Gender Gap in the Elasticity of Intertemporal Substitution[a]

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Abstract

This study examines the gender gap in the elasticity of intertemporal substitution. We use a combination of original consumer survey data on inflation expectations and scanner data on the actual expenditure. We find that the elasticity of intertemporal substitution for males is higher than that for females. Specifically, the elasticity of intertemporal substitution for males is about 1.3, while the elasticity of intertemporal substitution for females is about 1.0. Since the elasticity of intertemporal substitution is the inverse of risk aversion, we interpret that the gender gap in the elasticity of intertemporal substitution is related to the gender gap in risk aversion.

JEL Classification: D84; E21; E31; D84; J16
Keywords: gender gap; elasticity of intertemporal substitution; inflation expectations; consumption; Euler equation.

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1 Introduction

The elasticity of intertemporal substitution (EIS) is one of the important parameters in macroeconomics. The EIS captures how changes in the intertemporal allocation of consumption when real interest rates change. To stimulate the economy, the central banks design a conventional monetary policy that cuts nominal interest rates. That is, the value of EIS is important in inferring the impact of monetary policy. Although many existing studies have estimated the EIS, there is no consensus on the value of the EIS. One of the main reasons is that we do not have concurrent information on consumption growth and inflation expectations.

Using matched data on inflation expectations and scanner data on the actual expenditure, we investigate the gender gap in the EIS. Furthermore, to our knowledge, no existing studies attempt to analyze the heterogeneity of the EIS by household. We find that the elasticity of intertemporal substitution for males is higher than that for females. Specifically, the elasticity of intertemporal substitution for males is about 1.3, while the elasticity of intertemporal substitution for females is about 1.0. Since the elasticity of intertemporal substitution is the inverse of risk aversion, we interpret that the gender gap in the elasticity of intertemporal substitution is related to the gender gap in risk aversion.

Literature

Starting with Hall (1978), many papers have attempted to estimate the EIS. Hall (1988) concludes that the EIS is unlikely to be much above 0.1, and may well be zero, using time-series data of consumption growth and interest rates. Follow-up papers, however, come up with mixed results. For example, the EIS estimated by Attanasio and Weber (1995) is 0.56, using the Consumer Expenditure Survey, while Cashin and Unayama (2016) find an EIS of 0.21, using data from the Japanese Family Income and Expenditure Survey. Among further studies that estimate the EIS are Basu and Kimball (2002), Barro (2009), and Crump et al. (2022), each one of which estimates the EIS differently. There is therefore no clear consensus on the magnitude of the EIS; this arises because of the data limitations in relation to inflation expectations, which are usually unobservable and not available.

2 Data

2.1 Survey of inflation expectations

We conduct a quarterly online survey for Japanese households to collect inflation expectations from 2015(Q4). Every quarter, approximately 30,000 households answer the

questions regarding their outlook for price changes for the next one, three, and ten years. Respondents are asked to answer the following questions:

"What will the levels of CPI be over the next one-, three-, and ten-year periods given that the current level of CPI is 10,000? Provide price level figures over each period, excluding the impact of consumption tax hikes on the price levels."

The question asks respondents to estimate the CPI levels which they forecast over the next 1-, 3-, and 10-year periods on average. The questionnaire directly measures households' inflation expectations in the short, medium, and long term. The questionnaire is unique because the survey allows us to obtain the quantitative answers and alleviate the "round number" problem which Binder (2017) points out.[1]

2.2 Data about the consumption expenditure

The data we use is the panel data (SCI-personal) on the consumption expenditure, collected by a marketing company, Intage. We use the data that records day-to-day shopping information collected on an ongoing basis from more than 50,000 consumers aged 15–79 all over Japan. The data captures the profile of these consumers in detail, including aspects such as income, education, and financial assets. We can see who bought what, when, where, how many, and at what price. This data covers items which that households purchase frequently, such as food (except for fresh food, prepared food, and lunch boxes), beverages, daily miscellaneous goods, cosmetics, pharmaceutical products, and cigarettes.[2] We combine the inflation survey with the consumption expenditure from the same respondents and empirically test the theoretical relationship with inflation expectations and consumer spending.

3 Estimation Strategy and Results

According to the model shown in Kikuchi and Nakazono (2020), we estimate the EIS. Our empirical framework is based on the following equation:

$$\ln\left(\frac{p_{i,t+q}x_{i,t+q}}{p_{i,t}x_{i,t}}\right) = \alpha \times E_t^j\left[\pi_{t\to t+k}\right] + X\xi + \varepsilon_{t+1}^i, \tag{1}$$

where $\ln\left(\frac{p_{i,t+q}x_{i,t+q}}{p_{i,t}x_{i,t}}\right)$ and $E_t^i\left[\pi_{t\to t+k}\right]$ are denoted as the nominal expenditure growth rates by individual i from t to $t+q$ and inflation forecasts by individual i over the

[1] See Kikuchi and Nakazono (2022) for detail.

