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A TIME–SERIES INVESTIGATION OF THE IMPACT OF CORPORATE AND PERSONAL CURRENT TAXES ON ECONOMIC GROWTH IN THE U. S.

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Abstract

This paper investigates the impact of corporate income taxes and personal current taxes on economic growth. Time-series tests analyzing the relationship between corporate taxes and nonresidential investment are implemented. Also tests of the impact of personal current taxes on the labor supply, approximated by the average weekly overtime hours in manufacturing, are undertaken. These tests include cointegration, vector error correction (VEC) estimation, and Granger causality testing of the relevant time-series data. Cointegration tests indicate the existence of a stable long run relationship between corporate taxes and nonresidential investment. Further investigation of this relationship is undertaken within the VEC testing framework. VEC test results indicate that corporation taxes have a negative impact on nonresidential investment. Therefore, corporate taxes appear to affect negatively the economic growth in the U.S. Econometric tests of the personal current taxes data and the average weekly overtime data indicate that these two time series data are statistically independent. Therefore, under this study's testing framework, there is no statistical evidence of a negative impact of personal current taxes on the labor supply and economic growth.

JEL classification: *E62, H20*

Keywords: *Corporate income taxes, personal current taxes, economic growth, VEC estimation.*

INTRODUCTION

Recent tax cuts enacted in the U.S. in the 2001 and 2003 legislation, have led to renewed interest in analyzing the impact of taxes in general, and economic policies aimed at reducing taxes in particular, on economic growth. The current economic decline underlines further the urgency of understanding the impact of taxes on economic growth.[1] The proponents of tax reducing policies rely on the supply-side theory to explain the link between taxes and economic growth. The key element in

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the supply-side analysis of tax policies rests upon the incentive effects of such policies on the supply of labor and capital in an economy. Since an economy's output (X) is the function of capital (K), labor (L), and technology (T), {X = x (K, L, T)}, any tax policy that will lead to an increase in these resources will bring about economic growth. In theory, reducing personal income taxes will provide incentives to work harder and longer, thereby increasing the supply of labor, while reducing corporate taxes will lead to higher capital investment by business firms. Higher amounts of labor and capital will lead to economic growth. The objective of this study is to provide new empirical evidence on the impact of corporate and personal income taxes on economic growth through the above outlined channels. Clearly, investigating the theoretical connection between taxes and economic growth is crucial in view of not only the 2001 and 2003 enacted fiscal legislation, but even more so when the merits of competing fiscal measures and their effectiveness to achieve economic recovery are considered.[2] This issue needs immediate empirical attention as the 2001 and 2003 tax reduction legislation is due to expire in 2010. Empirical research can provide crucial information on how this type of fiscal policy can impact the U.S. economy. The supply-side empirical investigation must focus on examining the relationship between taxes and economic growth.

There is perhaps no more important issue in the field of macroeconomics than identifying factors that influence economic growth. This subject has received extensive attention in economic literature. Recent contributions in the on-going debate concerning the factors that affect economic growth include research by Dollar (1992) and Edwards (1992). These authors analyze the impact of trade on economic growth. Numerous studies address the impact of various taxes on economic growth. Helms (1985) found that when state and local taxes are used to fund transfer payments, then these taxes significantly retarded economic growth. However, the disincentive effects of these taxes are negated if tax revenues are used to finance improved public services. Similar conclusions about the effects of state and local taxes on economic growth are reached by Mofidi and Stone (1990). The results of their study also indicate a negative impact of these taxes when tax revenues are used to fund transfer payments, but a positive effect when tax revenues are used to finance expenditures on health, education, and public infrastructure.

Jorgenson and Wilcoxen (1997) analyze the impact of tax reform, such as the flat-rate consumption tax, on economic growth. Their study indicates that this tax would increase economic growth as measured by the GDP. Auerbach and Hines (1988) analyze the impact of taxes on investment in the U.S. Hulten (1984) also investigates the impact of tax policy on investment decisions. Dye (1980) investigates the impact of taxing and spending on economic growth in the U.S. Dye finds that while tax policies do not have much impact on economic growth, expenditure policies do impact economic growth significantly. Engen and Skinner (1996) also examine the impact of taxation on economic growth. Contrary to Dye's research, the joint authors report a positive impact of tax policies on economic growth. Blanchard and Perotti (2002) claim that both increases in taxes and increases in government expenditures affect investment spending negatively. Zagler and Durnecker (2003) also find that several tax rates and categories of expenditures have a long run impact on economic growth.

