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A Multi-state model of state dependence in labor supply: Intertemporal labor supply effects of a shift from joint to individual taxation ☆

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ABSTRACT

In this paper I develop an intertemporal discrete choice model of female labor supply to analyze the effects of true state dependence and its effect on labor supply behavior over time. The estimation results show that state dependence is significantly positive at the extensive margin and lower but in general still significant at the intensive margin. I apply this model to study the short and long run labor supply effects of a fundamental reform of the German income tax system, i.e. the shift from joint to individual taxation of married couples and show that labor supply responses are significantly higher in the long run than in the short run.

1. Introduction

In this paper I develop and estimate an intertemporal discrete choice model of female labor supply. In particular, I focus on the effects of true state dependence on the labor supply behavior along the extensive (labor market participation) and intensive margin (working hours). True state dependence measures the causal effect of the previous working behavior on the current employment state. I apply the intertemporal model to study the short and long run labor supply effects of a fundamental reform of the German income tax system for married coupes, i.e. a shift from joint to individual taxation.

Following Heckman (1981a), several studies have found strong and significant effects of true state dependence on the labor supply behavior, one prominent example is Hyslop (1999). In this analysis, I extend the previous research in particular along two lines and combine several important aspects for the analysis of female labor supply. First, in contrast to the model of Hyslop, I focus not only at the extensive but as well on the intensive margin of working behavior. Although labor supply effects on the extensive margin tend to be more important (Heckman, 1993), it is necessary to study the intensive margin as well when analyzing the labor supply behavior. This is in particular important for the evaluation of tax and transfer reforms, as income and substitution effects might provide opposite incentives for the labor market participation and the working hours (Laroque and Salanie, 2002). Moreover, potential sources of true state dependence, such as search costs or human capital accumulation, might affect behavioral responses along the extensive and the intensive margin differently. Second, the empirical analysis of female labor supply is based on a detailed microsimulation model for Germany (STSM) which maps the relevant regulations of the German tax and benefit system. The striking advantage of microsimulation is that the work incentives of individuals can be accurately described in the household context. Moreover, I account for child care costs which strongly affect female labor supply behavior (Wrohlich, 2006).

Based on panel data from the German Socio Economic Panel (SOEP), I estimate the intertemporal multi state model for married women in Germany for the period 2000–2004. I simplify the household maximization problem and assume that the wife maximizes the household utility conditional on the husband's behavior. In the econometric analysis, I employ a dynamic discrete choice panel data model with random effects. The choice of the employment state

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is estimated conditional on the labor supply of the last period, on household and alternative specific variables and on unobserved heterogeneity. Unobserved heterogeneity is modelled nonparametrically following Heckman and Singer (1984). Further, the problem of initial conditions is explicitly taken into account as suggested by Wooldridge (2005). In general, empirical studies based on survey data might suffer from measurement error in the data. In this application measurement error might be particularly problematic as I analyze the employment behavior at several discrete points. To assess the robustness of the key empirical results I replicate the estimation with different thresholds of the working hours and find that the general results do not depend on the chosen specification.

The estimation results are in line with previous studies indicating that true state dependence is significantly present for the labor supply behavior of married women. I show that state dependence is high at the extensive margin and lower but in general still significant at the intensive margin. This explains the dynamics of labor supply responses. In the short run, labor supply responses induced by a permanent income change are affected by state dependence and are therefore relatively moderate. In the long run, state dependence looses its impact and labor supply responses significantly increase. Similarly, a transitory income change does not only significantly affect labor supply in the current period but it changes the behavior as well in future periods.

The proposed intertemporal multi-state model is applied to estimate the dynamic behavioral effects of a fundamental tax reform. I estimate the short and long run labor supply effects of a shift from joint to individual taxation of married couple households. The results show significant and positive labor supply effects in the short run which are markedly increasing in the long run.

2. Theoretical background

2.1. Intertemporal discrete choice model

In this section I present the theoretical background for the intertemporal discrete choice model of female labor supply. I follow Hyslop (1999) and derive a reduced-form dynamic life-cycle model that generates the common dynamic first-order Markov-model of intertemporal labor supply. The intertemporal framework implies that the current working behavior is affected by true state dependence which is the causal effect of the previous labor supply on the current working state.

