The U.S. Corporate Tax Reform and Its Macroeconomic Outcomes

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Abstract

The corporate tax reform has been among the most controversial issues during the past U.S. presidential debates. Though much has been said about the adverse macroeconomic effects of the corporate tax hike, less attention has been paid to the magnitude of such effects. This study attempts to measure the adverse effects of the corporate tax hike on macroeconomic variables such as investment, real GDP, productivity growth, hourly wages, unemployment rate, natural rate of unemployment, and consumer price index (CPI). The estimated regression results with quarterly data from1960 to 2010suggest that a 10% increase in the effective corporate tax rate reduces private investment by3.1%, real GDP by 1.5%, productivity by 2.6%, and hourly wages by 4%. The results also indicate that this increase in the effective corporate tax rate raises short-term unemployment rate by 0.5%, the natural rate of unemployment by 1%, and the consumer price index (CPI) by 0.9%.

Keywords: Corporate tax hike, Productivity growth, Natural rate of unemployment, Automatic stabilizer, Menu cost model, Macroeconomic variables

1. Introduction

The views on a tax hike during a recession vary widely and fundamentally among economists. Though much has been said about the adverse effects of a tax hike on macroeconomic variables, few studies have attempted to measure the magnitude of these effects. This paper tries to investigate the quantitative outcomes of a corporate tax hike on macroeconomic variables such as private investment, real GDP, productivity growth, hourly wages, short-term unemployment rate, natural rate of unemployment, and consumer price index (CPI), using a quantitative research method.

According to orthodox Keynesian model a tax performs as an automatic stabilizer because it reduces the effective demand during a boom and raises it during a recession. The automatic stabilizer feature of a tax rate is only functional under price and wage rigidity assumption. However, the price and wage rigidity assumption does not apply to all circumstances. New Keynesians believe that small menu costs for price adjustment may induce large fluctuation in output (See Ball, Mankiw and Romer 1999). Indeed, based on orthodox Keynesian models prices are often assumed to be sticky. New Keynesians, however, argue that since the "menu costs" (costs for changing the prices and informing individuals) are small they provide weak foundations for sticky models. They believe that small menu costs can cause large welfare losses. However, the fact that price adjustments are small does not undermine the claim that they are central to understanding economic fluctuations because private incentives produce too much price adjustment following an expansion in aggregate demand and too little adjustment following a contraction in aggregate demand. In other words, prices are rigid downward but not upward (Note 1). Therefore, the automatic stabilizer notion of taxes does not apply to New Keynesian theory.

To see whether a corporate tax rate performs as stabilizer this paper tries to investigate the macroeconomic effects of a corporate tax hike through econometric models. The study implements quarterly data from 1960-Q1 through 2010-Q4 to measure the macroeconomic effects of one standard deviation in corporate tax rate on private investment, real GDP, productivity growth, hourly wages, short-term unemployment rate, natural rate of unemployment, and CPI.

2. Literature Review

Robert Carroll and Gerald Prante (2012) investigate the long-run effects of an increase in tax rate on high income taxpayers in 2013. They use a general equilibrium model (GEM) for the U.S. economy to examine the effects of an

increase in tax rate in the long-run. Their study addresses four policy changes: (i) the effects of an increase in the top tax rates from 33% to 36% (ii) reinstatement of the limitations on itemized deductions for high income tax payers (iii) taxation of dividends as ordinary income (iv) and, finally, increasing the Medicare tax rate from 2.9% to 3.8% for high income tax payers. The combination of these tax changes at the beginning of 2013 means that the tax rate on average income people will rise from 35% in 2012 to 40.9% in 2013. The top tax rate on dividends will rise from 15% to 44.7% and the top tax rate on capital gains will rise from 15% to 24.7% over the same period. The authors find that higher tax rates will have significant adverse effects on output, employment, investment, capital stock and real wages. Based on their results output would fall by 1.3%, employment by 0.5%, investment by 2.4%, and real after tax wages by 1.8%.

