

A MIMIC approach to modeling the underground economy in Taiwan

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Abstract

The size of underground economy (UE) expansion usually increases the tax gap, impose a burden on the economy, and results in tax distortions. This study uses the MIMIC approach to model the causal variables and indicating variables to estimate the UE in Taiwan. We also focus on testing the data for non-stationarity and perform diagnostic tests. By using annual time-series data for Taiwan from 1961 to 2003, it is found that the estimated size of the UE varies from 11.0% to 13.1% before 1988, and from 10.6% to 11.8% from 1989 onwards. That the size of the UE experienced a substantial downward shift in 1989 indicates that there was a structural break. The UE is significantly and positively affected by such casual variables as the logarithm of real government consumption and currency inflation, but is negatively affected by the tax burden at 5% significant level. Unemployment rate and crime rate are not significantly correlated with the UE in this study.

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1. Introduction

The size of underground economy (UE) expansion will cause the tax gap increasing, impose a burden on the economy, and result in tax distortions. Government policies based on the erroneous macroeconomic variables are then less likely to succeed. There are many methods introduced to estimate the size of the economy, and discussions regarding these methods can be found in Refs. [1–7]. In view of the wide variety of methods used, the results can, depending on the estimation method used, vary considerably. The different methods can be categorized into direct, indirect and model approaches. The direct approaches include sample survey estimation, the estimation of tax audits based on survey data, and audit measurements of undeclared taxable income to measure the size of the UE. The indirect approaches include estimating national accounting statistics on the basis of the discrepancy between the income and expenditure statistics in national accounting

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or in individual data to measure the size of the UE. Labor force statistics are used to estimate the decline in labor participation in the official economy, assuming that the labor force has a constant participation rate overall. The estimation of currency demand assumes that shadow transactions are undertaken using cash and that an expansion of the UE will raise the demand for cash. The estimation of physical inputs (electricity consumption) assumes that electricity consumption is the single best physical indicator of overall economic activity. The growth rate of official GDP is also deducted from the growth rate of total electricity consumption and the difference is attributed to the growth of the shadow economy. The model approach includes the latent variable approach and involves estimating the size of the UE. The UE is a function of observed variables such as the burden of taxation, as well as the burden of government regulation and of variables where UE activities leave traces, like cash, official working time, unemployment, etc., and it considers multiple causes and effects simultaneously. While each approach has its own strengths and weaknesses, and yields its own insights and results [8], the currency demand and latent variable approaches are the ones most widely used.

Schneider and Enste [8] stated the growth of the UE is caused by many different factors, with the tax burden and government regulation being considered as two major ones. Aigner et al. [9] concluded the government regulation has a big impact on the UE. Johnson et al. [10,11] also believed that government regulation was the key to measuring the UE. Giles and Tedds [12] confirmed that government regulation is positively correlated with the UE. Fugazza and Jacques [13] applied a continuous time matching model and their empirical results indicated that the compliance cost of the UE will increase when tax rates and government regulation increase. In addition, their study found that the existence of the UE will interfere with the execution of government policies and suggested that the government should provide more incentives, instead of prohibitions and punishments, to turn people away from the UE [14]. Ihrig and Moe [15] showed that both tax rates and government regulation policies affect the size of the UE.

Other than these two major causes of the UE, Giles and Tedds [12] showed that the size of the UE expands as the unemployment rate increases. A positive relationship was found to exist between the corruptness of government and the UE in Refs. [16,17]. Bordignon and Zanardi [18] indicated that the ratio of those self-employed gave rise to a change in the size of the UE. The more effort the government makes to restrain the crime rate, the lower will be the reward from participating in underground economic activity [19]. Hence the crime rate may also be a factor that positively affects the UE. Eilat and Zinnes [20] found the crime rate also influences the UE more rapid growth.

Different studies rendered various viewpoints concerning the effects of the UE on the official growth rate and on tax revenue. However, official institutions' norms and rules still has significant impact on UE [8]. The UE may give rise to an increase in the tax gap, distort the equity of the tax system and result in misleading official indicators. Houston [21] found that the UE was related to macroeconomic variables. Government policies that are based on these macroeconomic variables are then likely to be prone to errors, and this explains why there is a rapid growth in interest in measuring the size of the UE. In particular, the growth of corrosion of the tax revenue causes budget deficit accelerating recently in Taiwan. The Taiwan government is facing a tremendous challenge in balancing its expenditure in a way similar to the Organization for Economic Cooperation and Development (OECD) countries. It is thus necessary to understand the size of the UE in Taiwan before the government can propose appropriate tax reforms. This study thus applies the Multiple Indicators and Multiple Causes (MIMIC) approach that models a latent variable such as the UE in Taiwan. The methodology behind this approach is introduced in Section 2. Section 3 reports the empirical results and their implications. The concluding remarks are presented in Section 4.

2. Methodology and variables

The pioneers of the model approach to estimate UE are Frey and Pommerehne [1], Frey and Weck-Hannemann [22], and Giles et al. [23]. This study considers the MIMIC model with multiple indicators and multiple causes is used to estimate the latent variable UE. This technique was first applied by Frey and Weck-Hannemann [22]. The causal or endogenous variables include the tax burden (*TaxB*), the logarithm of government real consumption (*LnGRC*), the unemployment rate (*UnEmp*), currency inflation (*CInf*) and the crime rate (*CR*). The indicators or exogenous variables are the logarithm of real gross domestic product (*LnGDP*) and the currency net ratio (*CNR*). Doubts exist as to the effect of the UE on economic growth.

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