The impact of corporate taxes on economic growth has also been investigated extensively. For example, Lee and Gordon (2005) used cross-country data ranging from 1970 to 1997 to investigate the impact of tax policies on a country's economic growth. Their study finds that increases in corporate taxes have a negative impact on economic growth. In fact, a ten percent reduction in the corporate tax rate will result in a one to two percent increase in the annual rate of growth. Similar conclusions about the impact of corporate taxes on economic growth are reached by Djankov, Ganser, McLiesh, Ramalto, and Shleifer (2008). Their cross-sectional study of 85 countries in 2004 indicates that corporate taxes have a large negative impact on aggregate investment and economic growth in countries under their empirical investigation.

Clearly, empirical results on the effects of taxation on economic growth to date, although numerous, are controversial and inconclusive. Since much of the empirical research is conducted within a cross-sectional testing framework, the issue of the short and the long run effects of tax changes on economic growth remains largely unresolved. Further research of the short and the long run effects of tax policies is needed to provide additional empirical evidence on how taxes affect economic growth. The objective of this paper is to provide such evidence by analyzing the impact of corporate taxes on business investment, and by investigating the impact of personal income taxes on the labor supply. The novelty of the present research is twofold. First, it provides new empirical information on both the short and the long run effects of taxes on economic growth. Second, the issue of causality in the taxes and economic growth relationship is investigated. Granger (1969) causality testing framework is used to accomplish this task. These above stated objectives can best be accomplished within a reduced form modeling of time series data. Unlike structural modeling, reduced form modeling of the data can be used to shed light on the short and the long run relationship among all test variables. It can also indicate the existence or the absence of causal flows among the test variables. Therefore, reduced form modeling is the most appropriate testing structure to accomplish the above stated research objectives. This modeling is comprised of unit root and cointegration testing, vector error correction (VEC) estimation, and Granger (1969) causality testing. Consequently, the remainder of this paper is organized in the following way. Initially the time series methodological issues and the data selections are outlined. Thereafter, test results of all time series data are reported. Overall conclusions about the impact of corporate and personal taxes on the U.S. economy are summarized in the final part of this paper.

DATA AND METHODOLOGY

Taxes impact economic growth through numerous channels. For example, one obvious way that corporate taxes affect economic growth is by decreasing the amount of financial capital available for expenditures on plants and equipment. Investment in new plants and equipment leads to an increased production of goods and services and, thereby, to economic growth. Therefore, the most appropriate macroeconomic measure of these types of investment expenditures is the nonresidential investment (NRI). Consequently, nonresidential investment is used in the present study to approximate investment. Tax on corporate income (CTAX) is the best test variable that measures the impact of taxation on corporations. Personal current taxes (PCT) are used to investigate the effect of taxes on the labor supply. In theory, personal income taxes affect the work-leisure choice. Higher taxes will lead to a reduction in the work effort, and to an increased consumption of leisure.[3] The selection of the variable that is best suited to capture the impact of income taxes on the work effort-leisure choice is affected by the constraints faced by most labor force participants. The majority of workers cannot vary their basic 40 hour work week. However, in most cases, they can choose the number of overtime hours worked. Therefore, it is possible to capture the impact of personal current taxes on the labor supply by analyzing the impact of these taxes on the overtime hours worked. Average weekly overtime hours in manufacturing (0H) are used in all subsequent tests to approximate the overtime variable. Time series data on all the above described variables ranging from the first quarter of 1947 to the third quarter of 2008 are used to analyze the effects of taxes on economic growth in the U.S.[4]

Econometric modeling of the above described time series data necessitates undertaking several steps prior to the estimation of any test equations. These steps include, among others, unit root and cointegration testing of all time series data. The results of these two tests determine the appropriate testing framework to be deployed in all the further data modeling. Initially, each individual time series data must be subjected to stationarity tests. Time series data often exhibit a trend. Such data are nonstationary, and as such are not suitable for any econometric estimation. The objective of stationarity tests is to determine whether the data are stationary or nonstationary, i.e., to determine the degree of integration of each individual data series. If the data are integrated of the same order, then a cointegration testing framework can be used to determine the existence or the absence of a long run relationship among the group of the test variables.[5] Cointegration test results determine the type of estimation framework that must be deployed in further time series analyses of all relationships under investigation. If the data are found to be cointegrated, then vector error correction (VEC) modeling is the appropriate testing framework to be used in further data analyses. VEC estimation can be used to investigate the short run dynamics of relationships under empirical investigation. This modeling can also be used to determine the direction of causal flows between test variables in the short run. The absence of cointegration among test variables necessitates using a different approach in further analyses of the relationships. A VAR testing framework, such as the Granger (1969) causality technique, can be used in such a case.

