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Accounting for labor demand effects in structural labor supply models ☆

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ABSTRACT

When assessing the effects of policy reforms on the labor market, most studies only focus on labor supply. The interaction of supply and demand is not explicitly modeled, which might lead to biased estimates of potential labor market outcomes. This paper proposes a straightforward method to remedy this shortcoming. We use information on firms' labor demand behavior and feed them into a structural labor supply model, completing the partial analysis of the labor market on the microdata level. We show the performance and relevance of our extension by introducing a pure labor supply side reform, the workfare concept, in Germany and simulating the labor market outcome of the reform. We find that demand effects offset about 25% of the positive labor supply effect of the policy reform.

1. Introduction

Labor supply elasticities are important ingredients for policy evaluation (see, e.g., Blundell et al. (2000) for a partial equilibrium application and Bovenberg et al. (2000) for a general equilibrium model). Furthermore, they crucially affect the optimal design of tax systems (see, e.g., Saez, 2001; Immervoll et al., 2007 and Blundell et al., 2009). The elasticities are usually derived using some sort of (structural or reduced form) labor supply model (see, e.g., Aaberge et al., 1995, 1999, 2000; Hoynes, 1996; Eissa and Hoynes, 2004 and Heim, 2007, 2009). All these studies have in common that they focus only on the supply side implicitly assuming perfectly elastic labor demand. Only in this case labor supply effects equal eventual employment effects. However, as the extensive empirical evidence suggests, labor demand is usually somewhat elastic (Hamermesh, 1993). Hence, labor market estimates stemming from pure labor supply models are almost surely biased and inference based on them is consequently flawed.

In this paper, we develop a straightforward approach to extend random utility models of labor supply to explicitly take into account demand effects. In terms of labor supply modeling, no generally agreed-upon standard estimation approach exists. Recent practice has mostly relied on natural experiments based on tax reforms to identify responses to exogenous variations in net wages (see Blundell and MaCurdy, 1999 and Bargain et al., 2011b for surveys). While these approaches address the microeconometric identification issues especially with respect to the endogeneity of wages, they are less robust with respect to general equilibrium effects on the labor market.[1] For this reason we use structural labor supply and demand

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[1] That is, the natural experiment approach works well provided that control groups are well defined and not affected by the policy change. However, if reforms affect large numbers of people, changes in supply and demand of the treatment group can have feedback effects on the behavior of the control group, which cannot be captured in this approach. In a recent paper, Chetty et al. (2011) stress the importance of structural modeling by showing that quasi-experimental evidence ignores firm responses and labor market frictions.

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models and iterate them until the partial labor market equilibrium is reached. Our approach is related to the work of Creedy and Duncan (2005) as well as Haan and Steiner (2006) who also employ discrete choice labor supply modeling. In both studies information on labor demand is used to calculate wage adjustments after some kind of labor supply shift. The authors of the former study employ the concept of aggregate labor supply to determine the effects of proportional wage changes. In contrast, Haan and Steiner (2006) model labor supply responses and wage adjustments at the individual level.

We augment the original methods in several ways. First, instead of relying on labor demand elasticities from the literature, we estimate own labor demand functions for different types of workers, based on rich, linked administrative employer–employee data. By doing that, we remain at the microdata level as the detailed administrative firm dataset allows the identification of precise labor demand reactions to wage changes for different labor inputs (i.e. household type/skill cells). In addition, our iteration process guarantees that households individually face possible demand restrictions depending on their characteristics. Hence, we capture the full heterogeneity of the microdata sample. Finally, neither Creedy and Duncan (2005) nor Haan and Steiner (2006) provide much evidence on how the interaction of supply and demand side functions. We open the black box and give detailed insight on both the iteration process itself and its theoretical plausibility.

We also see several advantages of our approach compared to alternative methods of incorporating labor demand effects in labor supply estimations, such as computable general equilibrium (CGE) models (see Peichl, 2009 for an overview) or models integrating demand side restrictions via probabilities (cf. Blundell et al., 1987). Our model is slender and parsimonious, since it focuses only on the labor market. At the same time, we can introduce much more heterogeneity, as both supply and demand sides are estimated using microdata. Moreover, we explicitly model the interaction of demand and supply, taking firm behavior into account and separating it from labor supply effects.

