Volume Title: A General Equilibrium Model for Tax Policy Evaluation

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1 Introduction

Many questions of economic policy can be analyzed within a partial equilibrium framework. When the policy changes being considered are relatively small, it may be appropriate to neglect the general equilibrium interactions among many different markets. However, when large policy changes are considered, partial equilibrium analysis becomes painfully inadequate. In recognition of this fact, a vast increase has occurred in the past twenty years in the number of economists who use general equilibrium models.

The work on applied general equilibrium models can be divided into two traditions. The first tradition owes a great deal to Arnold Harberger and Harry Johnson. Most of Johnson's work (e.g., Johnson and Krauss 1970) deals with international trade issues. Harberger's work has helped to increase the popularity of general equilibrium models among public finance economists. We shall discuss the Harberger model in greater detail in chapter 2. Because these models are difficult to manipulate, they are usually operated at a rather high level of abstraction, with only two sectors or countries, two factors, and two goods. The models can yield strong results, but they do so at the cost of abstracting from much of the complexity of the real-world economy.

The second tradition in general equilibrium analysis uses computational techniques, recently developed, that enable us to investigate economies with many more sectors, goods, and factors. Within the last decade especially, the literature based on this type of general equilibrium analysis has grown phenomenally. In this book we describe our model of the United States economy and tax system, which is a part of this second tradition of general equilibrium analysis.

Here are a few of the salient features of our model:

—We model the economy with twelve consumer groups that differ in endowments and preferences.
—We divide the production side of the economy into nineteen producer sectors that differ in production technology. This is a reasonably high level of disaggregation.
—In addition to consumers and producers, we model the activities of the government and the foreign sector.
—We operationalize the model using actual data for 1973 from the National Income and Product Accounts and other sources.
—We specify the growth of the economy's endowments over time, so that we can analyze intertemporal efficiency issues as well as intersectoral ones. This is crucially important to our analysis of the consumption tax, and it also plays an important role in our analysis of other tax policy issues.
—We model the tax system in great detail. We include not only personal income taxes and corporate income taxes, but also property taxes, payroll taxes, sales and excise taxes, and a variety of smaller taxes. Consequently, our model is capable of analyzing a large number of tax policy questions within a second-best framework.

A brief outline of this volume follows: In chapter 2, which discusses general equilibrium analysis with taxes, we begin with a discussion of general equilibrium without taxes, and then consider the ways in which the model is changed in order to include a variety of taxes. We outline the fundamentals of the computational algorithm, and we describe the calculation of *equal-revenue-yield equilibria*. In almost every case when we compare two simulations, we require that the same revenues be collected in both simulations. Otherwise, our results would be a mixture of the effects of changes in the configuration of taxes with changes in the overall size of government. Revenue yield equality can be preserved in a number of different ways, and we shall see that different methods can lead to different results.

In chapters 3 through 7 we discuss our model in detail. Chapter 3 describes our assumptions about the behavior of consumers, producers, the government, and the foreign sector. In each case we specify the functional form of the relevant production function or utility function. Without specific functional forms we would not be able to make precise numerical calculations.

Chapters 4 and 5 deal with the basic benchmark data for 1973. In chapter 4 we cover the production side of the model, including data on factor use by industry, factor taxes by industry, and intermediate production. Chapter 5 covers the data on household income and expenditure, government expenditure, imports, and exports.

The data described in chapters 4 and 5 come from many sources and

must be adjusted in several ways before they satisfy the conditions of a general equilibrium. For example, consumer expenditure must equal consumer income, and the value of the factor endowments of consumers and government must equal the factor payments made by industry. We describe these consistency adjustments in chapter 6.

Even with a consistent data set, we still do not have enough information to perform general equilibrium calculations. We must first choose parameters for the utility and production functions. The parameterization is also covered in chapter 6. It is important to recognize that the various parameters cannot all be chosen independently. If an arbitrary set of parameter values were imposed upon the model, and if we then were to solve for a set of equilibrium prices and quantities, we would not generally be able to replicate the benchmark data set. We first choose a few important parameters and impose them on the model. Then we use the model equilibrium conditions and the assumptions of cost minimization and utility maximization to generate all of the remaining parameters. This procedure insures that the complete set of parameters will replicate the benchmark data set exactly. Finally, in chapter 6 we describe our choices of the saving elasticity, labor supply elasticity, foreign trade elasticities, elasticities of substitution in production, and other key parameters.

We deal with the dynamic features of our model in chapter 7. The dynamic features deserve special emphasis because they represent a major departure from earlier applied general equilibrium analyses. Our analyses begin with 1973 and project the economy into the future by computing a sequence of equilibria. We assume that the economy was on a balanced growth path in 1973. This implies that without an alteration of government policies, all relative prices will remain constant over time. Factor endowments grow over time as a result of exogenous growth of the labor endowment and endogenous saving decisions by consumers. We choose the growth rate of labor so that in a *base-case sequence* of equilibria with no change in tax policy, labor and capital will grow at the same rate. Therefore, the base-case sequence replicates the balanced growth path on which the 1973 equilibrium was assumed to be.

