Review of Estimates of the Frisch Elasticity of Labor Supply

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By Felix Reichling and Charles Whalen

Among the models that CBO uses to analyze the economic effects of changes in federal fiscal policy is a life-cycle growth model. That model requires an estimate of the responsiveness of the supply of labor to a one-time temporary change in after-tax compensation, which is described by the so-called Frisch elasticity. CBO incorporates into its analyses an estimate of the Frisch elasticity that ranges from 0.27 to 0.53, with a central estimate of 0.40. This paper describes how CBO derived that range from the research literature.

I. Introduction

In choosing how much to work, people respond to incentives that are partly determined by federal fiscal policies. When the Congressional Budget Office (CBO) analyzes the effects of changes in federal taxes and spending on economic output, it uses models that require estimates of the responsiveness of the supply of labor to those changes in policy.[1]

Among the models that CBO uses to analyze the economic effects of changes in federal fiscal policy is a life-cycle growth model.[2] That model is considered a "general-equilibrium" model because people make decisions in response to prices (such as wages and rates of return on saving), and prices are determined by people's decisions. In the life-cycle model, the economy consists of different cohorts of households (also known as overlapping generations) that are forward-looking in their behavior. Accordingly, CBO's analyses of changes in federal fiscal

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[1] The amount of labor used in the economy depends also on the demand for labor by employers, but the determinants of labor demand lie outside the scope of this paper.

[2] For a discussion of the models that CBO uses to estimate the economic effects of fiscal policies, see Congressional Budget Office (2012a), Appendix, pp. 13-18.

policy require an estimate of the responsiveness of the supply of labor to both current and anticipated changes in after-tax compensation (wages plus benefits).[3]

Approaches to estimating the responsiveness of labor supply vary according to whether changes in after-tax compensation are viewed as permanent or temporary. The responsiveness to a permanent change in after-tax compensation—a tax cut that would permanently reduce marginal tax rates, for example—can be measured by the substitution and income elasticities. McClelland and Mok (2012) describe CBO's assessment of the research literature regarding those elasticities. The responsiveness to a one-time temporary change in after-tax compensation can be described by the so-called Frisch elasticity, which is the sum of the substitution elasticity and a measure of people's willingness to trade work for consumption over time.[4] This paper describes CBO's assessment of the research literature regarding the Frisch elasticity. CBO (2012a) explains how the agency uses estimates of the substitution elasticity, income elasticity, and Frisch elasticity of labor supply in its analyses of the economic effects of changes in federal fiscal policy.

Researchers estimate two components of the Frisch labor supply elasticity. One component measures how changes in after-tax compensation affect workers' decisions about how many hours they work—the so-called intensive margin. The other component measures how changes in after-tax compensation affect individuals' decisions of whether to work or not—the so-called extensive margin.

Estimates of the Frisch elasticity can be generated using data on changes in individuals' hours of work or data on changes in the total hours worked in the economy. Estimates based on data for

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[3] Some research suggests that total compensation should also include the value of the human capital that workers accrue on the job; see, for example, Keane and Rogerson (2012) and Imai and Keane (2004).

[4] For a technical discussion of how the Frisch elasticity (named for Norwegian economist Ragnar Frisch) relates to the substitution elasticity, see Chetty (2012) and Browning (2005).

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individuals—micro data—vary substantially not only with the assumptions made in the estimation process but also with the individuals studied. For example, estimates of the Frisch elasticity are often different for women and men as well as for younger and older workers. Estimates based on changes in the total hours worked in the economy—macro data—are generally much larger than those based on micro data. CBO bases its range for the Frisch elasticity on estimates derived from micro data because, as discussed below, those estimates are generally more relevant for CBO's life-cycle model than are estimates from the macro-data studies.

CBO incorporates into its analyses an estimate of the Frisch elasticity that ranges from 0.27 to 0.53, with a central estimate of 0.40. That range comes from the agency's assessment of the research literature on the Frisch elasticity as well as from values the agency derives from the research literature on the substitution elasticity.

II. Frisch Elasticities for the Intensive Margin

Estimates of the Frisch elasticity for the intensive margin that are based on micro data range from zero to more than 1.0. Micro-based studies typically estimate Frisch elasticities for specific demographic groups. Among the findings of those studies are the following:

- Men have a smaller Frisch elasticity than women, meaning that men vary their hours of work less in response to temporary changes in current or future after-tax compensation;

- Younger men have a smaller elasticity than men who are closer to retirement;

- Women without children have a smaller elasticity than women with children; and

- Single individuals have a smaller elasticity than workers in dual-income households.

