TAX AND GROWTH IN A DEVELOPING COUNTRY: THE CASE OF BRAZIL

Adolfo Sachsida[1]
Institute for Applied Economic Research.
Email: sachsida@hotmail.com.

Mario Jorge Mendonça
Institute for Applied Economic Research.
Email: mario.mendonca@ipea.gov.br

Tito Belchior Silva Moreira
Catholic University of Brasilia:
Email: tito@pos.ucb.br

Abstract:

This paper uses Brazilian quarterly data, from the period Jan/2002 to June/2015, to estimate the impact of taxes over GDP per capita. The econometric results show a negative and statistically significant impact of the overall tax burden over per capita GDP. In average, an increase of 1 percent in the overall tax burden decreases GDP per capita by 0.3 percent. This result is very similar in magnitude with those presented by Heady et al. (2011). Furthermore, additional econometric results pointed out that a revenue neutral fiscal policy which changes the tax structure toward consumption taxes and personal income taxes would improve economic growth. Besides that, we strongly recommend against both taxes over the capital stock (mainly the recurrent ones) and the corporate income taxes.

Keywords: tax, economic growth, fiscal policy prescription.

1. Introduction

There is a considerable debate over the relation between taxes and economics performance. Recently, Heady et al. (2011) elaborated a ranking of taxes stating that

---

changing the tax mix in direction of more consumption taxes (and away from corporate income tax) would improve economic performance.

We follow the idea presented in Heady et al. (2011) and estimated a tax ranking for a developing country (Brazil). This paper contributes to the literature applying the methodology developed by Heady et al. (2011) to a single country. Instead of a panel data technique this paper makes use of a time series approach to verify the impact of taxes over the Brazilian GDP per capita.

The econometric results show a negative and statistically significant impact of the overall tax burden over per capita GDP. In average, an increase of 1 percent in the overall tax burden decreases GDP per capita by 0.3 percent. This result is very similar in magnitude with those presented by Heady et al. (2011). Furthermore, our policy prescription is very similar of that presented by Heady et al. (2011), that is, a revenue neutral fiscal policy which changes the mix of tax burden toward consumption and personal income taxes and away from corporate taxes has the potential to improve the economic performance.

Besides this introduction, section 2 presents the econometric results, and section 3 concludes the paper.

2. Econometric Results

This paper uses Brazilian quarterly data, from the period Jan/2002 to June/2015, to estimate the impact of taxes over GDP per capita. After that we are able to elaborate a tax growth ranking suggesting the better mix of taxes to improve Brazilian economic growth rate. The full description of all variables adopted in this article can be obtained in Sachsida and Mendonca (2016).

A brief overview of the Brazilian tax mix can be seen in Table A bellow. As can be seen during the period Brazilian tax system relies a lot on consumption taxes (75.2 percent of the taxes revenue come from this source), followed by income taxes and taxes over capital stock or wealth (mainly the recurrent ones). Furthermore, we can infer that this tax mix was constant over the period of our analysis.

Table A: Brief Overview of the Brazilian Tax Structure, percentage of each tax in relation to the overall tax burden.

Tax Structure	Average	Maximum	Minimum	Std. Deviation
Personal Income Tax	10.8%	14.32%	8.63%	1.32%
Corporate Income Tax	9.9%	13.29%	6.49%	1.61%
Consumption Tax	75.2%	80.37%	68.77%	3.04%
Non-Recurrent Tax on Properties	0.6%	1.00%	0.35%	0.17%
Recurrent Tax on Properties	3.4%	7.12%	1.51%	1.92%

The econometric strategy to verify the impact of the tax mix overgrowth will closely follow Heady, Johansson, Arnold, Brys and Vartia (2009). The major difference is that in this paper we will use time series techniques to check the tax mix effect over a specific country, while Heady at all (2009) adopt panel data techniques in a set of OECD countries.

Let us begin with a simple estimation of the impact of the overall tax burden over the Brazilian economic growth. Table 1 presents this result. The physical and human capital and the population are major sources for growth in the economic textbooks. In Table 1 we present two different proxies for each one of these variables. The effect of physical capital over growth is positive in all four regressions (and statistically significant in three of them). The effect of human capital over growth is positive and significant in three specifications (and statistically insignificant in the other one). As soon as there are a lot of critics about how to measure human and physical capital, we will not detail our analysis here. The idea of this paper is to verify the impact of taxes over growth, and in line with it we can infer about a negative impact of the overall tax burden over real GDP per capita. Column (1) of Table 1 shows that an increase of 1 percent in the overall tax burden decreases real GDP per capita by 0.3 percent, and similar results are presented in the other columns. The four columns in Table 1 present similar qualitative results about the negative, and statistically significant, effect of the overall tax burden over per capita

GDP. This reinforces and gives more confidence to the negative effect of taxes over growth showing the robustness of the tax results.

