

# Labor Supply, Endogenous Wage Dynamics and Tax policy

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## Long Abstract

In this paper we analyze analytically, quantitatively, and empirically a framework where labor supply has three distinct roles. First, as usual, it increases contemporaneous earnings. Second, because of incomplete asset markets, it provides some partial insurance for idiosyncratic labor productivity shocks. And last, labor supply also works as investment in future earnings potential (human capital). In this sense, in our model, wage dynamics is partially endogenous.

The insurance effect of labor supply was (among others) studied by Pijoan-Mas (2006). The human capital investment dimension of labor supply was first introduced by Imai and Keane (2004) in a life-cycle environment without idiosyncratic shocks. In terms of modeling, our contribution to the literature is twofold. First, we develop a framework where both the additional insurance (incomplete markets) and investment (human capital accumulation through learning-by-doing) aspect of hours are present. Second, we allow the return from an additional hour to vary with the initial level of wages (human capital). Based upon the work of Santos (2010), we show that this feature is particularly important: in both CPS and PSID data, the marginal effect of an hour on future wages is increasing significantly with current wages. This suggests that learning-by-doing provides a better 'technology' of generating wage growth (or avoiding a reduction in wages) for agents with higher initial wage (human capital). In order to focus on these differences on post-educational human capital accumulation, we do not include a life-cycle or schooling component in our benchmark model. To be consistent with the model, we clean the data along these dimensions as well.

We focus on three main issues using this framework. First of all, in this environment, the monetary return of an additional hour is not equal to the current hourly wage as in the standard models of labor supply. Rather, it is augmented by the expected net present discounted value of all the earnings increases this

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hour's choice implies for the future. Consequently, labor supply does have an insurance role not only in the static sense (low current hourly wages can be partially offset by high current hours) but also from a dynamic precautionary perspective (*ceteris paribus*, higher labor supply decreases the chance of lower wages in the future). Given that this dynamic effect of labor supply is stronger for high wage earners, this implies that this mechanism amplifies contemporaneous cross-sectional inequality.

Second, the above observation has some strong implications on the measurement of labor supply elasticity. As we noted earlier when the dynamic effect is considered the rewards of a marginal hour become more dispersed across agents with different current wages. This implies that to explain the fact that hours are relatively constant across wage groups, we need to have a smaller elasticity of labor supply. We show that indeed this is the case: when ignoring the endogeneity of the wage process we obtain 0.5 as a Frisch elasticity of labor supply. This is a standard estimate in the micro literature but it is lower than the 0.72 that Pijoan-Mas (2006) obtains in a similar model. However, he uses an exogenous and somewhat different wage process. When we estimate/calibrate this elasticity using our model allowing for the asymmetric investment role of labor supply we obtain an estimate of 0.25, which is significantly lower than what we have in the benchmark case. Hence, we show that ignoring the presence of the asymmetric investment effects of labor supply biases upward the estimate of the Frisch elasticity significantly (double it up). Note that in the life-cycle framework of Imai and Keane (2004), and in the subsequent work of Wallenius (2009), when the dynamic effect of labor supply is introduced the Frisch elasticity tends to increase. The reason is that, in their case, the dynamic effect negatively co-varies with the static effect. In particular, young workers have low current wages but because of their longer horizon they have higher dynamic effect, while older workers have higher current wages but they benefit less from the dynamic effect. Given that they do not have cross-sectional heterogeneity or an insurance effect of labor supply and we do not have life-cycle effect, it is not obvious what would be the overall effect of this investment channel on the estimation of labor supply elasticity. Nevertheless, our results suggest that it can be easily the case that the 'true' Frisch elasticity is even lower than that estimated by ignoring the dynamic effect.

Third, a low Frisch elasticity is usually bad news for macroeconomists, because fitting aggregate hours and wages data and/or matching the responses of aggregate labor supply (and hence aggregate output) to tax policy changes usually requires a high elasticity of labor supply of the representative agent (see Prescott (1986), Prescott (2004)). However, in our framework, we can have a low elasticity and yet expect significant responses of aggregate labor supply and human capital when the progressivity of the tax system is decreased. This is the case because, in our environment, progressivity does not only change the distribution of contemporaneous wages but also the dynamic gains associated with an additional hour. This dynamic effect can magnify the changes in labor supply incentives especially for those with high current wages. Since, they are the more productive individuals in the economy aggregate labor supply can in-

crease significantly. Since, in this environment, labor supply is an investment good as well, this mechanism may lead to a permanently higher level of human capital (a similar mechanism operates in Guvenen, Kuruscu, and Ozkan (2009)). Some preliminary results show that this is indeed the case. More precisely, in our model with the dynamic effect of labor supply and low elasticity of labor supply, a reduction in progressivity has a higher aggregate effect than in a model which is identical but the wage process is exogenous.

This model also brings up some computational and empirical challenges. One of the most important ones is the issue of measurement error. In our empirical analysis, we use both hourly wage and hours data. It is known (see French (2004), for example) that both data are contaminated by measurement error. Since, for our empirical exercise we use them on both sides of the regressions, this is itself an issue for estimation. Furthermore, because hours are used to calculate hourly wages from daily, weekly, monthly or annual earnings, the measurement errors are potentially correlated. To include all these issues directly in the empirical analysis seemed to be a hard if not formidable task. Fortunately, French (2004) has estimated both the size and the correlation across these measurement errors. With these figures, we use our model to clean the effect of the measurement error and the endogeneity of asset decisions. In particular, we simulate an artificial sample of individuals using the stationary distribution and optimal decision rules of agents. Then we contaminate their hours and hourly wage data with measurement error and run the same regressions on this contaminated data as we run on the 'real' data. The human capital production technology (endogenous wage process) is then found such that we match the data estimates with the model estimates from these wage growth regressions. We find this way of cleaning the effect of measurement error easy to implement and at the same time very transparent, hence we believe that this procedure can be applied in others settings as well.

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