In order to analyze a proposed change in tax policy, we alter some of the tax rates and rerun the model. (We do not change the behavioral parameters between a base-case sequence and a *revised-case sequence*; otherwise, we would be unable to isolate the effects of the tax change.) For the purpose of policy analysis, the next step is to compare the base-case sequence with the revised-case sequence. Chapters 8 through 11 contain many such comparisons.

In chapter 8 we consider a variety of proposals for integrating the personal income tax and the corporate income tax. In this regard, an important feature of our work is that we have a detailed model of the

aspects of the personal income tax that affect the allocation of capital among industries. We consider proposals for full integration, as well as partial integration plans such as a dividend deduction in the corporate income tax. This chapter represents an updating and extension of work in Fullerton, King, Shoven, and Whalley (1980, 1981).

In chapter 9 we analyze proposals for the adoption of a consumption tax. Again we consider a variety of plans, including plans that only move us part of the way toward a consumption tax. For comparison we also analyze the effects of adopting a more pure income tax, which would involve removing the existing preferences for saving in the individual income tax. This chapter updates work in Fullerton, Shoven, and Whalley (1983).

Chapter 10 includes an analysis of Laffer curves. In this chapter we determine the combinations of tax rates and behavioral parameters that could lead to a decrease in tax revenue collections, even though tax rates are increased. Here we update work published in Fullerton (1982).

Chapter 11 includes descriptions of alternative models of the behavior of the foreign sector. In our basic model, we assume that foreign commodity trade can be characterized by constant elasticity import supply and export demand functions. We also assume that there are no international capital flows. In chapter 11 we put forth three alternative models of the foreign sector. In the first of these, we model some imports as being imperfectly substitutable with domestic production. The other two alternative models allow for an international capital rental market and for international purchases of capital, respectively. We then analyze a number of tax policy changes using each of these models. We take another look at corporate tax integration and at the consumption tax. We also model a value-added tax and evaluate its effects under each of the models of the foreign sector. This chapter represents an extension of Goulder, Shoven, and Whalley (1983).

The simulations we report in chapters 8 through 11 should not be viewed as precise predictions. We believe that our model is good for providing insights about the general direction in which tax policy ought to move, rather than providing an exact guide to policy. With this qualification in mind, we now give a brief summary of some of our results.

We find that integration of the corporate and personal income taxes could generate substantial welfare gains for the economy. The welfare gain from full integration, accompanied by indexation of capital gains taxes, is about $695 billion in 1973 dollars if the lost revenues are replaced with lump-sum taxes. However, the gains are sensitive to the form of the replacement tax. When revenues are recouped with equiproportional increases in the marginal tax rates faced by consumers, the gains are only about $311 billion. These dollar figures represent 1.39 percent and 0.62 percent of the total present value of welfare in the base case. Full

integration yields greater gains than the partial-integration plans. All of the plans lead to changes in the industrial allocation of capital and in its relative prices. These changes can be substantial, especially in the case of full integration.

The integration plans improve economic efficiency in two ways. First, they increase the efficiency with which capital is allocated among industrial sectors. Second, by reducing the overall tax burden on capital, they increase intertemporal efficiency. In chapter 9 we focus more closely on the intertemporal aspects of the model by considering proposals to move toward a consumption tax. These proposals involve substantial increases in the proportion of savings that is sheltered from tax, and our model indicates that they could lead to large welfare gains. Increasing this proportion to the level that would shelter all savings would lead to welfare gains of between $537 billion and $616 billion, depending on the way in which revenues are replaced. When we combine the consumption tax with corporate tax integration, the gains can be as large as $1,304 billion. This is 2.61 percent of the total present value of national welfare. We find that our results for the consumption tax are somewhat sensitive to the assumption about the elasticity of saving with respect to the rate of return. Also in chapter 9 we investigate the length of the "long run." We find that it usually takes around thirty years from the time of the policy change before the economy begins to settle close to its new steady state.

In chapter 10 we consider Laffer curves. While we accept the possibility that extremely high tax rates may lead to decreases in tax revenue, we find no reason to believe that the United States is now at such a point. At current tax rates, the labor supply elasticity would have to be about 3.0 in order to put the economy onto the "prohibitive range" of the Laffer curve. This far exceeds any econometric estimate of the labor supply elasticity. Alternatively, if we assume that the labor supply elasticity is 0.15, tax rates would have to approach 70 percent before we would observe perverse revenue effects.

In chapter 11 we reexamine the consumption tax and corporate tax integration under a variety of different formulations of the foreign sector. Our results do not change much when we consider an imperfectly substitutable import. However, the results are fairly sensitive to the modeling of international capital flows. In this chapter we also consider different types of value-added tax (VAT). We show that the VAT would have the same effects, regardless of whether it is levied on the origin basis or the destination basis. However, a VAT of the consumption type (which resembles a consumption tax in many ways) would be much more beneficial than a VAT of the income type. In general, VATs of the consumption type lead to gains of $94 billion to $498 billion, or between 0.19 percent and 0.98 percent of the total present value of welfare. Income-type VATs generally are less beneficial, according to our calculations.