Can tax policy help explain state-level macroeconomic growth?

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Abstract

This paper empirically tests the role of tax distortions in explaining state-level economic growth through the estimation of disaggregated personal income, general sales and property tax rates. The results show that these disaggregated tax rates generate predictions more consistent with growth theory.

Keywords: Regional growth; Marginal tax rates

JEL classification: O47; H71

1. Introduction

The theoretical growth literature argues that increases in distortionary taxation lower the growth rate of output. Distortionary taxes are defined as those tax rates that alter the price of an accumulated factor of production — physical capital, human capital and technology. In the neoclassical growth model, Turnovsky (1996) shows that only increases in marginal tax rates on physical and human capital lower the transitional growth rate. Likewise, in two-sector endogenous growth models, Stokey and Rebelo (1995) show that increases in marginal tax rates on physical and human capital lower the steady-state growth rate.

However, the empirical growth literature typically does not distinguish between taxes paid on income, consumption or property, but rather lumps all distortionary taxation into one or two overall tax rates. For example, in cross-country studies, Koester and Kormendi (1989) and Easterly and Rebelo (1993) include one overall measure of tax distortion in their growth regressions. Similarly, in studies of US states, Mullen and Williams (1994) and Becsi (1996) include one estimate of the total effective marginal tax rate in their growth regressions. Given the gap between the theoretical

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predictions and the tax variables used in the above studies, it is not surprising that the empirical results have been mixed over the effects of taxation on growth. In fact, Robert Barro argues that tax distortions ‘are likely to be important for growth . . . but further measurement and investigation is important for obtaining reliable results.’¹

This paper takes Barro’s statement to task by empirically testing the role of tax distortions in explaining state-level growth in the US. Unlike previous work, the effects of taxation are disentangled by estimating disaggregated personal income, general sales and property tax rates. These disaggregated tax rates are then included in Barro-type growth regressions to estimate their impact on growth in total production, average productivity, investment and labor. The empirical results show that these disaggregated tax rates enter more often with the correct sign and significance than the aggregate measures used in the empirical literature. Therefore, this paper indicates that the current gap between the theoretical and empirical growth literatures may be closed by the use of improved estimates of marginal tax rates.

2. Theoretical predictions

The neoclassical and endogenous growth models show that growth in output per worker is driven by accumulation in the reproducible factors of production: human and physical capital. In the neoclassical growth model, capital accumulation only influences the transitional growth rate since steady-state growth is determined by exogenous technological progress and population growth. Therefore, the neoclassical model predicts conditional convergence: economies who start with lower output per worker will grow faster during the transition conditioned upon population growth rates, fiscal policy and investment rates. In the endogenous growth models, increases in physical and human capital accumulation, public infrastructure and innovation lead to faster steady-state growth rates.

Since the majority of taxes affect households’ decisions, the growth implications of taxation are similar in that tax rates that lower the transitional growth rate in the neoclassical growth model will lower the steady-state growth rate in endogenous growth models. For income taxation, Xu (1994) and Turnovsky (1996) show that increases in marginal tax rates on income lowers the growth rate of output, average productivity, investment and labor. For most production specifications, income tax rates lower the return on reproducible capital and thus decrease investment. This decrease in investment in turn decreases the growth rate of output, labor and productivity. For consumption or sales taxation, Stokey and Rebelo (1995) show that under most circumstances a consumption tax does not affect the return on capital and thus has no effect on investment, output and productivity. Property taxation, however, lowers the return on reproducible physical capital and on non-reproducible land. Therefore, increases in property tax rates that lower the return on capital will reduce growth in investment, output and productivity.

3. Estimated tax rates

There are five tax rates included in the growth regressions. First, the average tax rate with respect to gross state product (GSP) is measured as the ratio of total state and local tax receipts to GSP.

¹Barro (1997, p. 120).
Similarly, the average tax rate with respect to property is measured as the ratio of state and local property tax receipts to the net assessed value of property. The procedure of Koester and Kormendi (1989) is used to produce the remaining three tax rates: average effective marginal tax rates with respect to total production (GSP), personal income and general sales. For each state, the following regression is estimated over the 1977–1995 period

\[
\text{Revenue}_t = \text{lump}_t + \text{MTR} \cdot \text{Base}_t,
\]

where \( \text{Revenue}_t \) is tax revenue collected, \( \text{lump}_t \) is lump-sum taxes that do not affect individual decisions, MTR is the marginal tax rate and \( \text{Base}_t \) is the tax base.

### 4. Estimation results

This paper follows the work of Barro and Sala-i-Martin (1995) and others in the regional growth literature and estimates the following equation:

\[
(1/T) \cdot \ln[y_{t/T}/y_{t0}] = a - (1 - e^{-\beta T})/T \cdot \ln[y_{t0}] + \text{other variables} + \varepsilon_{0,T}
\]

where \( T \) is the length of the interval (19 years). The dependent variable is measured either as (i) the average growth rate in real GSP, (ii) the average growth rate in real GSP per worker (average productivity), (iii) the average growth rate in the quantity of labor, or (iv) the average ratio of real investment to gross state product (\( I/GSP \)). \( \ln[y_{t0}] \) represents the initial level of GSP per worker (or GSP for the labor growth equation) and is included for the neoclassical prediction of convergence. When GSP or labor is the dependent variable, other variables consist of taxation measures. When average productivity or \( I/GSP \) is the dependent variable, other variables consist of human capital and taxation measures. These specifications are consistent with the cross-country work of Koester and Kormendi (1989) and Easterly and Rebelo (1993). Lastly, the \( \varepsilon_{0,T} \) term represents the average of error terms between dates 0 and \( T \).

