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## Comment      Wei Li

The objective of Dr. Hur's paper is to estimate the impact of fiscal policy in Korea. To achieve this goal, Dr. Hur uses quarterly GDP, government revenue, and spending data between 1979:Q1 and 2000:Q4 and estimates structural VAR models. The paper's methodology follows those in Blanchard and Perotti (2002) and Perotti (2004), among others. In one of the SVAR models, it utilizes Korean institutional features—namely, the fiscal principle of expenditure within revenue—to impose identification restrictions. The author finds that estimated fiscal multipliers are in general small using a three variable—GDP, revenue, and spending—SVAR model, but they are larger when a fourth exogenous variable—U.S. GDP or the Real Effective Exchange Rate—is added. One note on presentation: It would be more informative if the impulse responses were transformed to report the Korean won response of each variable to a won shock to one of the fiscal variables—the conventional measure of a fiscal multiplier.

Before discussing the models and the data, let me first review the general economic environment in Korea during the sample period. Between 1979 and 2000, Korea underwent rapid economic transformation. In 1979, the first year in the sample, per capita GDP was \$3,322 in constant 2000 U.S. dollars and agriculture contributed to 21 percent of GDP (World Bank 2006). By 2000, the end year in the sample, per capita GDP more than tripled to \$10,884, and the contribution of agriculture to GDP fell to only 5 percent. The country's tax system also underwent structural changes. Based on data from the University of Michigan World Tax Database (2006) revenue collected from taxes on international trade and transfers fell from 19 percent of total revenue in 1979 to 7 percent in 1997, while tax revenue as a proportion of GDP increased only marginally from 15 percent to 16 percent. The data also show that the top personal income tax rate was cut from 89.25 percent in 1979 to 40 percent in 1997, during which personal income tax comprised 14.6 percent of total tax revenue in 1979 and 19.0 per-

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cent in 1997. However, like other newly industrialized economies, Korea still had a relatively larger informal economy than the richest economies in the world in 2000: based on Schneider's (2004) estimates, the informal economy in Korea stood at 27.5 percent in 2000, compared to 8.6 percent in the United States.

The rapid growth in Korea during the sample period may complicate the SVAR approach to estimating the size of fiscal multipliers. An observed change in tax revenue may be the result of a tax reform that altered the tax structure. The change in tax structure may have implications on the size of the informal sector and hence the tax base, as discussed in Gordon and Li (2006). Take for example a cut in the personal income tax rate. If this cut in tax rate reduces the informal economy by inducing people to switch their employment from the informal economy to the formal economy, it will increase the tax base and observed GDP, even if we assume that those already employed in the formal economy do not change their labor supply. Tax reforms in the presence of a significant informal economy may therefore offset, at least partially, the effect of the standard Keynesian tax multiplier. Consider another example in which we assume that there is an increase in government spending. In the presence of a significant informal economy, some of the government spending will inevitably be leaked into the informal economy, thereby reducing the measured response observed in the formal economy. The presence of a sizable informal economy may thus reduce the observed size of the spending multiplier. The discussion so far offers perhaps another alternative interpretation of the author's findings that the measured fiscal multipliers are small.

For an earlier draft of the paper, I suggested that the author incorporate the terms of trade variables as exogenous variables in the SVAR model. The author reported that adding the terms of trade variables to the SVAR did not change the results much. However, adding either U.S. GDP or the Real Effective Exchange Rate (REER) increased the estimates of the fiscal multipliers markedly. These findings are consistent with my suggestion, which is based on the Gordon and Li (2006) model of taxation in developing countries.

Let me explain the story still using the terms of trade variables. Gordon and Li (2006) show that in the context of a developing country with a sizable informal economy and hence an untaxed sector, if goods produced by the taxed sector are imported, the government would have an incentive to levy a tariff on imports in that sector in order to protect its tax base. Assume that the country is small, and so takes the terms of trade that it faces as given. While the trade distortions change the incentive that firms face, they do not change the terms of trade that the country faces.

Suppose that there is an increase in import prices in the world market (hence a fall in the terms of trade). This would shift domestic production toward the taxed sector, raising the domestic tax base and tax revenue. This

conjecture is indeed observed in the data. Table 3C.1 shows the regression results. The dependent variable is the annual logarithmic change in the effective tax rate, measured as the ratio of revenue to GDP. The two dependent variables are annual logarithmic changes in import prices and export prices. The regression also includes lagged dependent variables on the right hand side. The data are obtained from the International Financial Statistics published by the IMF in 2005. The sample covers countries in the IFS database with available annual data from 1950 to 2004.

