Discussion of Trabandt and Uhlig

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In their chapter, Trabandt and Uhlig compute Laffer curves for for the United States and fourteen European countries. Their goal is to assess the limits of taxation in these countries and its implications for government deficit and the sustainability of current debt levels. Overall, I think this is a very interesting research project and a most welcome contribution to the current debate on fiscal policy in Europe and elsewhere. Undoubtedly, the estimates provided by the authors are subject to a number of important critiques, some of which I detail below. Despite this, we desperately need quantitative estimates of the effects of fiscal policy and the methodology developed by the authors can help us obtain those.

In this short comment, I first review the author's methodology and highlight on the way its basic strengths and weaknesses. This takes most of the space of these comments. After doing this, I briefly describe the main results and add some general remarks on them.

The methodology used by the authors can be summarized in five steps or assumptions. I describe next these steps or assumptions using a simplified version of the model that does not take into account monopolistic competition or human capital accumulation. These extensions are important from a quantitative perspective, but are not central when it comes to explain and comment on Trabandt and Uhlig's methodology.

The *first* step is to assume that aggregate production in the US and the fourteen European countries can be well described by a Cobb-Douglas technology of the following sort:

$$y_t = \xi^t \cdot k_t^{\theta} \cdot n_t^{1-\theta} = \xi^{\frac{t}{1-\theta}} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{\theta}{1-\theta}} \cdot n_t \tag{1}$$

where I use the same notation as the authors. In particular, y_t is output; k_t and n_t are the stocks of capital and labor; ξ^t denotes the trend in total factor productivity; and θ is a parameter such that $\theta \in (0, 1)$. This is routinely assumed in macroeconomics. But still I cannot resist mentioning here again that this might be a poor assumption when one goes beyond building theoretical examples and tries instead to use the models to make quantitative assessments.

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In open economies, international trade affects the aggregate production function. Comparative advantage and increasing returns lead countries to specialize their production in different sets of industries. Even if all the countries in the sample had the same industry production functions, their aggregate production functions might differ substantially as the latter also depend on these countries' industry mix.[1] This might be important for the calculations. As taxes are changed, patterns of specialization are altered and so does the shape of the production function. It is hard to assess here the biases that this misspecification of the model induces in the results, though. But it certainly induces additional uncertainty regarding the estimates.

The *second* step is to assume that factors markets are competitive and, as a result, factors are paid their marginal product:[2]

$$w_t \cdot n_t = (1-\theta) \cdot \xi^t \cdot k_t^\theta \cdot n_t^{1-\theta} = (1-\theta) \cdot \xi^{\frac{t}{1-\theta}} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{\theta}{1-\theta}} \cdot n_t \tag{2}$$

$$(r_t - \delta) \cdot k_t = \theta \cdot \xi^t \cdot k_t^\theta \cdot n_t^{1-\theta} - \delta \cdot k_t = \left(\theta - \delta \cdot \frac{k_t}{y_t}\right) \cdot \xi^{\frac{t}{1-\theta}} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{\theta}{1-\theta}} \cdot n_t \tag{3}$$

where w_t is the wage and $r_t - \delta$ is the rental minus the depreciation rate. This assumption is also standard in quantitative, but widely acknowledged to be unrealistic. Collective bargaining, regulations of various sorts and many other frictions ensure that labor markets in many European countries are anything but competitive. Adverse selection, agency costs, oligopolistic behavior by banks and other frictions create a wedge between the rates of return to investment and those that are perceived by savers. This might also be important for the calculations. As taxes are changed, factor rewards might change more or less than proportionally, depending on the nature of these frictions. Once again, it is hard to assess the biases that this misspecification of the model induces in the results, though. This depends on the specific frictions that are more prevalent in labor markets, but a good dose of healthy skepticism should be used after assuming that the United States and Spain have the same competitive labor and financial markets.

The first couple of steps allow us to write tax revenues are as follows:

$$T^k = \tau^k \cdot \left(\theta \cdot \frac{y_t}{k_t} - \delta\right) \cdot k_t = \tau^k \cdot \left(\theta - \delta \cdot \frac{k_t}{y_t}\right) \cdot \xi^{\frac{t}{1-\theta}} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{\theta}{1-\theta}} \cdot n_t \tag{4}$$

$$T^n \equiv \tau^n \cdot w_t \cdot n_t = \tau^n \cdot (1-\theta) \cdot \xi^{\frac{t}{1-\theta}} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{\theta}{1-\theta}} \cdot n_t \tag{5}$$

$$T^c \equiv \tau^c \cdot c_t = \tau^c \cdot \frac{c_t}{y_t} \cdot \xi^{\frac{t}{1-\theta}} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{\theta}{1-\theta}} \cdot n_t \tag{6}$$

[1] See Ventura (1995) for a detailed discussion of this point, and Fadinger (2011) for an attempt to quantify its importance when estimating cross-country productivity differences.

[2] With monopolistic competition, the wage becomes lower than the marginal product of labor, but it is still proportional to it.

where τ^k, τ^n and τ^c are the applicable tax rates on capital income, labor income and consumption respectively; while T^k, T^n and T^c are the respective tax collections. Computing Laffer curves consists of plotting tax revenues as the applicable tax rates increase. To be able to do this, we need a theory of the capital-income ratio, employment and the propensity to consume out of income vary with these tax rates. That is we need a theory of how $\frac{k_t}{y_t}$, n_t and $\frac{c_t}{y_t}$ react to changes in τ^k, τ^n and τ^c. And this is what the next couple of steps provide.

