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28 March 2014

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March 28, 2014

Abstract

In this study, using Japanese household panel data, we analyze how well idiosyncratic income risks are shared by regions. We find that geographic mobility influences individual consumption growth rates, suggesting that complete asset markets fail to exist. We reject the full insurance hypothesis for both urban and rural areas and find that the extent of risk sharing differs significantly by region.

Keywords: Risk sharing, Consumption insurance, Geographic mobility
JEL Classification: D12, D31, E21

*I thank Julen Esteban-Pretel, Minchung Hsu, Dan Sasaki, Motohiro Sato, Michio Suzuki, Ryuichi Tanaka and the seminar participants at the University of Tokyo, Meiji University, GRIPS, and Senshu University for helpful comments. This research is financially supported by the Ministry of Education, Science, Sports, and Culture, Grant-in-Aid for Scientific Research (B), 22330090.

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1 Introduction

Whether the full insurance hypothesis holds is a main concern of representative agent models in macroeconomics. Although this hypothesis has been rejected in literature, empirical tests convey many insights on consumption insurance.[1] In this paper, we add another dimension, geographic mobilities, into the full insurance hypothesis tests. The objectives in this paper are close to Hess and Shin (2000), who show that risk sharing is not perfect within and between regions, although they do not explicitly consider geographic mobilities.

Even if complete asset markets do not exist, there are several ways to share idiosyncratic income risks such as precautionary savings, public transfers, and geographic mobility. However, views on geographic mobility as a means for risk sharing differ among countries. Moretti (2012) writes that, while Americans move very frequently for seeking jobs, "In Italy, [...] most people spend their entire lives in the city where they were born, which is often the city where their parents were born (p. 154)." The Japanese traditionally live like the Italians. However, similar to the U.S., in Japan, the unemployment rate differs among prefectures. In addition, the wage level in urban areas is generally more than 15% higher than that in rural areas. Thus, job searches with geographic mobility provide opportunities to seek meaningful employment. Using panel data, we show that geographic mobility in Japan is not effectively used as an insurance channel.

The paper proceeds as follows. In Section 2, we provide the benchmark model to test the full insurance hypothesis. In Section 3, we briefly explain micro data. In Section 4, we discuss results of regressions. Section 5 briefly concludes.

2 Model

Consider an infinite horizon complete market economy. A continuum of household indexed by $i \in [0,1]$ exists in region r. A history of states of economy is represented by $s^t = \{s_0, s_1, ..., s_t\}$, where $s_t \in S$ is the state of the economy at time t. Labor endowment is a function of the current state, $e(s_t)$, which represents idiosyncratic shock, region-specific shock and aggregate shock.

A household's problem is written as follows:

$$\sum_{t=0}^{\infty}\sum_{s^t} \beta^t \pi(s^t) u[c_{i,r}(s^t)],$$

$$\text{s.t.} \quad \sum_{t=0}^{\infty}\sum_{s^t} p(s^t)[e(s_t) - c_{i,r}(s^t)] + A_{i,0} = 0.$$

where $c_{i,t}$ is the consumption of individual i in region r, β is the subjective discount

[1]See Mace (1991), Cochrane (1991), Hayashi et al. (1996), Kohara et al. (2002), among others.

factor, $\pi(s^t)$ is the probability of state s^t, $p(s^t)$ is the price contingent on s^t, and $A_{i,0}$ is the initial asset.

If the utility function belongs to the hyperbolic absolute risk aversion family, we obtain the following equation from the first order condition:[2]

$$\frac{u'[c_{i,r}(s^{t+1})]}{u'[c_{i,r}(s^t)]} = \frac{u'[C(s^{t+1})]}{u'[C(s^t)]}, \ \forall i, r \tag{1}$$

where C is the aggregate consumption at state s^t.

Many empirical studies have tested whether Equation (1) holds. More explicitly, the following equation has been tested with several extensions:[3]

$$\Delta c_{i,r,t} = \beta \Delta C_t + \mathbf{\Psi}'\mathbf{Z}_{i,r,t} + \varepsilon_{i,r,t},$$

where the vector $\mathbf{Z}_{i,r,t}$ contains the idiosyncratic factors. If the asset markets are complete, all idiosyncratic factors disappear and the individual consumption growth perfectly correlates with the aggregate consumption growth.

Here we focus on whether geographic mobility influences individual consumption growth. We will test the following specification[4]

$$\Delta c_{i,r,t} = \beta_1 \Delta C_t + \beta_2 \Delta y_{i,r,t} + \beta_3 Move + \beta_4 Emp + \varepsilon_{i,r,t+1}, \tag{2}$$

where $\Delta y_{i,r,t}$ is the idiosyncratic income growth and $Move$ represents the change in residence. We consider three types of the geographic movement defined below: three major metropolitan area, prefecture, and 10 district. Motivated by Cochrane (1991), we add Emp to test whether changes in employment status influence the consumption growth. From equation (1), note that if the asset markets are complete, then $\beta_1 = 1$ and other β must be zero.