[2] Because our scanner data covers daily necessities, it does not cover housing, utilities, durables, clothing, and services.

next k quarters at time t, respectively.[3] Our focus is on the parameter α in Equation (1). When the parameter α is negative, a rise in inflation expectations associates with greater current consumption. The association follows the prediction of the consumption Euler equation. We show the results from the four types of specifications as benchmark results: (1) pooling regression, (2) fixed-effects regression, (3) instrumental variable method (IV) with 3-year ahead forecasts, and (4) IV with 1 to 3-year ahead forecasts. We show the results with a sample divided by gender.

Table 1 summarizes the estimation results using the entire sample. The table shows that higher inflation expectations are negatively associated with the growth rate of consumption, that is, higher inflation expectations generate greater current spending compared to future spending. However, the evidence is weak: the estimation results except for OLS regression for males are insignificant. Note that the entire sample include liquidity-constrained consumers. When consumers are under liquidity constraints, their current expenditure may not respond to higher inflation expectations.

We find clear gap in gender when the data is divided into the subsamples from households without liquidity constraint. Table 2 shows the results from the subsample of households without liquidity constraint.[4] The table shows that the EIS for males is higher than that for females. The EIS for males is about 1.3 - 2.2, while that for females is about 1.0 - 1.3.

The gender gap in the EIS is related to the gender gap in risk aversion. The EIS is the inverse of risk aversion. That is, high (low) EIS means low (high) risk aversion. Our results imply that females are more risk-averse than males. These results are consistent with existing studies (see Borghans et al. (2009), Croson and Gneezy (2009), and Booth et al. (2014)).

4 Conclusion

This study examines the gender gap in the EIS. Using a combination of original consumer survey data on inflation expectations and scanner data on the actual expenditure, we investigate the gender gap in the EIS. We find that the EIS for males is higher than that for females. Specifically, the EIS for males is about 1.3, while that for females is about 1.0. Since the EIS is the inverse of risk aversion, we interpret that the gender gap in the EIS is related to the gender gap in risk aversion. High (low) EIS means low (high) risk aversion. Our results imply that females are more risk-averse than males.

[3] A vector X includes the control variables such as the fixed effects, time dummies, and aggregate inflation rates.

[4] Households without liquidity constraints are defined as those who earn annual household income of seven million yen and above, hover 40 years old, and completed college.

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Table 1: EIS: Full sample

$$\Delta \ln c_{t+1} = \alpha \times E_t^i[\pi_{t \to t+4}] + X\xi + \varepsilon_{t+4}^i$$

	Male				Female			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
α	−0.106*	−0.103**	−0.023	0.161	−0.035	0.068	−0.013	−0.278
	(0.062)	(0.046)	(0.125)	(0.322)	(0.048)	(0.074)	(0.092)	(0.249)
EIS: $1-\alpha$	1.106	1.103	1.023	0.839	1.035	0.932	1.013	1.278
Fixed effect		✓	✓	✓		✓	✓	✓
Demographic variables	✓	✓	✓	✓	✓	✓	✓	✓
Time dummy	✓	✓	✓	✓	✓	✓	✓	✓
Observations	49,290	49,290	48,791	48,571	46,956	46,956	46,167	46,035

Note: Standard errors in parentheses are clustered at individual levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively. We instrument $E_t^j[\pi_{t \to t+4}]$ with $E_t^j[\pi_{t \to t+12}]$ in third and seventh columns and $E_t^j[\pi_{t+5 \to t+12}]$ in fourth and eighth columns.

Table 2: EIS: Non-constrained households

$$\Delta \ln c_{t+1} = \alpha \times E_t^i[\pi_{t \to t+4}] + X\xi + \varepsilon_{t+4}^i$$

	Male				Female			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
α	−0.279**	−0.311***	−0.606**	−1.180*	−0.243*	−0.008	−0.090	−0.358
	(0.129)	(0.066)	(0.275)	(0.661)	(0.136)	(0.125)	(0.240)	(0.635)
EIS: $1-\alpha$	1.279	1.311	1.606	2.180	1.243	1.008	1.090	1.358
Fixed effect		✓	✓	✓		✓	✓	✓
Demographic variables	✓	✓	✓	✓	✓	✓	✓	✓
Time dummy	✓	✓	✓	✓	✓	✓	✓	✓
Observations	12,315	12,315	12,231	12,201	4,990	4,990	4,950	4,944

Note: Standard errors in parentheses are clustered at individual levels, and ***, **, and * indicate 1%, 5%, and 10% significance, respectively. Households without liquidity constraints are defined as those who earn annual household income of seven million yen and above, over 40 years old, and completed college. We instrument $E_t^j[\pi_{t \to t+4}]$ with $E_t^j[\pi_{t \to t+12}]$ in third and seventh columns and $E_t^j[\pi_{t+5 \to t+12}]$ in fourth and eighth columns.