Before doing this, it is useful to highlight a very positive feature of this methodology in that it recognizes that sometimes, the main effects on tax revenues of a change in a given tax work through other taxes! For instance, an increase in capital income taxes might have a larger negative effect on labor tax revenues than on capital income taxes. By studying all these taxes together, this methodology allows us to consider these general equilibrium effects.

The *third* step in Trabandt and Uhlig's methodology is to assume that the behavior of savings and employment are well approximated by the steady state of an infinite-horizon neoclassical growth model. In such a model, the first-order conditions on savings and labor choice imply that:

$$1 + \left(\theta \cdot \left(\frac{k_t}{y_t}\right)^{-1} - \delta\right) \cdot \left(1 - \tau^k\right) = \xi^{\frac{\eta}{1-\theta}} \cdot \beta^{-1} \tag{7}$$

$$\left(\eta \cdot \kappa \cdot n_t^{1+\frac{1}{\varphi}}\right)^{-1} + 1 - \frac{1}{\eta} = \frac{1+\tau^c}{1-\tau^n} \cdot \frac{1+\frac{1}{\varphi}}{1-\theta} \cdot \frac{c_t}{y_t} \tag{8}$$

where β is the rate of time preference and φ is the constant Frisch elasticity of the labor supply. These equations are standard, and equate the growth in the marginal utility of consumption with the interest rate and the marginal utility of consumption times the wage with the disutility of labor. As it is typical in macroeconomics, the authors use a description of aggregate choice that abstracts from demographic structure. Surely changes in taxes have different effects on the young and the old, and therefore demographic structure might be an important factor. Moreover, this demographic structure might be quite different across countries.

The *fourth* step consists of assuming that the government adjusts transfers as tax revenues change. Then, the resource constraint implies that:

$$\frac{c_t}{y_t} = 1 - \left(\xi^{\frac{1}{1-\theta}} - 1 + \delta\right) \cdot \frac{k_t}{y_t} - \bar{g} \cdot \left(\frac{k_t}{y_t}\right)^{\frac{-\theta}{1-\theta}} \cdot n_t^{-1} \tag{9}$$

This step is highlights another positive feature of this methodology, in that it forces us to make assumptions on what the government does (or stops doing) when tax revenues change. An assumption of this sort is needed, since the impact of a reduction of tax rates depends crucially on what the government does with the additional revenue. But I wonder whether it would have been more realistic to assume that tax revenues are used to reduce debt levels. This would certainly complicate some of the technical details of the calibration. But it might be quite different to assume that the government pays creditors rather than transfers back the taxes to the those that have been taxed. If, as it is the case in many countries, creditors are foreigners debt reduction has a negative wealth effect that is not taken care in the current set of results. This negative wealth effect is likely to reduce tax collections substantially.

Despite these caveats, the methodology is clear and sound. We can now solve Equations (7), (8) and (9) for $\frac{k_t}{y_t}$, n_t and $\frac{c_t}{y_t}$ as a function of τ^k, τ^n and τ^c; and then plug the results into Equations (4), (5) and (6). Once this is done, we cna compute Laffer curves. For instance, the capital-tax Laffer curve for τ^k traces how total revenue $T \equiv T^k + T^n + T^c$ changes with τ^k keeping other taxes constant. Analogous procedures yield the labor-tax and consumption-tax Laffer curves. Also, it is possible to construct Laffer hills by combining two taxes. Only one thing is missing to be able to perform this quantitative exercise, and this is to choose parameter values.

The *fifth* and final step of this methodology is to choose these values. Here Trabandt and Uhlig assume that all countries have the same parameter values, except for their fiscal policy variables, i.e. tax rates, government spending and public debt. Then, they choose parameter values in the usual RBC style. This is perhaps where there is more room to make improvements at a low cost. Surely one can choose parameter values differently for each country, drawing from the large literature on quantitative macroeconomic models that has been developed in the last couple of decades.

The methodology described above (with some refinements that include monopolistic competition and human capital accumulation) generates an interesting result: Assume all changes in revenue went into paying interest on the debt, what is the highest interest that countries could pay? If only labor taxes are used, the US could afford real interest rates rates between 12 and 15 percent; Ireland could afford rates of 11 percent; Germany, Portugal and Spain close of around 9 percent; while Austria, Belgium, Denmark, Finaland, France, Greece and Italy cannot afford interst rates above 6 percent. These interest rates grow a bit when capital income taxes can be used, but not too much. On the one hand, these are the kind of quantitative results that we need to produce as a profession. On the other hand, the crudeness of the assumptions discussed above makes us wonder about how seriously we should take these numbers. To what extent is the model reliable and/or stable across countries? To what extent frictions in labor and financial markets affect the reaction of the tax base to changes in taxes? To what extent are the assumptions of a stable fiscal policy without sovereign defaults, for instance, a reasonable characterization of the current situation? To what extent is the long-run analysis performed here a good guide for policy in the current depression? It would be unfair to ask Trabandt and Uhlig to answer all these questions in a single piece of research.

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