Table 1 presents the estimation results. The data for each of the 48 contiguous US states are pooled into a single observation. Each regression is estimated using ordinary least squares (OLS) where the standard errors have been corrected for heteroskedasticity using the method of White (1980). Columns 1–4 indicate that the neoclassical prediction of convergence in GSP and average productivity holds for the 1977–1995 period. The marginal tax rate with respect to GSP enters in positively in column 1, but negatively in column 3. The average tax rate, on the other hand, enters in negatively in both regressions. However, in column 2 and to a lesser degree, column 4, the results show that the disaggregated tax rates are more consistent with growth theory. First, personal income and property tax rates enter in negatively and are significant, while the sales tax rate is insignificant. Second, the adjusted \( R \)-squared increases from column 1 to 2 and from column 3 to 4.

Columns 5–8 present the estimation results for private capital formation and labor growth. As in GSP, columns 5 and 7 show that the marginal tax rate with respect to GSP enters in positively, while the average tax rate enters in negatively. Therefore, the effective marginal tax rate on GSP — the tax

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Limited observations on the net assessed value of property prevent the estimation of an average effective marginal tax rate on property. However, since property is typically taxed at one common rate, the average tax rate with respect to property provides a good measure of the distortionary effect of property taxation.
Table 1
Regression results*

<table>
<thead>
<tr>
<th></th>
<th>Growth in GSP</th>
<th>Growth in productivity</th>
<th>Ratio of investment to GSP</th>
<th>Growth in labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.1783</td>
<td>0.2252</td>
<td>0.2477</td>
<td>0.1308</td>
</tr>
<tr>
<td>(0.1213)</td>
<td>(0.1081)</td>
<td>(0.0636)</td>
<td>(0.0690)</td>
<td>(0.1428)</td>
</tr>
<tr>
<td>GSP per worker, 1977</td>
<td>-0.0117</td>
<td>-0.0175</td>
<td>-0.0231</td>
<td>-0.0090</td>
</tr>
<tr>
<td>(0.0117)</td>
<td>(0.0100)</td>
<td>(0.0057)</td>
<td>(0.0066)</td>
<td>(0.0132)</td>
</tr>
<tr>
<td>College, 1979</td>
<td>0.0758</td>
<td>0.0691</td>
<td>0.2431</td>
<td>0.1688</td>
</tr>
<tr>
<td>(0.0284)</td>
<td>(0.0282)</td>
<td>(0.0554)</td>
<td>(0.0541)</td>
<td></td>
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<tr>
<td>Average tax rate with respect to GSP</td>
<td>-0.4333</td>
<td>-0.0156</td>
<td>-0.7966</td>
<td>-0.5359</td>
</tr>
<tr>
<td>(0.1676)</td>
<td>(0.0978)</td>
<td>(0.1959)</td>
<td>(0.1524)</td>
<td></td>
</tr>
<tr>
<td>'Marginal' tax rate with respect to GSP</td>
<td>0.0132</td>
<td>-0.0511</td>
<td>0.0536</td>
<td>0.1497</td>
</tr>
<tr>
<td>(0.0669)</td>
<td>(0.0300)</td>
<td>(0.0751)</td>
<td>(0.0635)</td>
<td></td>
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<tr>
<td>'Marginal' tax rate with respect to personal income</td>
<td>-0.2041</td>
<td>-0.0067</td>
<td>-0.2109</td>
<td>-0.1573</td>
</tr>
<tr>
<td>(0.0514)</td>
<td>(0.0255)</td>
<td>(0.0648)</td>
<td>(0.0553)</td>
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<tr>
<td>'Marginal' tax rate with respect to general sales</td>
<td>0.0105</td>
<td>-0.0173</td>
<td>0.0719</td>
<td>0.0367</td>
</tr>
<tr>
<td>(0.0490)</td>
<td>(0.0351)</td>
<td>(0.0625)</td>
<td>(0.0522)</td>
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<tr>
<td>Average tax rate with respect to general sales</td>
<td>-0.0577</td>
<td>-0.0270</td>
<td>-0.0758</td>
<td>-0.0446</td>
</tr>
<tr>
<td>(0.0211)</td>
<td>(0.0127)</td>
<td>(0.0263)</td>
<td>(0.0226)</td>
<td></td>
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<tr>
<td>Adjusted $R^2$</td>
<td>0.0884</td>
<td>0.2839</td>
<td>0.2392</td>
<td>0.3479</td>
</tr>
<tr>
<td>N</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
</tbody>
</table>

* All regressions were run using ordinary least squares (OLS). The standard errors are in parentheses and have been corrected for heteroskedasticity using the method of White (1980). The estimates on real gross state product (GSP) and labor are obtained from the Bureau of Economic Analysis (1998) and the Bureau of Labor Statistics (1998), respectively. The estimates for state-level private investment rates in physical capital are taken from Garofalo and Yamarik (1999). The human capital measure, College, is the percentage of individuals, age 25 or older, who have completed 4 or more years of college and is taken from the 1980 Census of Population.

rate used by Mullen and Williams (1994) and others — has the correct sign in only one of the four sets of regressions. Columns 6 and 8 again show that the disaggregated tax rates are more consistent with growth theory. The personal income and property tax rates enter in negatively and are significant, while the general sales tax rate is insignificant. Therefore, the results in Table 1 show that the disaggregated tax rates provide a better measure of tax distortions than the effective marginal tax rate on GSP.

5. Conclusion

This paper empirically tested the role of tax distortions in explaining state-level economic growth. By disentangling the effects of taxation through the estimation of individual personal income, general sales and property tax rates, the results found that these disaggregated tax rates provide a better measure of tax distortions. This paper thus indicates that the current gap between the theoretical and empirical growth literatures may be closed by the use of improved estimates of marginal tax rates.
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References