Table 1: The effect of the Overall Tax Burden over real GDP per capita[#]

Dependent variable: Ln of real GDP per capita	(1)	(2)	(3)	(4)
Baseline Model				
Ln of Physical Capital (k)	2.46*** (.539)	1.42*** (.413)		
Ln of Human Capital (average years of schooling)	-0.58 (.773)			
Ln of Population (population)	1.01 (.731)		-0.18 (.588)	
Control Variable				
Ln of the Overall Tax Burden (total revenues / GDP)	-0.32*** (.107)	-0.33*** (.103)	-0.38*** (.122)	-0.33*** (.103)
Other proxies				
Ln of per worker Physical Capital (kpea)			0.75 (.459)	1.42*** (.413)
Ln of Human Capital (illiteracy rate of population over 15 years old)		-0.52*** (.176)	-1.35*** (.223)	-0.52*** (.176)
Ln of Economically Active Population (pea)		0.12 (.433)		1.55*** (.343)
Constant	-82.01*** (24.19)	-34.34*** (9.38)		-34.34*** (9.38)
Observations	54	54	54	54
	$F_{(4, 49)}$ = 211.87	$F_{(4, 49)}$ = 246.38	$F_{(4, 49)}$ = 170.79	$F_{(4, 49)}$ = 246.38
	Adj R-squared = 0.940	Adj R-squared = 0.948	Adj R-squared = 0.927	Adj R-squared = 0.948

#: Standard errors are in brackets. *: significant at 10 % level; ** at 5% level; *** at 1 % level. The inclusion of lags does not change qualitatively the results. The inclusion of other variables as trade openness, a trend variable, and the debt ratio to GDP do not change qualitatively the results.

In the next step, let's follow Heady at all (2009) and change our estimative from level variables to first differences. The idea is that we can replicate a long run pattern by a short run relationship with an error correction term. Additionally, we can include other control variables in the regression to check the robustness of the econometric findings.

Table 2 verifies the effect of changes in the overall tax burden over growth (growth rate of real GDP per capita). Because our human capital proxies are in annual basis, we include its fourth difference to verify if results would change. Again, the tax results are robust to it. In all the specifications we find a negative and statistically significant effect of the overall tax burden over growth, ranging from -0.12 to -0.23. That is, a 1 percent increase in the overall tax burden would decrease growth by a value between 0.12 and 0.23 percent. This result is robust to a wide range of different specifications.

Table 2: The effect of Changes in the Overall Tax Burden over Growth[#]

Dependent variable: growth rate of real GDP per capita	(1)	(2)	(3)	(4)
Baseline Model				
ΔLn of Physical Capital	0.49 (.581)	1.84** (.880)		
ΔLn of Human Capital	-3.31*** (4.37)			
Δ4Ln of Human Capital		-0.14 (.117)		
ΔLn of Population	0.41 (2.46)	1.44 (3.66)		
Control Variable				
ΔLn of the Overall Tax Burden (total revenues / GDP)	-0.12** (.052)	-0.23*** (.077)	-0.16** (.074)	-0.15** (.059)
Other Proxyes				
ΔLn of per worker Physical Capital (kpea)			1.68** (.831)	0.82 (.728)

ΔLn of Human Capital (illiteracy rate of population over 15 years old)				1.14*** (.290)
Δ4Ln of Human Capital (illiteracy rate of population over 15 years old)			0.02 (.063)	
ΔLn of Economically Active Population (pea)			1.37 (1.31)	0.53 (1.07)
Error Correction$_{-1}$	-0.254** (.099)	-.485*** (.152)	-0.814*** (1.41)	-0.488*** (.135)
Constant	0.02** (.008)	-0.004 (.012)	0.001 (.006)	0.01** (.006)
Observations	53	50	50	53
	F(5, 47) = 24.92	F(5, 44) = 6.63	F(5, 44) = 13.08	F(5, 47) = 19.16
	Adj R-squared = 0.697	Adj R-squared = 0.364	Adj R-squared = 0.552	R-squared = 0.670

#: Standard errors are in brackets. *: significant at 10 % level; ** at 5% level; *** at 1 % level. The inclusion of other variables as change in the trade openness and in the debt to gdp ratio did not change qualitatively the results.