3 Data

We use the Keio Household Panel Survey (KHPS) to test Equation (2). In this study, the KHPS is suitable because it is panel data that includes labor earnings, consumption expenditures, individual characteristics such as employment status, and place of residence.

The KHPS is conducted by Keio University's 21st Century Center of Excellence

[2]For the derivation, see Kohara et al. (2002)

[3]See Guvenen (2011) for the survey.

[4]Ravallion and Chaudhuri (1997) show that inclusion of aggregate consumption to control for aggregate shocks may have biases. As a robustness check, we have also conducted the full insurance test using a time dummy variable instead of the aggregate consumption, and find that our results do not affected by the specification.

program, which began its survey in 2004 with a sample size of 4,000. Thus, we have panel data for nine years: 2004-2012.[5] The household survey targets are chosen from the voter registration list. If married, both the household head and the spouse answer questions about previous year's labor earnings, current employment status, among others. Total household labor earnings represent the sum of earnings for the household head and spouse, but we do not add other members' earnings such as parents and children into the total household earnings. In addition, the survey asks about monthly household expenditures in January of the current year.

Consumption: We use three types of consumption expenditures: food expenditure, nondurable expenditure and total. Nondurable expenditures include categories such as food, fuel, utilities, medical expenses, education, clothing, and entertainment. Total expenditures include durable expenditures, such as expenditures on cars, in addition to nondurable expenditures.

Earnings: We use the previous year's before-tax annual earnings and focus on workers aged 25-59. We include both married and single households, as well as full-time and part-time workers.

Both consumption expenditures and labor earnings are equivalized using the OECD equivalent scale. All variables are deflated using the CPI of 10 districts.[6] We consider three types of geographic movement from the residence information: (1) among prefectures, (2) among 10 district, and (3) between three major metropolitan area (TMMA).[7] We construct Move as follows. It is not surprising that geographic mobility from periods t to $t+1$ influences the current consumption growth because moving requires certain expenditures. Therefore, we consider whether a one-period lag in geographic mobility influences the current consumption. In other words, we test the effect of geographic movement from periods $t-1$ to t on the consumption growth rate from periods t to $t+1$.

4 Results

In Table 1, we show results of tests of the full insurance hypothesis using the full sample. We conduct two specifications of geographic movements in Table 1; (1) between TMMA and non-TMMA and (2) among prefectures. Similar to the results of a previous research, we find that the full insurance hypothesis does not hold in Japan from KHPS, because the F-test for "$\beta_1 = 1$ and $\beta_2 = 0$" is rejected in all cases. That is, the growth of individuals' consumption $\Delta c_{i,r,t}$ does not perfectly correlate with that of the aggregate

[5] For more details on KHPS, see Yamada (2013).

[6] The 10 district consists of Hokkaido, Tohoku, Kanto, Hokuriku, Tokai, Kansai, Chugoku, Shikoku, Kyushu, and Okinawa.

[7] TMMA consists of Tokyo, Kanagawa, Chiba, Saitama, Aichi, Mie, Gifu, Osaka, Kyoto, Hyogo, Shiga, Nara, Wakayama prefectures. Non-TMMA area consists of the other 34 prefectures.

consumption ΔC_t, and it actually reacts to the change in their labor earnings $\Delta y_{i,r,t}$. Among the three kinds of expenditures, from estimates of β_2, we find that growth rates of food expenditure respond less from idiosyncratic labor income shocks than other expenditure; it is 0.02 points lower than that of nondurable expenditures and total expenditures. Both changes in employment status and changes in residence do not affect the consumption growth without nondurable expenditures with residential change between TMMA and non-TMMA. Does it mean that geographic movements do not affect consumption growth? To dig this point more, we separate the data set into TMMA and non-TMMA.

Table 2 and 3 summarizes the main results of our test using Equation (2). The difference between Table 2 and Table 3 is that we consider the geographic movement between TMMA and non-TMMA in Table 2 and among prefectures in Table 3. Again, as the F-statistics show, the full insurance hypothesis is rejected in all cases, although β_1 becomes close to one in some case.[8] These values are in line with the previous study by Kohara et al. (2001). For all three kinds of expenditures, compared with TMMA, in non-TMMA, there is more correlation of the consumption growth rate with the aggregate consumption growth.[9] In all cases, the individual consumption growth rate strongly reacts to changes in labor earnings, i.e., $\Delta y_r > 0$, suggesting that idiosyncratic income risks matter for consumption smoothing. The finding that β_2 in non-TMMA is higher than that in TMMA implies that risk sharing for idiosyncratic risk is more difficult in rural areas.