Estimates of the Frisch elasticity for the intensive margin among men range from zero to 0.8. Blundell, Pistaferri, and Saporta-Eksten (2012), French (2005), Altonji (1986), and MaCurdy (1981) estimate Frisch elasticities for men that are small, ranging from zero to 0.5. Ziliak and Kniesner (2005), Pistaferri (2003), Lee (2001), and Angrist (1991) estimate larger elasticities that range from 0.5 to 0.8. In a survey of early research, Pencavel (1986) reports estimates with a range from zero to 0.5 and a median value of 0.2; a more recent survey by Keane (2011) reports the same median value but a range from zero to 0.7.

Most estimates of the Frisch elasticity for the intensive margin among men age 25 to 54 (considered to be in their prime working years) tend to be close to 0.2, but the range of estimates runs from zero to 0.8. Such men have a notably higher rate of labor force participation than other workers: For example, the labor force participation of men age 25 to 64 in 2007 was roughly 90 percent, while that of women in the same age range was roughly 75 percent.[5] Thus, it is not surprising that men in their working prime do not adjust their hours of work very much in response to temporary changes in wages.[6]

Estimates of the Frisch elasticity for the intensive margin among women tend to be higher than those for men and range from 0.5 to more than 1.0.[7] Heckman and MaCurdy (1980, 1982) estimate Frisch elasticities of 1.1 and 2.2 for married women. Blundell, Pistaferri, and Saporta-Eksten (2012) estimate a Frisch elasticity of 0.8 for married women. Blundell, Meghir, and Neves (1993) estimate a Frisch elasticity of 0.5 for married working women without children.

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[5] See Congressional Budget Office (2011), Table 2.

[6] Although wages are only part of total compensation, most of the literature on the Frisch elasticity focuses on estimating the response of hours worked to temporary changes in after-tax wages.

[7] Keane (2011) emphasizes that estimating labor supply elasticities for women is in many ways more difficult than doing so for men. In contrast to men, a large fraction of women between the ages of 25 and 54 are not in the paid labor force, which complicates the task of estimation.

They also find that women with children have higher Frisch elasticities, especially when those children are young. Specifically, they estimate that women with children under the age of 2 have a Frisch elasticity of 1.4 and women with children who are 11 years old or older have a Frisch elasticity of 0.8.

The Frisch elasticity also appears to vary depending on a worker's age and family structure. Older workers generally adjust their hours of work more than younger workers in response to changes in wages. For example, French (2005) estimates a range of intensive margin elasticities between 0.2 and 0.4 for 40-year-old male heads of households and a range of elasticities between 1.0 and 1.3 for 60-year-old male heads of households. Kimball and Shapiro (2008) estimate a Frisch elasticity for the intensive margin among workers in dual-income households that is 30 percent larger than that for married earners in single-income households and 50 percent larger than that for single workers.

III. Frisch Elasticities for the Extensive Margin

Estimates of the Frisch elasticity for the extensive margin that are based on micro data also vary considerably, ranging from 0.2 to 0.7 for men and from 0.1 to 0.4 for women. Those estimates are often based on samples of people close to retirement, who are more likely than the overall population to adjust their labor force status in response to changes in after-tax compensation. Laitner and Silverman (2005) and Gruber and Wise (1999) find that the Frisch elasticity for the extensive margin ranges from 0.2 to 0.7 for men near retirement. Manoli and Weber (2010) and Brown (2009) estimate that the elasticity is 0.2 for a sample of men and women close to retirement.

Two papers provide estimates not based on samples of individuals close to retirement. Card and Hyslop (2005) estimate the extensive margin Frisch elasticity to be 0.4 for single mothers. Analyzing the labor supply response to a one-year decrease in income taxes, Bianchi, Gudmundsson, and Zoega (2001) estimate an extensive margin Frisch elasticity of 0.4 for all workers, with estimates ranging from 0.1 for women to 0.6 for men.

IV. Frisch Elasticities Based on Macro Data

Estimates of the Frisch elasticity that are based on macro data are considerably larger than most estimates based on micro data and typically fall within a range from 2 to 4. The macroeconomics literature uses two different approaches to obtain values for the Frisch elasticity. One approach, often used in the so-called "real business cycle" literature, is to choose a value for the Frisch elasticity (and values for other parameters of real business cycle models) so that the economic outcomes predicted by a model match some features of actual economic outcomes—such as the volatility and correlations of movements in gross domestic product, consumption, investment, or hours of work—over business cycles.[8] Following that approach, Cho and Cooley (1994) and King and Rebelo (1999) choose Frisch elasticities that range from 2.6 to 4.0. Another—and more recent—approach uses macroeconomic data to estimate the parameters that are used in dynamic stochastic general-equilibrium (DSGE) models.[9] Using that approach, Smets and Wouters (2007), for example, estimate a Frisch elasticity of 1.9.

