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Estimating Frisch labor supply elasticity in Japan ☆

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ABSTRACT

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Using Japanese data from the 1990s aggregated by prefecture, age group, and sex, we estimate Frisch labor supply elasticity, which has been seldom estimated in Japan. The change in labor supply can be decomposed into two labor-supply behaviors: extensive margin, indicating workers' entry and exit from the labor market; and intensive margin, indicating changes in hours of work in response to a wage change. Our estimates of the Frisch elasticity on the extensive and intensive margins combined are in the range of 0.2 to 0.7 for males, 1.3 to 1.5 for females, and 0.7 to 1.0 for both sexes. Our estimates of the Frisch elasticity on only the intensive margin are in the range of 0.1 to 0.2 for all three categories. These results suggest that extensive margin explains the bulk of labor-supply changes in Japan. As for the changes in the estimates of the Frisch elasticity in Japan from the 1990s, it has been either unchanged or in a declining trend on the extensive and intensive margins combined, either unchanged or in a slight rising trend on only the intensive margin, and in a declining trend on only the extensive margin. *J. Japanese Int. Economies* **22** (4) (2008) 566–585. Hitotsubashi University, Japan; Keio University, Japan.
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1. Introduction

Using Japanese data from the 1990s aggregated by prefecture, age group, and sex, we estimate Frisch labor supply elasticity (hereafter, Frisch elasticity) in Japan. As pointed out by Prescott (1986), Frisch elasticity is one of the most important structural parameters in economics. In the dynamic general equilibrium models used in macroeconomics, for example, the responses of endogenous variables to shocks largely depend on Frisch elasticity. To our knowledge, however, previous studies have not done much to estimate the elasticity in Japan. Given this situation, the main objective of this paper is to show parameter values of Frisch elasticity in Japan.

Frisch elasticity is a type of intertemporal labor supply elasticity, which is derived from standard dynamic models that solve the intertemporal utility maximization problem of a representative agent. We estimate Frisch elasticity based on a life-cycle model, a line of analysis that stems from the permanent income hypothesis from Friedman (1957, 1976). According to the life-cycle model, a representative agent changes his/her labor supply over the business cycle in response to the temporal wage changes induced by shocks (that is, to the deviation of actual wages from the permanent or expected wage). Frisch elasticity indicates the extent to which people change their labor supply in response to these temporary wage changes. There is a wealth of literature estimating Frisch elasticity using either aggregate or longitudinal data in the United States and European countries. Examples of such research include Lucas and Rapping (1969), Altonji (1982), Mankiw et al. (1985), and Algoskoufis (1987), which use aggregate data, and MaCurdy (1981), Heckman and MaCurdy (1982), Browning et al. (1985), and Altonji (1986), which use longitudinal data.

As for Japan, however, there is a paucity of empirical research on Frisch Elasticity. Consequently, the parameter value derived from US or European research is typically used without modification when conducting simulations on dynamic general equilibrium models in Japan. Should there be substantial differences in labor market characteristics across countries, however, this may be reflected in different labor supply behavior in Japan. In this regard, it is worth estimating the elasticity for Japan using its own data. In addition, because of this lack of estimates for Frisch elasticity, we do not yet know whether there is an inconsistency between theory and empirical evidence[1] in Japan as has been the case in the US and European literature. That is, when the parameter values of Frisch elasticity obtained in empirical analyses have been plugged into simulations of theoretical models, those simulations have usually done a poor job in describing the real economy.

As stated above, there is no prior research specifically aimed at estimating Frisch elasticity in Japan. The only related research would be Osano and Inoue (1991), which uses Japanese time series data to estimate Euler equations for consumption and leisure. Although their main purpose is to examine the validity of life-cycle models and implicit contract theory, we can infer the Frisch elasticity from their estimation results—about 0.06 to 0.13.

Our approach differs from that of Osano and Inoue (1991) in several respects. First, our primary objective is to provide the estimates for Frisch elasticity. To achieve this objective, we also estimate *m*-supply, Marshallian, and Hicksian labor supply elasticities. We do this because these other elasticities are robust to liquidity constraints, and at the same time they provide additional information regarding the size of Frisch elasticity. Since there is a theoretical relationship in size between Frisch and other elasticities, we can specify the upper and lower bound of the Frisch elasticity. Second, we estimate Frisch elasticity using not only time series variation but also cross-sectional variation with data on hours of work, wages, and other variables aggregated by prefecture, age group, and sex. Third, using aggregate data enables us to estimate labor-supply behavior on the extensive margin and intensive

[1] Much of the empirical research using longitudinal data thus far estimates a small Frisch elasticity near zero, but normally a parameter value for Frisch elasticity of around 1 or larger is used when simulating dynamic general equilibrium models (for example, Rotemberg and Woodford, 1998 use an elasticity of 9.5). Within the real business cycle literature, a number of papers use the concept of indivisible labor to derive an infinite Frisch elasticity (for example, King and Rebelo, 1999 use an elasticity of 4 in their basic model, and an infinite elasticity in an extension of their model). For a description of indivisible labor, see Hansen (1985), Rogerson (1988), and Browning et al. (1999).

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