UNIT ROOT AND COINTEGRATION TESTS

As mentioned above, the first step in investigating the relationship between corporate and personal income taxes and economic growth is to subject each individual data series to stationarity tests to determine the degree of integration of each time series. Unit root testing accomplishes this objective. Unit root tests are numerous and well known. They are commonly used in research that involves time series data. Therefore, any further detailed outline of these tests would be redundant. In the present study, the augmented Dickey-Fuller [Fuller (1976), Dickey and Fuller (1979)] (ADF) test was deployed initially to determine the degree of integration of the CTAX, NRI, PCT, and OH variables. Thereafter the Phillip-Peron (1988) (PP) unit root test was used to test the robustness of the initially obtained ADF test results. An intercept and a deterministic time trend variable was included in all test equations.[6] Test results for all the variables are reported in Table 1 below. These tests indicate that CTAX, NRI, and PCT variables are nonstationary in levels. These variables contain unit roots. It is also clear that they contain only one unit root since their first differences are stationary. Therefore, CTAX, NRI, and PCT are all integrated of the first order, I(1). At the same time, both the ADF and the PP tests indicate that the OH variable is stationary, i.e., it is I(0).

Table 1
ADF and PP Test Results for CTAX, NRI, PCT, and OH.

Variable	*ADF test results*	*PP test results*
CTAX[1]	-2.866	-1.930
CTAX[2]	-5.405*	-14.778*
NRI[1]	-0.810	-0.241
NRI[2]	-5.764*	-8.181*
PCT[1]	-2.485	-1.494
PCT[2]	-4.850*	-18.887*
OH[1]	-12.752*	-12.908*
OH[2]	-6.515*	-78.647*

[1]ADF and PP test results for the levels of variables.
[2]ADF and PP test results for the first differences of levels.
*Indicates statistical significance at the five-percent level.

The above reported unit root test results determine the appropriate reduced form testing framework of the effect of taxes on economic growth. CTAX and NRI variables are nonstationary, and integrated of order one, I(1). Given this fact, cointegration estimation is the most appropriate testing structure for investigating the impact of corporate taxes on nonresidential investment. Since CTAX and NRI are nonstationary, and of the same order of integration, it is possible that corporate taxes and nonresidential investment may be related in the long run. Cointegration tests of these two time series can be used to make this determination. However, a cointegration testing method cannot be used to examine the effect of personal current taxes on the labor supply, since the PCT and the OH variables are of different orders of integration, I(1) and I(0), respectively. Therefore, these variables cannot be cointegrated. The absence of cointegration requires that an alternative testing framework, such as the Granger (1969) causality estimation within a VAR modeling, be used to analyze the effect of personal current taxes on the labor supply.

One of the key advantages of reduced form modeling of the time series data is its ability to provide some information on the long run relationships among test variables, such as the relationship between corporate taxes and nonresidential investment. If such a relationship is established, than it would be reasonable to conclude that corporate taxes may impact the long run economic growth in the U.S. As mentioned above, a cointegration testing framework can be used to accomplish this objective. Numerous cointegration tests are available to investigate the long run relationship among any I(1) time series data, such as the corporate taxes and nonresidential investment data. The Engle and Granger (1987) test, the Stock and Watson (1988) estimation, as well the Johansen (1988) procedure, among others, can be used to determine whether corporate taxes and investment are related in the long run. Although all cointegration tests share the same common objective of finding the most stationary linear combination of the vector time series under investigation, some important statistical differences exist among these tests. Gonzalo (1994) investigated relative merits of alternative cointegration tests. His investigation found Johansen's test superior to the other cointegration tests. Dickey, Jansen, and Thornton (1991) reached similar conclusions with respect to the merits of the three above mentioned cointegration tests. Given the above findings concerning relative merits of various cointegration tests, Johansen's (1988) estimation was adopted in analyzing the long run relationship between corporate taxes and nonresidential investment. In addition to the above mentioned advantages of Johansen's estimation method, there is one other compelling reason to deploy this particular procedure in the present data analyses. There exists an important econometric connection between Johansen's cointegration tests and further VEC analyses of the CTAX and the NRI data. Test results generated by Johansen's cointegration estimation can be used in subsequent VEC data modeling.[7]