In Table 3 we are going to disentangle the tax burden in its different components. This will allow us to estimate a tax rank of the effect of different types of taxes over real GDP per capita. We follow the same tax division adopted by Heady, Johansson, Arnold, Brys and Vartia (2009), that is, income taxes (personal income tax and corporate income tax), consumption taxes (included here are the production taxes), and property taxes (recurrent and non-recurrent property taxes)[2].

All of the baseline variables are statistically significant at 1 percent level, and all of them have the expected signal. As predicted by theory, in the long run, real GDP per capita is positively affected by physical and human capital, and by the size of the economically active population. Following the results, we can infer that taxes over the capital stock (mainly the recurrent ones) are the worst for economic growth. In other words, a higher level of GDP per capita can be obtained changing the tax system in

---

[2] Sachsida and Mendonca (2016) provide a full description of where each tax was allocated.

direction of income and consumption taxes and decreasing the taxation over the capital stock.

Table 3: The effect of the Overall Tax Burden over real GDP per capita, and the tax rank[#]

Dependent variable: Ln of real GDP per capita	(1)	(2)	(3)	(4)
Baseline Model				
Ln of per worker Physical Capital (kpea)	1.70*** (.449)	1.65*** (.454)	1.06*** (.358)	1.04*** (.364)
Ln of Human Capital (illiteracy rate of population over 15 years old)	-0.51*** (.174)	-0.50*** (.181)	-0.85*** (.141)	-.80*** (.204)
Ln of Economically Active Population (pea)	1.55*** (.339)	1.57*** (.353)	0.94*** (.271)	.97*** (.286)
Control Variable				
Ln of the Overall Tax Burden (total revenues / GDP)	-0.22* (.126)	-0.24* (.132)	0.003 (.110)	-0.009 (.129)
Tax Structure Variables				
1) Income Taxes	-0.139 (.094)			
Personal Income Taxes		-0.056 (.056)		
Corporate Income Taxes		-0.057 (.050)		
2) Consumption Taxes			0.138 (.285)	.072 (.297)
3) Property Taxes			-0.069*** (.022)	
Recurrent Taxes on Property				-.059*** (.021)
Other property taxes				.005 (.051)
Constant	-37.95*** (9.59)	-37.69*** (9.89)	-18.73** (7.81)	-19.12** (8.09)

Observations	54	54	54	54
	F(5, 48) = 202.26	F(6, 47) = 162.79	F(6, 47) = 312.36	F(7, 46) = 267.02
	Adj R-squared = 0.950	Adj R-squared = 0.948	Adj R-squared = 0.972	Adj R-squared = 0.972
Revenue-neutrality achieved by adjusting	2 and 3	2 and 3	1	1

#: Standard errors are in brackets. *: significant at 10 % level; ** at 5% level; *** at 1 % level.

Table 4 verifies the impact of changes in the tax mix over real GDP per capita growth. In relation to real GDP per capita growth, corporate income taxes look to be the worst of them, followed by taxes in the capital stock (mainly recurrent ones). The policy prescription here is clear: changing the tax system toward consumption taxes, or personal income tax, can improve economic growth.

Table 4: The Effect of Changes in the Tax Mix over Growth.

Dependent variable: growth rate of real GDP per capita	(1)	(2)	(3)	(4)
Baseline Model				
ΔLn of per worker Physical Capital (kpea)	1.81** (.857)	1.29 (.840)	0.39 (.494)	0.53 (.509)
Δ4Ln of Human Capital (illiteracy rate of population over 15 years old)	0.09 (.084)	0.004 (.091)	-0.02 (.048)	-0.02 (.049)
ΔLn of Economically Active Population (pea)	1.50 (1.34)	1.36 (1.28)	0.55 (.771)	0.75 (.801)
Control Variable				
ΔLn of the Overall Tax Burden (total revenues / GDP)	-0.04 (.115)	0.02 (.116)	0.12 (.076)	0.12 (.089)
Tax Structure Variables				