Since changes in export prices and import prices are exogenous for a small country, this specification is in fact an autoregressive model with exogenous terms of trade shocks. For large developed economies in the sample, this autoregressive model is likely misspecified. So in estimation, I divide the countries into four income quartiles based on GDP per capita in 1990. Quartiles 1 and 2 are countries with above-median incomes and quartiles 3 and 4 are countries with below-median incomes. The regression was run for each of the four subsamples of countries. Table 3C.1 shows that for countries with below-median income, an increase in import prices

**Table 3C.1**

	Income quartile			
	1	2	3	4
Intercept	0.013 (0.004)	0.015 (0.01)	0 (0.008)	0.007 (0.007)
$\Delta \ln(\text{unit value of imports})$	0.08 (0.067)	0.001 (0.096)	0.239 (0.078)***	0.122 (0.06)**
$\Delta \ln(\text{unit value of exports})$	-0.095 (0.071)	-0.1 (0.065)	0.004 (0.069)	0.039 (0.033)
$\Delta \ln(\text{tax revenue/GDP}_1)$	-0.005 (0.046)	-0.322 (0.075)***	-0.266 (0.084)***	-0.175 (0.078)**
$\Delta \ln(\text{tax revenue/GDP}_2)$	-0.036 (0.047)	-0.046 (0.07)	0.059 (0.082)	-0.091 (0.072)
No. of observations	786	185	153	178
Adjusted $R^2$	-0.002	0.08	0.116	0.041

*Notes:* Dependent variable =  $\Delta \ln(\text{tax revenue/GDP})$ . The dependent variable is the annual logarithmic change in the effective tax rate, measured as the ratio of revenue to GDP. The two dependent variables are annual logarithmic changes in import prices and export prices. The regression also includes lagged dependent variables on the right-hand side. The data are obtained from the International Financial Statistics published by the IMF in 2005. The sample covers countries in the IFS database with available annual data from 1950 to 2004. The sample countries are divided into four income quartiles based on GDP per capita in 1990. Quartiles 1 and 2 are countries with above-median incomes and quartiles 3 and 4 are countries with below-median incomes. The regression was run for each of the four subsamples of countries. The numbers in parentheses are standard errors.

\*\*\*Significant at the 1 percent level.

\*\*Significant at the 5 percent level.

would increase the effective tax rate. But changes in export prices do not have statistically significant effects on the effective tax rate.

How do changes in the terms of trade affect a developing country's income? Stylized facts show that among developing countries, there is a strong positive correlation between GDP and the terms of trade (Agenor, McDermott, and Prasad, 1999).

So the Gordon and Li (2006) model would forecast a negative relationship between tax revenue and GDP. Based on this line of logic, I suggested that the terms of trade be included as exogenous variables in the SVAR model.

It is a bit surprising that the inclusion of terms of trade variables does not change the size of the fiscal multipliers much but the inclusion of either the U.S. GDP or the REER does. This is because an increase in U.S. GDP or an appreciation in the REER can, in general, improve a small country's terms of trade. It is likely that data on import prices or export prices are measured with errors. For example, the data may not adequately differentiate between quality improvements and pure price changes. For Korea this may be particularly problematic as the country moved up in the quality chain quickly during the sample period.

Let me turn next to the data. Figure 3.1 in the paper shows that, since 1985, tax revenues have exceeded spending. This is inconsistent with consolidated central government budget data from the Ministry of Finance and Economy, which show that the Korean government experienced budget deficits in the early 1990s and in the late 1990s. Is it possible that the revenue and spending are not *matching pairs*? To the extent that revenue consistently exceeded spending during the sample period, when in fact there were two episodes of budget deficits, is  $\beta_1$ , the elasticity of spending with respect to revenue, in the paper underestimated? If so, how does it affect the estimated fiscal multipliers?

In sum, the paper does not find strong fiscal multipliers in the Korean context. The author points out two hypotheses: the new classical hypothesis and the nonlinearity hypothesis (model misspecification). My remarks give two more speculative hypotheses: the informal economy hypothesis and the terms of trade hypothesis. Both are based on Gordon and Li (2006). None of these hypotheses have been tested directly using Korean data, although one could interpret the estimation using U.S. GDP and REER as included exogenous variables as an indirect test of the terms of trade hypothesis.

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## Comment Yum K. Kwan

How would Korean GDP react to shocks initiated from taxation and government spending? This is essentially the question the author would like to answer using the methodology of structural VAR analysis. As the entire paper is empirical and the findings inevitably depend on the adopted statistical models, the author has also conducted an extensive sensitivity analysis to ensure that the key conclusion is robust against various technical assumptions, an exercise that no doubt lends more credibility to the empirical findings. The paper also includes a summary of the relevant literature on the issue—particularly those written in Korean and unlikely to be accessible to international readers—which should be useful to anyone interested in the fiscal policy effectiveness issue and the Korean economy.

The author focuses on evaluating the effectiveness of fiscal policy in the business cycle frequency and therefore uses detrended data series in the VAR analysis. Two time-trend models are considered—deterministic linear time trend and the Hodrick-Prescott (HP) filter—and all results in the paper are reported in parallel with respect to these two detrending schemes. I am not sure whether the deterministic time trend case is of interest at all. First, the deterministic linear time trend model is not supported by the data—formal statistical tests usually suggest stochastic time trend (i.e., the presence of unit root) rather than deterministic time trend—as the author himself acknowledges this is indeed the case for the Korean output series. The presence of unit root in the VAR system will render the impulse-response function (IRF) difficult to interpret, as the IRF depends on the moving average representation of the system, which itself may not even exist at all. Second, deterministic linear detrending is seldom used in the business cycle literature because deviations from linear time trend are usually too persistent