Chapter 1: Introduction and Summary

This dissertation is a study in applied econometric modeling. Econometric equations are estimated; the parameters are included in a model of the U.S. economy; and the model's behavioral properties are examined. The econometric model that plays the starring role in this work is called an Interindustry Macroeconomic (IM) model. As the name suggests, an IM model combines interindustry relationships and industry-level behavioral equations in a macroeconomic framework. The model's structure evolves from relationships derived in input-output analysis that determine product output as the sum of final and intermediate demand, and product prices as the sum of input costs and value added. The determination of prices and income is the main focus of this study.

There have been several dissertations devoted to developing the price-income side of an Interindustry Macroeconometric model.[1] This study differs from previous ones in three respects. First, the goal of this work is to develop equations that not only pass standard tests of econometric integrity and economic reasonableness. In addition, the equations must perform well once they are included in the econometric model. The essence of "performing well" refers to the dynamic properties of the equations: the ability of the equations

[1] See O'Connor (1973), Gilmartin (1976), Belzer (1978) and Hyle (1985).

to respond reasonably to changes in exogenous and endogenous variables in the econometric model.

The second difference between this approach to price-income determination in an IM model and previous approaches, is that this study explicitly allows for lags in the pass-through of cost changes to prices. In the traditional input-output dual equation, prices in any year equal the sum of material costs and value added in that year. A change in material costs is passed through to product prices entirely in the year in which the cost change occurs. In the following approach, value added is made a function of material costs, allowing pass-through of cost changes to occur partially in the year of the change, and only eventually pass through entirely to prices.

The final major difference between this study and earlier ones is the direct estimation of the components of capital income, rather than of the aggregate return to capital by industry. In prior work on the price-income side of the model, attention was paid to modeling total return to capital, which includes profits, depreciation, net interest payments, and several smaller income components. In the following work, emphasis is placed on isolating and explaining industry profits, as well as the other components of capital income. Aggregate return to capital then is calculated as the sum of the individual components.

The outline for the rest of the work is as follows. In the next chapter, the evolution of IM models, their basic structure, and how they compare to other models is described. The final sections of the chapter focus on the price-income side of an IM model and outline the approach for modeling industry income in this study. The main thrust of the econometric work is on estimating profit equations by industry.

Chapters 3 and 4 describe the theoretical basis for and the econometric estimation of industry profit equations. The role of profits in determining prices plays a central part in the specification of the equations. In particular, allowing profits to respond directly to changes in material costs of production permits the traditional assumption of complete, immediate pass-through of cost changes on product prices to be relaxed. The description of the estimation results includes analysis of "static" and "dynamic" forecasts with the equations. The static forecasts are done using projections of the equations' independent variables from a forecast of the LIFT model prior to the addition of the new price-income side. The dynamic forecast is the result of including the profit equations in the model and allowing the independent variables to respond to changes in profits.

Once industry profit equations are estimated, Chapter 5 describes equations for the remaining components of capital income. Most of the non-profit capital equations are estimated using an approach that allows an aggregate equation to capture behavioral activity, which is then distributed to industries. Since the equations developed in Chapters 3-5 are only one part of the IM model, Chapter 6 describes the particular IM model used for this study. The model, called the Long-term Interindustry Forecasting Tool (LIFT), is an annual model that provides industry and macroeconomic projections of the U.S. economy.

In Chapter 7, the newly estimated equations for income by industry are included in LIFT, and the complete model is used to make a Base forecast of the economy. Four alternate scenarios are then performed with LIFT, and the results compared to the Base forecast. By changing (1) monetary policy, (2) labor productivity, (3) exchange rates, and (4) the price of oil, the properties of the entire model, as well as the profit equations, are illustrated.

The structure of an IM model has been compared to Computable General Equilibrium Models (CGE), an alternate modeling framework recently made popular by Jaime de Melo, Sherman Robinson, and others.[2] CGE models are based on a Social Accounting Matrix (SAM), which is an accounting framework for an economy that includes input-output relationships, as well as final demand and income distribution. In Chapter 8, the results of a study using a SAM multiplier model are compared to the results of the

[2] See Dervis et al, and Adelman and Robinson. CGE's have been used often in modeling the economies of developing countries.

same study using LIFT. In particular, Robinson and Adelman use a SAM-multiplier model to analyze the leakages from an increase in the value-added of the agriculture sector. Since the SAM analysis is based on fixed-price multipliers, the results include only the positive income effects of a shock to value added. When a shock to agriculture's value added is analyzed in the LIFT model, the negative implications of a price shock, as well as the positive effects of the income shock are both considered. In addition, the LIFT results specify the timing of the effect of the shock to value added, while the SAM multiplier analysis gives only the end-result of the shock. Since the timing of effects may be crucial in evaluating the impact of a value added shock, the IM approach is preferred to the SAM multiplier approach.

The final chapter offers conclusions from this study, as well as some suggestions for the direction of future research in the area of price-income modeling.