1) Income Taxes	-0.163* (.084)			
Personal Income Taxes		-0.030 (.045)		
Corporate Income Taxes		-0.115** (.042)		
2) Consumption Taxes			0.283 (.191)	0.225 (.212)
3) Property Taxes			-0.049*** (.012)	
Recurrent Taxes on Property				-0.037*** (.012)
Other property taxes				0.028 (.038)
Error Correction$_{-1}$	-.768*** (.144)	-.700*** (.141)	-.197* (.110)	-.195* (.112)
Constant	-.768*** (.006)	.002 (.006)	.006 (.003)	.004 (.004)
Observations	50	50	50	50
	F(6, 43) = 10.46	F(7, 42) = 10.59	F(7, 42) = 39.80	F(8, 41) = 33.87
	Adj R-squared = 0.536	Adj R-squared = 0.578	Adj R-squared = 0.847	Adj R-squared = 0.842
Revenue-neutrality achieved by adjusting	2 and 3	2 and 3	1	1

#: Standard errors are in brackets. *: significant at 10 % level; ** at 5% level; *** at 1 % level.

The comparison of our results with those presented by Heady, Johansson, Arnold, Brys and Vartia (2009) is straightforward. In their paper the tax ranking is the following: the best taxes should rely on immovable property (recurrent taxes over immovable property), followed by consumption taxes, personal income taxes, and the worst of them corporate income taxes. In our paper, the worst taxes are related with both capital stock (recurrent taxes) and corporate income taxes. And the best ones are related to consumption and personal income taxes.

Besides some differences, the policy prescriptions are very similar between our findings and those of Heady at all (2009). Both papers suggest that a change toward consumption taxes would improve growth. And both paper strongly advice against taxes over corporate income. Table B resume the main findings of the literature about tax and growth.

Table B: International Results about Tax and Growth

Tax over:	Personal income	Corporate income	Consumption	Property	Capital income
Angelopoulos, Economides and Kammas (2007)	- (labor income tax)	+			+
Heady, Johansson, Arnold, Brys and Vartia (2009)	-	-	+	+	
Acosta-Ormaechea and Yoo (2012)	-	-	+	+	
Ojede and Yamarik (2012)	No effect	No effect	- (long run)	- (short and long run)	
Xing (2012)	No evidence	No evidence	No evidence	+ (long run)	
Our Results	+	-	+	-	

3. Conclusion

This paper analyses the effect of the tax burden over GDP per capita and its growth. Our paper follows the recent development in the literature of taxes and growth as stated by Heady, Johansson, Arnold, Brys and Vartia (2009).

The econometric results pointed out for a negative effect of overall tax burden over both the level and the growth of GDP per capita. In relation to the level of GDP per capita, this negative effect ranges around -0.3. In other words, an increase of 1% in the overall tax burden decreases real GDP per capita by 0.3%. This is a strong and statistically significant negative effect of overall tax burden over GDP per capita. In relation to the growth level of GDP per capita, the change in the overall tax burden has a negative impact close to 0.15.

Furthermore, additional econometric results pointed out that a revenue neutral fiscal policy which changes the tax structure toward consumption taxes and personal

income taxes would improve economic growth. Besides that, we strongly recommend against both taxes over the capital stock (mainly the recurrent ones) and the corporate income taxes.

Bibliography

Acosta-Ormaechea, S. and Yoo, J. (2012) "Tax Composition and Growth: A Broad Cross-Country Perspective". IMF WorkingPaper, WP/12/257, Fiscal AffairsDepartment, October.

Angelopoulos, K. and Economides, G., and Kammas, P. (2007) "Tax-spending policies and economic growth: Theoretical predictions and evidence from the OECD".European Journal of PoliticalEconomy, vol. 23(4), pages 885-902, December.

Heady, C., Arnold, J., Brys, B., Johansson, A., Schwellnus, C., and Vartia, L. (2011) "Tax Policy for Economic Recovery and Growth".Economic Journal, v. 121, issue 550, pages:F59-F80.

Heady, C., Johansson, A., Arnold, J., Brys, B., and Vartia, L. (2009) "Tax Policy for Economic Recovery and Growth". University of Kent School of Economics Discussion Papers, December, KDPE 0925.

Kaplow, L. (2010) "The theory of taxation and public economics". Princeton University Press, 472 p.

World Bank. "Doing Business (2015)".12ª edition.Online: http://portugues.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB15-Full-Report.pdf.

Ojede, A. and Yamarik, S. (2012) "Tax policy and state economic growth: The long-run and short-run of it".Economics Letters, vol. 116(2), pages 161-165.

Sachsida, A. and Mendonca, M.J.C. (2016) "Tax and Growth in a Developing Country: The Case of Brazil". Texto para Discussao do IPEA.

Xing, J. (2012) "Tax structure and growth: How robust is the empirical evidence?" Economics Letters, vol. 117(1), pages 379-382.