In order to demonstrate the performance of our newly developed supply–demand link, we depart from a standard, discrete choice, structural labor supply model following van Soest (1995) and Blundell et al. (2000). We estimate the model with the 2009 wave of the German Socio-Economic Panel Study (SOEP), a representative, microdata, household panel study, using the IZA tax benefit calculator IZAΨMOD to transform gross income to net income. As a counterfactual policy reform, we introduce a workfare concept (see Besley and Coate, 1992 and Moffitt, 2002). Every employable individual living in a household that receives government benefits has to fulfill a work requirement equivalent to a full-time job. We choose this specific counterfactual mainly because it is expected to have a substantive positive labor supply effect and because it is often criticized for ignoring demand side restrictions. Furthermore, the effect on the government budget is expected to be positive, making the reform feasible from a fiscal point of view.

Our simulation results show that demand effects do indeed play an important role. They offset the positive labor supply reaction of the workfare reform by 25% (equivalent to 380,000 full-time jobs). Thus, labor demand works as a stabilizer to labor supply shifts. To check the robustness of our results, we also simulate different counterfactuals. We find demand effects of comparable sizes in relative terms. Moreover, the stabilizing effect also works in the other direction, that is, if a reform reduces labor supply, the incorporation of labor demand effects countervails the negative supply effects, making the overall employment effect less negative. Further sensitivity tests show that, in line with theory, the higher the demand elasticity, the smaller the demand adjustments.

The paper is structured as follows. Section 2 compares our method to the literature. In Section 3, we set up a standard labor supply model. Section 4 describes the labor demand model. Section 5 demonstrates the linkage of labor supply and demand. Empirical results are presented and discussed in Section 6 and Section 7 concludes.

2. Related literature

There are other approaches to account for demand effects in labor supply models which are naturally related to ours. One common method, particularly in the field of ex-ante policy evaluation, is linking labor supply models with computable general equilibrium (CGE) models (see Bourguignon et al., 2003; Bovenberg et al., 2000; Boeters et al., 2005; Arntz et al., 2008; Boeters and Feil, 2009 and Hérault, 2010). The advantage of our approach is that we overcome possible aggregation and linking problems in micro–macro models.[2] Our analysis remains on the micro-level, as both the supply and demand sides are estimated using microdata. This allows us to introduce much more heterogeneity into the analysis, since we do not rely on just a few representative agents, as is the case in CGE models. Moreover, we do not have to model further markets and impose assumptions on how, for example, a decline in consumption translates into a reduction in output. Instead we adopt a partial framework and focus solely on the labor market.[3] As a consequence, our method abstracts from intertemporal adjustments and optimization behavior. Temporary labor demand shocks could potentially delay but do not alter the adjustment process to the new labor market equilibrium.[4]

Another cluster of studies tries to extend structural labor supply models by introducing probabilities which account for possible demand side frictions. Within this line of literature, there is a whole range of different models, which can be broadly divided into three subgroups. Firstly, there are Double Hurdle Models that assume a two-tier decision making process (see Blundell et al., 1987; Hogan, 2004 and Bargain et al., 2010 for a recent empirical implementation for Germany). In the first stage, the individual decides whether to participate in the labor market or be inactive. The second hurdle is the probability of being involuntary unemployed, conditional on having chosen to work. This probability can be interpreted as a demand side restriction.

The second group of studies extends labor supply models to take classical non-employment into account. Meyer and Wise (1983a,b) model the effects of a minimum wage on youth employment by introducing the probability that a worker is not productive enough to be hired. Laroque and Salanié (2002) extend this framework and include the probability of being involuntarily unemployed due to frictional or business-cycle related unemployment.

The third probability-based approach to integrate labor demand constraints is to restrict the set of hours which can be chosen by individuals. In those models, working hours generally stem from some

[2] When conducting such a micro–macro linkage, several potential problems arise (see Peichl, 2009). The main problem is the lack of theoretical and empirical consistency between the micro and macro components, which can give rise to biased results. To be able to successfully link microsimulation and CGE models, there have to be some common variables through which the two models can exchange information. Although CGE models are based on the microeconomic general equilibrium theory, they usually use aggregated macrodata for the analysis. Hence, it is necessary to aggregate or disaggregate these variables in order to make them comparable with the variables in the other model. Furthermore, it has to be checked whether the same variable in both models represents the same population (e.g. household consumption in the micromodel vs. aggregated total consumption, including the governments in the macromodel).

[3] On the other hand, our slender approach is not able to take into account general equilibrium effects (other than wage and employment changes). In particular, we ignore changes in consumption and consumer prices. Hence, if these responses are important, our approach is not able to capture the full effects of a policy change (but it still performs better than a pure labor supply model).

[4] Bargain et al. (2011a) use a model similar to ours based on the same dataset to estimate the labor demand effects of the Great Recession for Germany, taking into account that wages were quite sticky in the short-run.