I focus on married spouses in prime working age, defined as 20–55 years. I simplify the utility maximization of the household and do not consider collective bargaining between the spouses, as suggested by e.g. Chiappori (1992). Instead, I assume that the wife maximizes her utility conditional on the husband's behavior. The husband is assumed to work full time.[1]

The model proceeds as follows. Each period t the wife maximizes her utility conditional on the behavior of her husband by choosing among j different discrete labor market states. In each labor market state j she receives a flow utility V_{ijt} which is a function of her leisure time modelled as disutility for work, the household consumption level in state j and individual and household specific characteristics. Moreover, her utility depends on her previous labor market state which makes the model intertemporal.

This utility flow determines the current labor supply and consequently the job search behavior of the wife. According to the empirical distribution of female working hours, I define 5 discrete labor market states ($J=5$) for the wife, i.e. no work, two different part-time arrangements, full-time and over-time work (Table 1 and Appendix B). Formally, the utility flow V at each discrete choice j is specified in the following way:

$$V_{ijt} = U\left(H_{ijt}, C_{ijt}, Z_{it-1}, X_{it}, c_{ij}, \epsilon_{ijt}\right). \quad (1)$$

The utility function U contains an observable and an unobservable component. The observable component includes her working hours H_{ijt} and the household consumption level C_{ijt}. Further, individual, household and time specific characteristics X_{it} that are constant over the different labor supply alternatives, such as age, number and age of children or nationality affect her utility. These variables can be interpreted as taste shifters of the preferences for income and working time. In addition, the utility is dependent on her realized working state in the previous period Z_{it-1}. This specification implies that preferences are not separable over time and that the current utility flow is affected by a preference related effect of true state dependence. The unobservable component consists of an individual specific term c_{ij} which is constant over time. This term differs for each working state and captures individual and household specific unobservable effects. Finally, utility is affected by a random term that is assumed to vary independently over time, working states and individuals ϵ_{ijt}.

The maximization problem of the wife is subject to the household budget constraint. The budget constraint is a function of the joint gross household income G_{ijt} and the tax and transfer system TR_{ijt}. The gross household income consists of the earnings of the full-time working husband and the state specific earnings of the wife. Moreover following Hyslop (1999), I assume that the budget constraint is affected by the previous working state of the wife Z_{it-1}. This captures the effects of true state dependence which are related to search costs.

In this framework it is assumed that household can neither save nor borrow. Therefore, the budget constraint has the following form:

$$Y_{ijt} = C\left(G_{ijt}, TR_{ijt}, Z_{it-1}\right) \equiv C_{ijt}. \quad (2)$$

With respect to this budget constraint and conditional on the behavior of her partner, the wife maximizes her utility. Note, in this study I do not differentiate between voluntary and involuntary unemployment, thus the agents choose their employment state voluntarily without facing labor demand side restrictions. This assumption addresses a general shortcoming of the labor supply literature. Following Blundell et al. (1987), there have been several attempts to introduce involuntary unemployment into a labor supply model. Bargain et al. (2010) derive labor supply elasticities with and without labor market constraints using the same data as employed in this study. They find that elasticities accounting for involuntary unemployment are significantly lower for singles and men living in couples, yet not significantly different for married women. This is because the majority of the inactive married women chooses

Table 1
Discrete employment states.

Employment	Share (%)	Hours women (per week)	Net income (in Euro)	Child care cost (in Euro)
0	26.76	0	2705	–
1	13.95	10	3030	108
2	34.54	23	3317	108
3	19.35	38	3703	142
4	5.40	43	3833	142

The following working hour (weekly) classifications are used: 0, 0–14, 15–34, 35–40, >40. Net household income (monthly) is calculated on basis of the microsimulation model STSM. The net household income is the mean income in the given alternative. Child care costs are average expected monthly child care costs for households with children younger than 7 years (Wrohlich, 2006).
Source: SOEP, wave 2001–2005, STSM.

[1] At first glance this often applied simplification might seem restrictive. However, empirical evidence suggests that cross elasticities between spouses are either not significant or of little importance (Steiner and Wrohlich, 2004) and thus provides justification for this assumption.