	\
Material Aspiration	Measures for Material Aspiration (ranked from 1-10)	5.76	2.79	5.71	2.83	5.04	2.93
Risk Preference	Dummy Variable for Risk-loving (1=Yes)	\	\	\	\	0.38	0.48
County-level Variables							
Log GDP Per-capita	Log of GDP Per-capita	10.49	0.93	10.80	0.90	10.98	0.86
Log Area Per-capita	Log of Land Area Per-capita	0.37	1.20	0.37	1.21	0.39	1.23
Service Ratio	Value-added of the tertiary industry/GDP	0.42	0.13	0.40	0.14	0.43	0.14
Log Fiscal Exp. P.C.	Log of Fiscal Expenditure Per-capita	8.53	0.85	8.90	0.80	9.13	0.76
Household Control Variables							
Familysize	Family Size	3.48	1.55	3.51	1.59	3.47	1.65
Child Ratio	Number of Children (0-16 years old)/Family Size	0.26	0.24	0.21	0.22	0.18	0.21
Elder Ratio	Number of the Old (60 years old and above)/Family Size	0.18	0.32	0.21	0.34	0.26	0.36
Log Income	Log of Household Income	10.17	1.02	10.16	1.41	10.41	1.24
House	Dummy Variable for Having a House (1=Yes)	0.86	0.35	0.85	0.36	0.86	0.35
Hospital	Dummy Variable for a Household Member in Hospital (1=Yes)	0.17	0.38	0.21	0.41	0.25	0.44
Financial Literacy	Dummy Variable for a Holding College degree in Finance	0.05	0.21	0.05	0.22	0.06	0.23
Householder Control Variables							
Male	Dummy Variable for Gender (1=Male)	0.67	0.47	0.67	0.47	0.67	0.47
Han	Dummy Variable for Han Ethnicity (1=Yes)	0.96	0.20	0.96	0.20	0.96	0.20
Age	Age	50.68	12.90	52.67	12.9	54.67	12.9
Age Square	Age^2	2735.3	1358.7	2940.7	1409	3155.4	1460
Edu Years	Years of Education	8.00	4.66	7.82	4.75	7.82	4.75
Healthy	Dummy Variable for Health Status (1=healthy)	0.86	0.35	0.82	0.38	0.83	0.37
Spouse	Dummy Variable for Having a Spouse (1=Yes)	0.88	0.32	0.87	0.33	0.86	0.34
Party	Dummy Variable for Communist Party Member (1=Yes)	0.15	0.36	0.16	0.36	0.15	0.36
Urban Hukou	Dummy Variable for Urban Hukou Status (1=Yes)	0.55	0.50	0.58	0.49	0.59	0.49

4. Models and results

We first estimate a Probit model to examine the effect of inequality on whether a household invests in risky assets. Our major baseline results are shown in Table 2. Although the coefficients on inequality of opportunity fall slightly after adding householder's control variables, they still remain significantly positive. Moreover, the results are similar regardless of whether we measure risky asset investment through stocks or through total risky assets.

Table 2. The Impacts of Inequality of Opportunity on Financial Investment (Probit Model)

	(1)	(2)	(3)	(4)
	Stock		Risky Asset	
Theil	0.074*** (0.016)	0.053*** (0.013)	0.096*** (0.019)	0.068*** (0.015)
Oppo Ineq	0.091** (0.037)	0.054* (0.029)	0.132*** (0.042)	0.081** (0.032)
County-level Variables	Yes	Yes	Yes	Yes
Household Control Variables	Yes	Yes	Yes	Yes
Householder Control Variables		Yes		Yes
Province Dummy	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes
Obs.	10,793	10,747	10,793	10,747

Note: "Theil" denotes the total income inequality in a county, and "Oppo Ineq" denotes inequality of opportunity in income within a county. Cluster standard errors at county level are presented in parentheses, and *** p<0.01, ** p<0.05, * p<0.1.

We then adopt two intensity measures for risky asset investment: the ratio of stocks to the total household financial asset, and the ratio of risky asset investment to the total household financial asset. We estimate a Tobit model because the dependent variable is left-censored; the results are displayed in Table 3. Just as before, both the total income inequality and the inequality of opportunity are positively associated with household risky asset investment. The sample size shrinks by about one-third because the 2014 CFPS dataset lacks information on the ratio of risky assets as well as the ratio of stocks.

Table 3. Intensity Analysis by Using Ratios of Financial Investment as Dependent Variables (Tobit Model)

	(1)	(2)	(3)	(4)
	Ratio of Stock		Ratio of Risky Assets	
Theil	0.472*** (0.116)	0.326*** (0.093)	0.500*** (0.103)	0.356*** (0.082)
Oppo Ineq	0.636** (0.267)	0.333 (0.213)	0.815*** (0.220)	0.510*** (0.167)
County-level Variables	Yes	Yes	Yes	Yes
Household Control Variables	Yes	Yes	Yes	Yes
Householder Control Variables		Yes		Yes
Province Dummy	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes
Obs.	7,369	7,336	7,420	7,386

Note: The model specification is similar to that in Table 2. Cluster standard errors at county level are presented in parentheses, and *** p<0.01, ** p<0.05, * p<0.1. Coefficients are reported in the table, and marginal effects are 0.034, 0.023, 0.049 and 0.035, respectively.

5. Conclusions

Our paper investigates how inequality of opportunity within a region affects household risky asset investment and is one of the first attempts to look at the consequence of inequality of opportunity on household behavior. We employ the tracking survey (China Family Panel Studies) in three waves (2010, 2012 and 2014) to examine this relationship. The empirical results show that inequality of opportunity raises both the probability and intensity of household risky asset investment.

As is seen, the inequality of opportunity not only affects economic growth at the macro-level as several existing studies have proved, it also has much impact on household behavior. Accordingly, creating more equal opportunities for people will generate larger policy effects than we normally expected.

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