Table 2
Johansen Cointegration Test Results for CTAX and NRI. Lags 1-2

Variables	*Trace Test Results*	*Eigen Value Test Results*
CTAX and NRI[1,2]	24.630*	23.689*

[1]Trace test indicates one cointegrating equation at the five percent level of significance.
[2]Eigen value test indicates one cointegrating equation at the five percent level.
*Indicates statistical significance at the five percent level.

Results of the Johansen's cointegration testing of the CTAX and NRI data are summarized in the above Table 2.[8] Both the trace and the eigen value tests reject the null hypothesis of no cointegrating equation. The likelihood ratio test implies the existence of one cointegrating equation at the conventional five percent level of statistical significance, given the value of the trace statistic of 24.630. The eigen statistic of 23.689 confirms this conclusion. These test results provide new empirical evidence on the relation between corporate taxes and nonresidential investment in the long run. They indicate the existence of a stable long run relationship between these two variables. Consequently, it appears that corporate tax policies may influence investment decisions in the U.S. in the long run. However, establishing the existence of a stable, long run relationship between corporate taxes and nonresidential investment gives no indication of the causal flows in this relationship. It would certainly be of crucial importance to determine if corporate taxes have a causal impact on investment. Cointegration tests alone cannot make this determination. This objective can be accomplished within VEC analyses of the corporate tax and nonresidential investment data.

VEC ESTIMATION

Given the fact that corporate tax and nonresidential private investment time series data are cointegrated, it is possible to investigate the short run dynamics of the relationship between these two variables within a VEC testing framework. This investigation can provide key evidence of the short run impact of corporate taxes on investment and economic growth. In this research, the Engle and Granger (1987) VEC estimation method is used to provide this vital information. One obvious advantage of using this particular method for VEC estimation is its connection with Johansen's (1988) cointegration estimation. Several steps must be followed in the Engle and Granger VEC testing procedure. These steps include initial integration and cointegration testing of the CTAX and the NRI data, and thereafter, VEC estimation. Essentially, if two time series variables such as CTAX and NRI are both integrated of the same order I(1) and are also cointegrated, then the residuals from the Johansen's cointegrating equation can be used in further Engle and Granger VEC data modeling.[9] In accordance with the Engle and Granger methodology, the two following equations are estimated as follows:

$$\Delta NRI_t = \alpha + \rho z_{t-1} + \sum_{j=1}^{2} \beta_j \Delta NRI_{t-j} + \sum_{j=1}^{2} \lambda_j \Delta CTAX_{t-j} + \varepsilon_t \tag{1}$$

$$\Delta CTAX_t = \alpha_1 + \rho_1 z_{t-1} + \sum_{j=1}^{2} \beta_1 \Delta CTAX_{t-j} + \sum_{j=1}^{2} \lambda_1 \Delta NRI_{t-j} + \varepsilon_1 \tag{2}$$

The Engle and Granger VEC model is estimated in the first differences of levels. Therefore, ΔCTAX and ΔNRI are changes in corporate taxes and nonresidential investment. It is assumed that at least one of the coefficients (ρ or ρ_1) is nonzero. The z_t terms are the residuals from Johansen's (1988) previously estimated cointegration equation reported in Table 2. These lagged z_t terms provide key information about the short run relationship between corporate taxes and investment. Their analysis provides information about the dynamics of the model under empirical investigation, as the two rho coefficients in equation (1) and (2) are the speed of adjustment coefficients.[10] The combined analysis of these coefficients can also provide information about the causal flows between corporate taxes and nonresidential investment. In general, a statistically insignificant z_t term implies a state of equilibrium in the model under investigation. Finding a statistically significant coefficient of the lagged z_t term indicates that disequilibrium prevails in this model. In such a case, the signs of the two coefficients determine the direction of causal flows between corporate taxes and nonresidential investment. VEC results of estimations of equations (1) and (2) are reported in the following Table 3.