Artruo Jose Galindo and Cristina Pombo (2011) investigate the impact of corporate taxation on investment and productivity. They use data for a set of 42 developing countries and examine whether firms with different sizes are affected differently by taxation. Their sample covers the period of 2004 to 2006 and they measure the impacts of corporate tax rates on investment and total factor productivity (TFP). They use independent variables such as corporate tax rate, size, and GDP per capita. Their results indicate that corporate tax rate has a negative impact for medium and large firms. They conclude a one standard deviation increase in corporate tax rate would reduce investment for large firms by 0.016 and total factor productivity (TFP) by 0.8.

Simeon Djankov, Tim Ganser, Caralee McLiesh, Rita Ramalho, and Andrei Shleifer (2010) investigate the effects of a hike in corporate tax rate on investment. They use data on effective corporate tax rates in 85 countries for 2004. The data covers 22 rich OECD countries, 10 East Asia, 17 Eastern Europe, 13 Latin American, 6 Middle East, 14 African, and 3 South Asia countries. They use two measures of investment: gross fixed capital formation and foreign direct investment (FDI) both as a percentage of GDP. They also examine two measures of entrepreneurship: the number of business establishments and the rate of new business registration. They control for variables such as tax evasion, property rights, and government regulations including entry and labor market regulations, which affect investment and entrepreneurship. They find that there is a large statistically significant negative impact from corporate tax rate on investment and FDI. Their estimates indicate that raising the effective tax rates by 10 percentage points reduces investment by 2.2 and FDI by 2.3 percentage points. The results are close to those found in the literature, where the elasticity of investment to the tax-adjusted user cost of capital is between -0.5 and -01.0. They conclude that corporate tax rates have substantial negative impacts on investment and entrepreneurship.

Robert Barro and Charles Redlick (2009) investigate the macroeconomic effects of government purchases and taxes. They use annual data from 1912 to 2006 and estimate per capita GDP growth rate as a function of tax rate and government spending. They also include lagged values of marginal tax rate in their model. Their estimated results suggest that a decrease of 1 percentage point in marginal tax rate leads to an increase of 0.6% in per capita GDP growth rate over the next year.

Christian Romer and David Romer (2007) consider all significant legislated tax changes over the period of 1947 to 2006 to measure the impacts of tax changes on macroeconomic performance. To investigate whether tax changes cause output growth they identify 49 tax laws during the above period. They examine the relationship between tax changes and the growth of real output by estimating an equation where GDP growth is a function of tax rate. Their estimated results suggest that the maximum impact is a fall of 3% in output. They also consider two measures of changes in monetary policy. The first is a dummy for an anti-inflationary monetary policy and the second is a continuous indicator of monetary shocks measured by residuals of a regression of changes in the Federal Fund Rate target on the Federal Reserve's internal forecast of inflation and real growth. Controlling for the monetary policy, their forecast suggests that the tax increase by one percent of GDP reduces the output by 3.1%. They also control for government spending and find that the maximum impact of a tax increase by one percent of GDP is an output decline of 2.9%. However, controlling for the oil shock, the tax rise reduces the GDP by 2.7%.

James Gwartney and Robert Lawson (2006) examine how taxes affect economic performance and the distribution of income. They implement cross-country data on changes in marginal tax rate to see how changes in the tax rates affect economic growth and inequality during the period 1990-2002. They collect data for seventy-seven countries that levied a personal income tax throughout 1980-2002. They use regression analysis to investigate the links between changes in top marginal tax rates and economic growth for all of seventy-seven countries. Their dependent variable is the growth rate of real GDP per capita and they control for GDP per capita at the beginning of the period and the initial marginal tax rates. They conclude that a 10 percentage point reduction in the marginal tax rate is associated with 0.5% increase in long-term growth. They argue that high income countries like United Kingdom, United States, and New Zealand that have cut their high top tax rates from 70% to 40% or less in the 1980s have

experienced a growth rate of approximately 2% per year, whereas countries like Japan, France, Germany and other members of the EU that have maintained a top marginal tax rate of 50%, or more, have experienced a growth rate of 1.5% since the 1990. They conclude that high marginal tax rates of 50% and above have retarded economic growth in many EU countries.