Our main finding is that geographic mobility influences the consumption growth rate of nondurable and total expenditures in urban areas from Table 2. Remember that if all idiosyncratic risks are shared among individuals and regions, geographic mobility should not influence consumption smoothing. In addition, our finding shows that individuals who enter TMMA from periods $t-1$ to t show a *decline* in their consumption growth rate from periods t to $t+1$. Due to data limitations, identifying this decline is difficult. One possibility is that people have moved not for seeking a job but for other reasons, such as job relocation by their employer. On the contrary to the movement between TMMA and non-TMMA, geographic movements among prefectures affect individuals' consumption who live in non-TMMA. In particular, people who live in non-TMMA could *increase*

[8]We use the growth rate of average consumption as the explanatory variable. Kohara et al. (2001) propose using the averages of individual consumption growth rate as an alternative specification. We find that our main results do not change, even when using the average of the differences in consumption.

[9]Even if the aggregate shock cannot be shared, sharing region-specific shocks may be possible. In such cases, the individual consumption growth rate strongly correlates with the regional consumption growth rate. However, we have rejected such cases. Using Japanese data, Artis and Okubo (2012) show that the correlation of business cycles among prefectures depends on the similarity of GDPs, factor endowments, and geographic distance. Because consumption correlation is strictly higher than output correlation, risk sharing appears to exist at the prefecture level. In these cases, the relationship between individual consumption growth, regional consumption growth, and aggregate consumption growth becomes very complex.

the growth of nondurable/total expenditures by the movement among prefectures. In sum, depending on the living area, the geographic movements have opposite effects on consumption growth for individuals. Individuals who live in relatively rural area can improve consumption by changes in residence, although individuals living in urban may rather result in decline in the consumption growth rate by the movement.

Contrary to the findings by Cochrane (1991), the change in employment status does not influence the results of our estimations of the Japanese economy.[10] There are two reasons for this. First, the duration of unemployment in our dataset is less than one year, which does not represent a sufficiently large idiosyncratic shock. Second, extremely poor households may not participate in the survey when unemployed.

Finally, we show that the extent of risk sharing differs significantly by district. In Table 4, we run regressions based on Equation (2) with nondurable expenditure for 10 districts and choose four regions with different characteristics in several aspects.[11] First, consumption growth in the Tohoku region, which is the most rural area among the four district in Table 4, is more influenced by idiosyncratic income risks, Δy. Moreover, the unemployment shock has a influence on consumption growth with statistical significance of 10%. In Tokai area, the movement among districts declines the consumption growth rate significantly. Interestingly, people who live in Kansai area do not affected by both employment status and geographic movement. These findings suggest that labor market conditions and means of risk sharing differ by region, and that geographic mobility does not modify the differences.

5 Conclusion

In this study, we show that the full insurance hypothesis is rejected in the case of Japan. Geographic mobility from rural to urban areas results in a decline in the consumption growth with statistical significance. In addition, whether unemployment has an influence on consumption insurance depends on the region where people live. These empirical findings suggest that the extent of risk sharing and insurance channels can differ by region. Because of such differences, providing uniform redistribution policies throughout the country may be inefficient. Therefore, when considering redistribution policies or labor market reforms, we should include information about the extent of consumption insurance by region.

Recently, Schulhofer-Wohl (2011) and Mazzocco and Saini (2012) show that the assumption that all households have the same risk aversion biases the test against the

[10] Potentially there may exist a link between changes in residence and employment status. We do not consider the interaction between these two variable because of sample size problem.

[11] The big earthquake, tsunami and nuclear power plant accident in 2011 attacked Tohoku area and many people had to flee their severely damaged home town. However, we do not use these samples directly.

null of full insurance. Their results also implies that rejection of the full insurance hypothesis in Japan may also have been changed when we consider heterogeneous risk preferences. These challenges are remained for future research.