Table 3
VEC Estimates of Equations (1) and (2)

Equation	*Dependent Variable*	*Independent Variable*	*Coefficient*	*"t" Statistic*
(1)	Δ NRI	constant	2.867	4.0277*
		z(-1)	-0.018	-4.120*
		Δ NRI(-1)	0.336	5.100*
		Δ NRI(-2)	0.158	2.500*
		Δ CTAX(-1)	0.232	3.793*
		Δ CTAX(-2)	0.032	0.524
(2)	Δ CTAX	constant	0.405	0.505
		z(-1)	0.007	1.366
		Δ CTAX(-1)	0.126	1.830
		Δ CTAX(-2)	0.049	0.709
		Δ NRI(-1)	0.016	0.220
		Δ NRI(-2)	0.108	1.528

*Indicates statistical significance at the five-percent level.
Numbers in parentheses indicate number of lags.

The results reported in the above table provide key empirical evidence on the short run impact of corporate taxes on nonresidential investment in the U.S. Focusing on statistical estimates of the z_t terms in equations (1) and (2) individually provides this information. The lagged z_t coefficient in equation (1) is negative and statistically significant. The coefficient of the same variable in equation (2) is statistically insignificant. Therefore, these VEC estimation results indicate that corporate taxes have a statistically significant impact on nonresidential investment in the short run. It appears that this impact is negative, as the lagged z_t term is negative in equation (1). VEC estimates reported above also provide information about causal flows between corporate taxes and nonresidential investment. This information is obtained by analyzing jointly the test results of equations (1) and (2). As noted above, the coefficient of this lagged term in equation (1) is statistically significant while the same coefficient in equation (2) is statistically insignificant.

One interpretation of these results is to conclude that changes in corporate taxes have a negative causal impact on nonresidential investment in the short run. At the same time, there is no evidence of a causal flow from nonresidential investment to corporate taxes. Consequently, corporate taxes impede economic growth in the U.S.

GRANGER CAUSALITY TESTS

Cointegration and VEC modeling cannot be used to investigate the impact of personal current taxes on the labor supply. This testing structure can only be used when all test variables are integrated of the same order of integration. In the present case, the PCT data are nonstationary and I(1), while the OH data are stationary and I(0). This outcome necessitates adopting a different estimation approach other than cointegration and VEC modeling. A VAR Granger (1969) causality testing framework can be used in further analyses of the relationship between personal current taxes and overtime hours. Standard bivariate Granger causality testing requires estimating the following equations:

$$X_t = a_0 + \sum_{j=1}^{J} b_j X_{t-j} + \sum_{i=1}^{I} c_i Y_{t-i} + \varepsilon_t \tag{3}$$

$$Y_t = a_1 + \sum_{j=1}^{J} b_1 Y_{t-j} + \sum_{i=1}^{I} c_1 X_{t-i} + \xi_t \tag{4}$$

where X_t and Y_t are the two time series variables under investigation. Lags on the two test variables have to be selected in the two above equations. Lag selection can be either arbitrary, or it can be based upon a statistical criterion. Arbitrary lag selection in causality testing suffers by two serious shortcomings. The first involves the loss of degrees of freedom in cases when relatively short sample sizes are analyzed and long lag lengths are chosen. The second problem is perhaps even more serious, as an arbitrary lag selection itself can influence Granger causality test results.[11] Numerous statistical criteria, such as the Schwards information criterion (SIC), the Akaike information criterion (AIC), and Hsiao's (1979 and 1981) minimum final prediction error (FPE) are available for selecting the appropriate lag test structure of the time series variables. Using any one of such statistical criteria can solve the two above mentioned problems that plague the arbitrary lag selection in causality testing. In the present study, Hsiao's minimum final prediction criterion (FPE) was used to analyze the causal flows between personal current taxes and overtime hours.

The Hsiao's (1979 and 1981) minimum FPE causality testing method is uniquely suited for bivariate causality tests involving relatively short sample periods, such as those used in the PCT and the OH data analyses.[12] It allows an empirical examination of all lags in a predetermined lag range. The appropriate lag structure is determined by minimizing the final prediction error (FPE). FPE is calculated as

$(SEE)^2 . (T + K) / T$, where SEE is the standard error of the regression, T is the number of observations, and K indicates the number of parameters. Causality implications are determined by analyzing results of several statistical tests whose main objective is to find a lag structure that yields minimum FPE in each step of the estimation.[13] This procedure was used to determine the optimum lag length of X (PCT) and Y (OH) in equation (3). Lag lengths ranging from one to ten were examined in each case. The optimum lag length of PCT was determined to be three. This constituted the first step in Hsiao's causality testing procedure. The particular lag structure of the PCT variable obtained in this way was maintained while lagged values of OH were added ranging from one to ten lags. Minimizing the FPE resulted in a one lag selection for the OH variable. This estimation completed the second step in causality testing of the PCT and OH data. The same procedure was used in estimating equation (4) where the roles of X and Y were reversed. This led to a selection of five lags for OH and one lag for PCT. Causality implications were obtained by comparing minimum FPEs of the two estimation steps.