Rodrigo Vergara (2004) investigates the impacts of taxation on private investment in Chile. In this study investment equation is estimated as a function of changes in interest rates, price of capital goods, and credit loans to private sector. He implements data from 1975 to 2003. The sample covers a period where the corporate income tax was substantially reduced. His results indicate that for each 10 percentage point decrease in tax rate, private investment as a percentage of GDP jumps up by 0.57 percentage points in the short-run and by 0.9 percentage points in the long run. He concludes that lower corporate tax rate in Chile has had a significant positive impact on private investment. He argues tax rate has a significant negative impact on investment because it raises the cost of capital and reduces the available internal funds for investment.

Eric Engen and Jonathan Skinner (1996) investigate the impact of tax reform on macroeconomic growth, labor supply, and productivity growth. They use three approaches. First they look at the U.S. historical data to see if there is a link between changes in tax policy and changes in economic growth across time. Second, they consider whether growth rates across countries can be attributed to various tax policies. Third, they underpin the micro-level studies to see how taxes affect specific subsectors of the economy. Using data from 1959 to 1995, they argue that with the Kennedy-Johnson tax cuts in 1964, the real GDP growth rate averaged 4.8% over the period of 1964 to 1969. The Regan tax cut also led to an average growth rate of 3.9% from 1983 to 1989, significantly above the preceding period of 1980-82. Finally, their third approach is to measure the impact of corporate tax rate reform on microeconomic variables, such as labor supply and productivity. They find that both work hours and productivity are only mildly responsive to changes in the tax rate.

Jason Gummins and Kevin Hassett (1992) investigate the effects of taxation on investment. They estimate a vector auto-regression (VAR) model with panel data from 1970-1989 and find that investment has been lower compared to pre-tax reform level. They conclude that there is a statistically significant negative effect from the tax rate on investment.

Interestingly enough, both within and cross-country studies indicate that a rise in corporate tax rate will reduce investment, retard long-term economic growth, and decrease total factor productivity (TFP). However, few studies have focused on quantitative effects of a corporate tax rise on short-term unemployment rate, natural rate of unemployment rate, hourly wages, and consumer price index (CPI). One of the novel features of this study is that it attempts to measure the magnitude of corporate tax hikes on these variables.

3. Theoretical Model

This section represents the effects of corporate tax hike through different channels on macroeconomic variables by estimating regression models, using OLS technique with quarterly data for the period 1960-Q1 through 2010-Q4. The list of variables is presented in Table 1.

A Keynesian investment model as a function of real GDP and real interest rate is estimated, where the effective corporate tax rate is embedded into the model because a tax hike raises the cost of capital and, therefore, reduces investment.

$$Inv = \alpha_0 + \alpha_1 GDP + \alpha_2 R\operatorname{int}erest + \alpha_3 Corptax \tag{1}$$

The corporate tax rate has also been embedded into a Solow growth model because it raises the cost of capital and, reduces investment, which in turn, affects real GDP.

$$GDP = \alpha_0 + \alpha_1 Capital + \alpha_2 Labor + \alpha_3 Corptax \tag{2}$$

Following Robert Gordon (1979), productivity is estimated as a function of unemployment rate, wage index, and oil shock. The corporate tax rate has also been embedded into the model because it adversely affects profits, which in turn, affects wages and productivity growth..

$$\Pr oductivity = \alpha_0 + \alpha_1 Unemploy + \alpha_2 Wage + \alpha_3 Oilp + \alpha_4 Corptax \tag{3}$$

Following David Card (1999), the wage index is estimated as a function of GDP growth, openness, and education, measured by tertiary ratio. The corporate tax rate has also been embedded into the model because, as mentioned earlier, a tax hike reduces profits, which in turn, adversely affects wages.

$$Wage = \alpha_0 + \alpha_1 GDPG + \alpha_2 Openness + \alpha_3 Education + \alpha_4 Corptax \qquad (4)$$