Explaining why macro-based estimates of Frisch elasticities are larger than the micro-based estimates has been an active area of research in recent years. One possible explanation is that the micro-based estimates understate the true Frisch elasticity. For example, Keane and Rogerson

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[8] That approach is commonly referred to as calibration. For a discussion of the differences between empirical estimation and calibration, see Hansen and Heckman (1996).

[9] See Schorfheide (2011) for a discussion of challenges in estimating DSGE models.

(2012) and Imai and Keane (2004) argue that the value of increments to human capital should be included in the calculation of total compensation and that, if it was included, micro-data estimates of the intensive margin Frisch elasticity would be large enough to be consistent with macro–data estimates. That line of research highlights an important issue, namely, that most life-cycle models do not currently account for the evolution of human capital over time.

Another possible explanation is that the micro- and macro-based estimates of the Frisch elasticity are measuring different things. For example, Rogerson and Wallenius (2009) model the intensive and extensive labor supply margins in a life-cycle model and find that their model can generate both small micro-data elasticities and large macro-data elasticities.[10] Alternatively, Hall (2009) argues that the macro-based estimates measure not only changes in workers' choices about how many hours they want to work but also changes in the total hours worked in the economy as workers involuntarily lose jobs in economic downturns and regain jobs as economic conditions improve. In Hall's model, sticky wages lead to an increase in unemployment during a recession, and fluctuations in the total hours worked in the economy are largely due to changes in the number of workers who move in and out of unemployment rather than changes in workers' desired work hours. Because wages change little while aggregate hours of work change significantly over the business cycle, macro-based estimates of the Frisch elasticity will be much larger than the true Frisch elasticity. Assuming that the Frisch elasticity is 0.7, Hall's model generates changes in the total hours of work over the business cycle that are consistent with a macro-based estimate of 1.9.

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[10] Chetty, Guren, Manoli, and Weber (2011) are critical of those results. They evaluate the assumptions made in macro models and conclude that it is not possible to reconcile a macro-based Frisch elasticity above 1.0 with existing micro-based estimates.

V. CBO's Range for the Frisch Elasticity

CBO incorporates into its analyses an estimate of the Frisch elasticity that ranges from 0.27 to 0.53, with a central estimate of 0.40.[11] That central value is consistent with estimates of the Frisch elasticity from research studies using micro data and with the central value of CBO's estimates for the elasticity of substitution. CBO's range of estimates for the Frisch elasticity is roughly as wide (relative to the central estimate) as CBO's range of estimates for the substitution elasticity.

Estimates of the Frisch elasticity using micro data, including responses on both the intensive and extensive margins, range from 0.1 to more than 1.0, but cluster around 0.4. In CBO's assessment, macro-based estimates of the Frisch elasticity may be useful for predicting how workers will move between employment and unemployment over the business cycle, but they do not provide accurate information about how much workers change their labor supply in response to changes in federal fiscal policy.

CBO's chosen range for the Frisch elasticity is also informed by estimates that the agency derives from research studies on the substitution elasticity. As discussed in McClelland and Mok (2012), CBO uses a central estimate of the earnings-weighted substitution elasticity of 0.24. The agency's review of studies that estimate both the substitution elasticity and the Frisch elasticity suggests that the Frisch elasticity is about 50 percent larger than the substitution elasticity.[12] CBO's central estimate of the Frisch elasticity, 0.4, is roughly 50 percent larger than CBO's

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[11] In CBO's life-cycle growth model, the responsiveness of each person's labor supply to a change in after-tax compensation depends on the assumed Frisch elasticity, the age of the person, and the person's economic attributes such as hours of work, assets, and current and expected wage rates. The Frisch elasticity is chosen to reflect both the hours and participation responses of people. When simulating a policy that would increase employment, for example, the model applies increases in earnings for existing workers as a proxy for earnings by workers entering the labor force.

[12] See Ziliak and Kniesner (2005), Ziliak and Kniesner (1999), Altonji (1986), and Blundell and Walker (1986).

central estimate of the substitution elasticity, 0.24. CBO uses a range for the substitution elasticity that runs from 0.16 (which is about two-thirds of the central estimate) to 0.32 (which is about four-thirds of the central estimate). Applying those same proportions to CBO's central estimate of the Frisch elasticity yields a range for that elasticity from 0.27 to 0.53. Those values for the Frisch elasticity fall within the range found in the academic literature.

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