There are three causality outcomes possible in the test cases described above. First, there can be a unidirectional causal flow from PCT to OH, or from OH to PCT. That is to say, PCT can Granger (1969) cause OH, or OH can Granger cause PCT. Second, there can be a bi-directional causality between the two test variables. Finally, PCT and OH variables can be statistically independent of one another. These inferences are based upon comparisons of the minimum FPEs of the two above described estimation steps. If the minimum FPE_{OH} without the lagged values of PCT variable is greater than the minimum FPE_{OH} with the lagged values of the PCT variable, then causality flows from personal current taxes to overtime hours. Similarly, if the minimum FPE_{PCT} without the lagged values of the OH variable is greater than the minimum FPE with these lagged values, then a unidirectional causality flows from OH to PCT. It is also possible that adding lagged values of test variables in bivariate testing of the data does not decrease the minimum FPEs obtained under univariate data testing in the two test cases. Such a result would imply that the two test variables are statistically independent.

Table 4
Causality Testing by Computing FPEs for OH and PCT*

Dependent Variable	*Independent Variable*	*FPE*	*Causality Implications*
PCT(3)		747.37	
PCT(3)	OH(1)	747.64	747.37<747.64 OH ≠ PCT
OH(5)		2.359	
OH(5)	PCT(1)	2.379	2.359 < 2.379 PCT ≠ OH

*Numbers in parentheses are lags for minimum FPEs.

The Granger (1969) causality test results reported in the above table provide important new information on the causal relationship between personal current taxes and overtime hours. These results indicate the absence of causal flows between these two variables, as adding the lagged variables in bivariate test structures in both equations does not reduce minimum FPEs obtained in the univariate test setting. In the first test case, the minimum FPE of 747.37 (step one) is smaller than minimum FPE of 747.64 (step two). The same results are obtained when the roles of OH and PCT are reversed. Consequently, it appears that the two test variables are statistically independent. Therefore, changes in personal current taxes do not appear to impact negatively the overtime hours worked in the manufacturing sector of the U.S. economy. Therefore, reducing personal current taxes does not appear to have any statistically significant impact on the labor supply, under the present econometric testing structure. Given these results, reducing these taxes may not have the desired effect on economic growth in this country.

OVERALL CONCLUSIONS

The rapidly deteriorating economic situation in this country and throughout the rest of the world places utmost importance on determining which economic policies are most likely to reverse this universal economic decline. Fiscal policy can be used to accomplish this crucially important task. This policy can be used either to stimulate the aggregate demand, primarily through increases in various types of government expenditures, or it can be designed to affect positively the economy's aggregate supply. The latter task can only be achieved by various tax reductions. In theory, tax decreases will have positive incentive effects on economic resources. In particular, personal income tax cuts will increase the labor supply while reducing corporate taxes may lead to higher capital investment. Reducing taxes will lead to economic growth through these above described channels. The objective of this paper is to provide new empirical evidence on this key economic issue of the impact of taxes on economic growth. This task is accomplished within a time series reduced form modeling of economic data. The novelty of the present research is two fold. First, it analyzes both the short and the long run effects of taxation on economic growth in the U.S. It also provides new empirical evidence on the causality in the taxes and economic growth relationship. The focus of the present paper is on investigating the impact of corporate taxes (CTAX) on nonresidential private investment (NRI), and on the effect of personal current taxes (PCT) on the average weekly overtime hours (OH) in the manufacturing sector of the U.S. economy.