Unemployment rate is estimated as a function of investment, level of education, lagged values of unemployment rate, and consumer price index (CPI). The corporate tax rate is also included in the model because it affects the cost of capital and investment, which in turn, affects unemployment rate.

$$Unemploy = \alpha_0 + \alpha_1 Inv + \alpha_2 Education + \alpha_3 Unemploy1 + \alpha_4 CPI + \alpha_5 Corptax \qquad (5)$$

Based on Okun's Law (Note 2) the natural rate of unemployment rate is a function of real interest rate, GDP growth, oil shock, and lagged value of unemployment rate. The corporate tax rate is also an important factor here because it affects investment and unemployment rate in the long-run.

$$NROU = \alpha_0 + \alpha_1 R\operatorname{int}erest + \alpha_2 GDPG + \alpha_3 Oilp + \alpha_4 Unemploy1 + \alpha_5 Corptax \qquad (6)$$

Finally, consumer price index (CPI) is estimated as a function of money supply andcorporate tax rate because a tax hike affects after tax profits, and therefore, indirectly affects the price setting decision of entrepreneurs.

$$CPI = \alpha_0 + \alpha_1 M2 + \alpha_2 Corptax \qquad (7)$$

4. Data and Regression Results

This section represents data and estimated regression results. Data on investment, GDP, productivity, hourly wages, unemployment rate, natural rate of unemployment, CPI, and openness are retrieved from Federal Reserve Bank of St. Louis. Data on tertiary ratio is retrieved from the World Bank, and data on effective corporate tax rate is retrieved from the IRS website.

4.1 Data

This analysis uses quarterly data from the first quarter of 1960 through the fourth quarter of 2010 to estimate the effects of a corporate tax rate hike on private investment, real GDP, productivity, hourly wage index, unemployment rate, natural rate of unemployment, and CPI. The list of variables, their summary statistics, and sources are presented in Table 1.

4.2 Estimated Results

The estimated results (Table 2) suggest that a corporate tax hike has statistically significant adverse effects on macroeconomic variables. All models have been estimated in the logarithm form and all models have been tested for robustness. The results indicate that a 10 percentage point increase in effective corporate tax rate reduces private investment by 3.1%, real GDP by 1.5%, productivity by 2.6%, and hourly wages by 4%.

The effects on short-run and natural rate of unemployment rate are positive as expected. A 10 percentage point increase in corporate tax rate is associated with a 0.5% jump in short-term unemployment rate, and 1% rise in the natural rate of unemployment. The CPI is expected to rise by 0.9%..

The results for the investment model suggest that an increase of 10 percentage point in effective corporate tax rate reduces investment by 3.1%. Indeed, the corporate tax rate reduces investment through two different channels: (i) increasing the cost of capital and reducing the internal sources for investment (ii) reducing after tax profits and rates of return.

Not only investors will try to reduce the wage costs due to lower profits but also they will lay off some workers to compensate for a tax hike.This is the demand side effect, which affects wages, productivity, and unemployment rate. On the supply side, a higher corporate tax rate reduces hourly wages; workers have to work longer hours to retain their purchasing power, shifting the labor supply to the right and creating higher unemployment rate in the short-and long-run.

The estimated results on the effects of taxes on unemployment rate suggest that a 10 percentage point increase in the corporate tax rate raises the short-term unemployment rate by 0.5%, and the natural rate of unemployment by1%. The reason for higher natural rate of unemployment rate is that investors will be able to lay off more workers due to lack of technology rigidity in the long-run. They can easily replace workers with new technologies in the long-run.

Finally, consumer price index (CPI) is estimated to rise by 0.9% because higher corporate tax rate reduces after-tax profit, investment, and real output, which in turn, creates shortage in the supply of goods and services and leads to cost-push inflation.

5. Conclusion

This paper examined the effects of a corporate tax hike on macroeconomic variables such as real output, private investment, productivity, hourly wage index, unemployment rate, natural rate of unemployment and consumer price index (CPI).