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	Food		Nondurable		Total Expenditure	
$\beta_1 : \Delta C$	0.6703	0.6732	0.7938	0.7960	0.8173	0.8188
	[5.94]***	[5.96]***	[8.23]***	[8.26]***	[7.05]***	[7.06]***
$\beta_2 : \Delta y$	0.1405	0.1405	0.1672	0.1673	0.1641	0.1641
	[15.61]***	[15.61]***	[18.91]***	[18.91]***	[17.78]***	[17.78]***
β_3 : TMMA	-0.0101		-0.1669		-0.1029	
	[-0.10]		[-1.68]*		[-0.99]	
β_3 : Prefecture		0.0540		-0.0430		-0.0120
		[0.94]		[-0.76]		[-0.20]
$\beta_4 : Emp$	-0.0427	-0.0428	-0.0032	-0.0027	-0.0286	-0.0284
	[-1.02]	[-1.03]	[-0.08]	[-0.07]	[-0.68]	[-0.67]
F-stat. for						
$\beta_1 = 1$ and $\beta_2 = 0$	125.65***	125.50***	179.59***	179.59***	158.34***	158.33***
Adj. R-squared	0.0245	0.0246	0.0376	0.0374	0.0323	0.0322
Nobs.	11059	11059	11263	11263	11276	11276

Table 1: The Estimation Result for The Full Insurance Hypothesis Test with Full Sample
Note: t-value in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	Food		Nondurable		Total Expenditure	
	TMMA	Non-TMMA	TMMA	Non-TMMA	TMMA	Non-TMMA
$\beta_1 : \Delta C$	0.5325	0.8606	0.7845	0.8023	0.7303	0.9297
	[3.82]***	[4.57]***	[6.53]***	[5.03]***	[5.10]***	[4.80]***
$\beta_2 : \Delta y$	0.1241	0.1640	0.1600	0.1774	0.1516	0.1814
	[11.18]***	[10.89]***	[14.48]***	[12.18]***	[13.36]***	[11.71]***
β_3 : TMMA	-0.0155	-0.0041	-0.3166	0.0729	-0.2753	0.1706
	[-0.13]	[-0.02]	[-2.62]***	[0.43]	[-2.21]**	[0.94]
$\beta_4 : Emp$	-0.0015	-0.0962	0.0377	-0.0530	0.0069	-0.0728
	[-0.03]	[-1.45]	[0.72]	[-0.83]	[0.13]	[-1.08]
F-stat. for						
$\beta_1 = 1$ and $\beta_2 = 0$	67.95***	59.44***	105.51***	74.32***	90.17***	68.68***
Adj. R-squared	0.0203	0.0299	0.0383	0.0370	0.0307	0.0348
Nobs.	6554	4505	6668	4595	6677	4599

Table 2: The Estimation Result for The Full Insurance Hypothesis Test with Subsamples and Geographic Movement between TMMA and non-TMMA
Note: t-value in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	Food		Nondurable		Total Expenditure	
	TMMA	Non-TMMA	TMMA	Non-TMMA	TMMA	Non-TMMA
$\beta_1 : \Delta C$	0.5316	0.8690	0.7881	0.8051	0.7313	0.9345
	[3.81]***	[4.62]***	[6.56]***	[5.05]***	[5.11]***	[4.82]***
$\beta_2 : \Delta y$	0.1241	0.1637	0.1603	0.1772	0.1518	0.1813
	[11.18]***	[10.88]***	[14.51]***	[12.17]***	[13.38]***	[11.71]***
β_3 : Prefecture	-0.0145	0.2116	-0.1768	0.2838	-0.1181	0.2453
	[-0.22]	[1.87]*	[-2.77]***	[2.56]**	[-1.80]*	[2.08]**
$\beta_4 : Emp$	-0.0014	-0.0952	0.0397	-0.0518	0.0083	-0.0720
	[-0.03]	[-1.44]	[0.75]	[-0.82]	[0.15]	[-1.07]
F-stat. for $\beta_1 = 1$ and $\beta_2 = 0$	68.00***	59.26***	105.93***	74.19***	90.48***	68.65***
Adj. R-squared	0.0203	0.0306	0.0385	0.0384	0.0305	0.0355
Nobs.	6554	4505	6668	4595	6677	4599

Table 3: The Estimation Result for The Full Insurance Hypothesis Test with Subsamples and Geographic Movement among Prefectures
Note: t-value in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

	Tohoku	Kanto	Tokai	Kansai
$\beta_1 : \Delta C$	0.5251	0.9120	0.5173	0.7168
	[1.22]	[5.57]***	[1.86]*	[3.65]***
$\beta_2 : \Delta y$	0.2598	0.1616	0.1299	0.1865
	[5.95]***	[11.09]***	[5.02]***	[9.78]***
β_3 : District	0.8261	-0.2859	-0.5467	0.0335
	[1.81]*	[-1.94]*	[-2.75]***	[0.26]
$\beta_4 : Emp$	-0.2341	-0.0381	0.1702	0.1193
	[-1.82]*	[-0.55]	[1.48]	[1.10]
Adj. R-squared	0.0687	0.0375	0.0281	0.0454
Nobs.	563	4122	1243	2320

Table 4: The Estimation Result for The Full Insurance Hypothesis Test by District
Note: t-value in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.