Time series data on these variables ranging from the first quarter of 1947 to the third quarter of 2008 were used to analyze these relationships. The initial data analyses were carried out within the unit root and the cointegration testing structures. Thereafter, vector error correction (VEC) and Granger (1969) causality estimations were used to determine the impact of taxes on economic growth in the U. S. Initially all time series data were subjected to unit root testing. The augmented Dickey-Fuller (1976, 1979) (ADF) and the Phillips-Perron (1988) (PP) tests were used to determine the order of integration of each individual data series. These tests indicated that while the CTAX, NRI, and PCT data are nonstationary and I(1), the OH data are stationary, i.e., these data are I(0). These test results implied that a cointegration and vector error correction (VEC) estimation framework is appropriate for investigating the impact of corporate taxes on business investment, while a VAR estimation must be used to investigate the effects of personal taxes on the labor supply. The impact of personal current taxes on average weekly overtime hours in the manufacturing sector was analyzed within the Granger (1969) causality testing framework. Hsiao's (1979 and 1981) minimum final prediction error (FPE) estimation was used to determine the causal impact of personal current taxes (PCT) on the labor supply approximated by the average weekly overtime hours in manufacturing (OH). Test results indicated the absence of any causal flows between these two test variables. These results implied that lowering personal current taxes may not have the desired positive impact on the labor supply and, thereby, on economic growth in this country.

The Johansen (1988) cointegration test was used to determine the long run relationship between CTAX and NRI. Both the trace and the eigen value tests indicated the existence of a stable long run relationship between these two variables. One obvious way to interpret these results is by concluding that corporate taxes may have an impact on nonresidential investment in the long run. However, cointegration tests alone cannot be used to make meaningful inferences about the causal impact of corporate taxes on business investment. The Engle and Granger (1987) vector error correction (VEC) method was used to accomplish this objective. VEC test results provided new empirical evidence on the impact of corporate taxes on nonresidential investment. These results indicated that increasing corporate taxes will impact negatively nonresidential investment in the short run. Conversely, lowering corporate taxes will not only have a positive long run effect on economic growth, but such a tax policy may have a much desired positive short run impact on business investment and economic growth. This result is of crucial importance in the present economic circumstances when the most important feature of any economic policy must be its ability to lead to a quick economic recovery. The results of this research indicate that lowering corporate taxes may accomplish this key economic objective.

Notes

1. The U.S. economy is currently in the midst of a severe economic recession, as shown by a rising unemployment rate and a rapidly falling output, as well as other indicators The negative fourth quarter 2008 growth rate of the real GDP of 3.8 is unprecedented in recent economic history of this country.
2. Fiscal policies can affect economic growth through two distinct channels: by stimulating the aggregate demand (standard Keynesian hypothesis), or by increasing an economy's aggregate supply. Typically the aggregate demand policies favor increasing fiscal expenditures, while tax policies are most suited to affect the aggregate supply. Therefore, the key economic issue facing policy makers is whether to use expenditure or tax policy to achieve economic recovery.

3. This theoretical result will depend on the relative strength of the substitution and income effect.
4. The CTAX, NRI, and PCT data were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis. The OH data came from the U.S. Department of Labor, Bureau of Labor Statistics. The OH data are only available from the first quarter of 1956 onwards. The sample period is always adjusted to accommodate this limitation in all tests that use the OH data.
5. For a further excellent discussion of unit root and cointegration tests see Holden and Thompson (1992), and McCallum (1993), among others.
6. The SIC method was used to determine the test lag structure in the ADF tests.
7. This connection is explained in a greater detail in the following section of this paper.
8. The assumption of linear deterministic trend in the data was used in cointegration data testing.
9. This estimation procedure was followed in the present paper in the CTAX and NRI data analyses. Interested readers are referred to Enders (1995), pages 373-81 for a more detailed description of this estimation.
10. These coefficients describe the dynamics of the short run relationship between corporate taxes and nonresidential investment. In general, they outline the short run disequlibrium responses of the model under investigation. A statistically insignificant coefficient implies that change in z_t does not respond to the deviations from the long run equilibrium, indicating the state of equilibrium in the system under investigation. A statistically significant coefficient implies the existence of a disequlibrium in the model. For a more detailed explanation of these issues see Enders (1995), among others.
11. For a further discussion of this issue see Thornton and Batten (1985) and Saunders (1988), among others.
12. The OH data are only available from the first quarter of 1956. This constraint necessitated using a shortened sample period in all subsequent causality tests.
13. A detailed description of the minimum FPE causality testing procedure would be redundant, as it is well documented in economic literature. Interested readers are referred to Hsiao (1979 and 1981) for a more complete description of this causality testing technique.

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