The estimated fall of output by 1.5% in this study as a result of tax hike is very close to those of Robert Carroll and Gerald Prante (2012) who found a fall of 1.3% in output. Our results are also close to those of Simeon Djankov, Tim Ganser, Caralee McLiesh, Rita Ramalho and Andrei Shleifer (2010) who found a 10 percentage point increase in corporate tax rate is associated with 2.2% reduction in private investment. The estimated results of this study indicate a reduction of 3.1% in private investment. The difference in the magnitude of the fall in private investment in this study and that of Simeon Djankov et al. (2010) may be due to different samples; because they cover 85 countries including OECD, Latin America, Middle East and East Asia countries in their sample which have different economic fundamentals.

Contrary to Eric Engen and Jonathan Skinner (1996) who found that labor force participation and productivity are only mildly responsive to tax policy reform, the estimated results here indicate that a 10 percentage point increase in corporate tax rate reduces productivity by 2.6%. Indeed, there is a possibility that the drop in the productivity growth during the past few years may be attributed to higher corporate tax rate because with a higher corporate tax rate investors will have less profits and pay lower wages, which in turn adversely affects productivity growth.

The results of this study in contrast to those of Robert J. Gordon who argues the drop in productivity growth can be attributed to globalization, household and government debt, baby boomers, and inequality, suggest that a corporate tax hike is among the most important factors affecting productivity.

Since a corporate tax rate affects the relative price of labor to capital, it can affect the decision of labor supply and, therefore, its choice to work. This, in turn, can change the wage index substantially. The estimated results here indicate that hourly wage index is very elastic to changes in corporate tax rate. Indeed, a 10 percentage point increase in the corporate tax rate reduces hourly wage index by 4%.

Finally, a 10 percentage point increase in corporate tax rate is associated with a 0.5% jump in short-term unemployment rate, and 1% increase in the natural rate of unemployment. The more severe long-term effect of a tax rise on unemployment rate is due to ability of investors to lay off more workers and replace them with new technology in the long-run.

The adverse effects of a corporate tax hike on macroeconomic variables, as emphasized in this study, suggest that it is time to reform the corporate tax regime because it could further delay the sluggish recovery of a troubled economy.

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Notes

Note 1. Gregory Mankiw, "Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly", Quarterly Journal of Economics, Vol. 100, No2. May 1985, PP. 529-537, http://dx.doi.org/10.2307%2F1885395, at http://www.jstor.org/sici?sici=0033-5533%28198505%29100%3A2%3C529%3ASMCALB%3E2.0.CO%3B2-O&origin=JSTOR-pdf.

Note 2. See Francesco Bartolucci, Misbah T. Choudhry, Enrico Marelli, and Marcello Signorelli, Financial Crisis and Unemployment: Beyond the Okun's Law, at http://www.eco.unibs.it/~emarelli/AIEL.pdf. Also see Leopold Sogner and Alfred Stiassny, "A Cross-Country Study on Okun's Law", Vienna University of Economics and Business Administration, working paper No 13, at http://epub.wu.ac.at/996/1/document.pdf .

Table 1. List of variables and their summary statistics

Variable	Definition	Mean	Maximum	Minimum	Standard deviation	Source
GDP	Real Gross Domestic product	7578.89	13491	2800.2	3337.68	Federal Reserve Bank of St. Louis
GDPG	Real GDP Growth	0.75	3.9	-2.3	0.87	Federal Reserve Bank of St. Louis
Inv	Private Investment	875.25	2352.1	68.1	700.33	Federal Reserve Bank of St. Louis
Invr	Investment ratio to GDP	0.63	0.78	0.42	0.06	Federal Reserve Bank of St. Louis
Gexpr	Government Expenditures ratio to GDP	1.20	1.46	0.90	0.12	Federal Reserve Bank of St. Louis
Corptax	Effective Corporate Tax Rate	37.40	52.0	23.1	7.81	IRS data
Interest	Effective Federal Fund Rate	5.62	17.78	0.07	3.47	Federal Reserve Bank of St. Louis
CPI	Consumer Price Index (1983=100)	111.50	228.34	29.39	64.24	Federal Reserve Bank of St. Louis
Inf	Inflation rate of CPI	0.99	3.94	-2.32	0.77	Federal Reserve Bank of St. Louis
Rinterest	Real interest rate=Interest-Inf	4.63	15.69	-1.00	3.02	Author calculation
M2	Money Supply	4575.62	9764.1	1619.8	2165.5	Federal Reserve Bank of St. Louis
Oilprice	Oil price	24.94	123.96	2.92	24.50	Federal Reserve Bank of St. Louis
Employ	Employment	59.84	64.6	55.2	2.81	Federal Reserve Bank of St. Louis
Capital	Stock of Gross Fixed Capital	260.11	684.3	25.7	208.36	Federal Reserve Bank of St. Louis
Labor	Civilian Labor Participation Rate	63.70	67.3	58.5	2.91	Federal Reserve Bank of St. Louis
Wage	Hourly wage in dollars	9.37	19.07	2.14	5.37	Federal Reserve Bank of St. Louis
Productivity	Productivity Index	85.01	102.82	69.04	9.59	Federal Reserve Bank of St. Louis
Employ	Employment rate	59.84	64.6	55.2	2.81	Federal Reserve Bank of St. Louis
Unemploy	Unemployment	6.05	10.70	3.40	1.61	Federal Reserve Bank of St Louis
Unemploydur	Unemployment duration	8.10	23.20	4.20	3.68	Federal Reserve Bank of St. Louis
NROU	Natural Rate of Unemployment	5.62	6.27	5.00	0.44	Federal Reserve Bank of St. Louis
Openness	Ratio of Imports plus Exports to GDP	4.62	8.00	2.11	1.61	Federal Reserve Bank of St. Louis
Education	Tertiary ratio	67.74	94.80	47.12	13.23	World Bank Data Base (WDI)
BC	Business Cycle	1.28	3.95	-3.74	1.23	Federal Reserve Bank of St. Louis

Data from Federal Reserve Bank of St Louis retrieved from http://research.stlouisfed.org/fred2/series and tertiary data is from database World Bank retrieved from http://databank.worldbank.org/ddp/home.do?Step=2&id=4&DisplayAggregation=N&SdmxSupported=Y&CNO=2& SET_BRANDING=YES and data for corporate tax rate from IRS at http://www.irs.gov/uac/SOI-Tax-Stats-Corporation-Tax-Statistics

Table 2. Estimated effects of effective corporate tax rates on macroeconomic variables

Dependent Variables / Independent Variables	Investment	GDP	Productivity	Wage	Unemploy	NROU	CPI
GDP	2.16*** (0.02)						
GDPG				-0.13 (0.01)		-0.005 (0.005)	
Corptax	-0.31*** (0.048)	-0.15** (0.02)	-0.26*** (0.05)	-0.40*** (0.06)	0.052* (0.03)	0.10*** (0.02)	0.09*** (0.01)
Inv					-0.21*** (0.03)		
Capital		1.02*** (0.01)					
Labor		0.46* (0.26)					
M2							0.57*** (0.006)
Unemploy			-0.22*** (0.03)				
Wage			0.45** (0.07)				
Rinterest	0.13*** (0.01)					0.033*** (0.005)	
CPI					0.33*** (0.05)		
Oilp			-0.20*** (0.02)			-0.03*** (0.004)	
Openness				1.07*** (0.07)			
Education				0.75*** (0.09)	-0.0007 (0.0007)		
Unemploy(-1)					0.92*** (0.02)	0.25*** (0.01)	
R-Squared	0.98	0.99	0.74	0.93	0.96	0.81	0.97
F Statistic	2563.57	8487.63	60.59	424.15	1032.98	153.02	4422.45

* Statistically significant at 10%, ** statistically significant at 5%, *** statistically significant at 1%. Numbers in parentheses are standard errors.