Tax Design in the OECD: A test of the Hines-Summers Hypothesis

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Abstract

This paper investigates the effects of economic size and trade openness on tax design in the OECD. Using data for thirty OECD countries over the 1965-2007 period, we test the recently proposed Hines-Summers [2009] Hypothesis, according to which the smaller the size and the greater the openness of the economy, the more it will rely on expenditure taxes and the less on income taxes. Our findings show that the Hines-Summers Hypothesis can claim broad, statistically significant, and robust empirical support in the OECD data sets we examined.

Keywords: Income tax, Consumption tax, Country size, Trade openness.
JEL codes: E62, H20.

INTRODUCTION

The OECD countries have been raising tax revenues in remarkably different ways. For example, the United States and Japan raise almost half of total revenue with income taxes and less than one-fifth by expenditure taxes (taxes on goods and services). On the other hand, Mexico and Korea rely on expenditure taxes for half of their revenue, and income taxes for around one-quarter.

What can account for such marked differences? In a recent contribution, Hines and Summers [2009] argue that differences in tax design can be attributed to differences in country size and trade openness. Their argument is simple, but very intuitive. Because of globalization, governments find themselves operating in an environment of increasing mobility of economic activity and factors of production. As a result, countries which are small and open have tax bases that are more mobile than countries that are larger or less open. Therefore, small open countries have an incentive to rely less on income taxes and more on expenditure taxes, compared to larger and less open economies. Indeed, *the smaller the size and the greater the openness of the economy, the more it will rely on expenditure taxes and the less on income taxes*. We call this the Hines-Summers Hypothesis.

The implications of the Hines-Summers Hypothesis are clearly important. First, it is well known that income taxes and expenditure taxes have very different properties both in terms of economic efficiency and distributional equity. In particular, income taxes are generally more distortionary, but expenditure taxes are usually less progressive. The Hines-Summers Hypothesis is also important because of its policy implications in a world of increasing mobility of economic factors.

The literature on globalization and tax design has generally focused on tax competition as an outcome of increasing factor mobility [OECD, 2008].[1] In the fact of tax competition, national government will reduce their autonomy both in terms of rising taxes and in the provision of public goods [Wilson, 1986; Zodrow et al. 1986]. Moreover, tax competition is likely to increase the convergence and harmonization of the tax systems among countries,[2] in order to reduce negative spillover effects that government decision of one country can have on other countries.[3]

More recently, according to the Hiners-Summers Hypothesis, another effect of globalization on tax design is expected to occur through changes in the share of income and expenditure taxes as a result of an increasing degree of openness.

The purpose of the present paper is to test the validity of the Hines-Summers Hypothesis for the OECD countries. In particular, we will try to assess whether the fraction of revenue raised by income taxes is indeed increasing with country size and decreasing with trade openness, while the fraction raised by expenditure taxes is decreasing with country size and increasing with trade openness.

To this purpose we use annual data for a set of thirty OECD countries for most of which we have data from 1965 to 2007.

Our results are broadly consistent with the Hines-Summers hypothesis. Thus, the evidence suggests that higher economic size is associated with increased reliance on income taxes and reduced reliance on consumption taxes, while the opposite holds true for greater trade or financial openness. Moreover, our estimates are quantitatively substantial, statistically significant, and robust.

The rest of the paper is organized as follows. The next section describes the empirical methodology and the data we use to assess the effects of country size and trade openness on tax design. The third section presents and discusses the empirical results, and the fourth section concludes.

DATA AND EMPIRICAL METHODOLOGY

All tax data are from the *Revenue Statistics of OECD* database. For country *i* and year *t*, we use $T_{i,t}$ to denote total tax revenue, $T_{i,t}^{Y}$ for revenue from income taxes (defined as taxes on income, profits, and capital gains), and $T_{i,t}^{E}$ for revenue from expenditure taxes (defined as taxes on goods and services). Then we construct the fractions of tax revenue raised by income or expenditure taxes as:

$$\tau_{i,t}^{Y} = \frac{T_{i,t}^{Y}}{T_{i,t}} \tag{1}$$

and

$$\tau_{i,t}^{E} = \frac{T_{i,t}^{E}}{T_{i,t}} \tag{2}$$

respectively.[4]

For economic size, we mostly use a country's relative economic activity, which we measure by the country's real GDP as a fraction of the group's total real GDP:

$$size_{i,t} = \frac{GDP_{i,t}}{\sum_{i} GDP_{i,t}} \tag{3}$$

As will be discussed below, the alternative measure of population size will also be used, as in Hines and Summers [2009].

Finally, for openness we first rely on the usual construct of trade openness, given by the ratio of total trade (exports plus imports) to GDP:

$$open_{i,t} = \frac{EX_{i,t} + IM_{i,t}}{GDP_{i,t}} \qquad (4)$$

In the next section we will also consider two measures of financial openness, as well.

Data on GDP, exports and imports are from the OECD Analytical Database.

Table 1 provides a list of the 30 OECD economies together with country averages for our basic series.[5] For 23 of these countries (in bold on Table 1), the data are available for the entire 1965-2007 period – we call this set of countries the Full-Data Countries.

Table 1 displays the sizable differences in tax design across these countries. Focusing on the Full-Data Countries, for example, the fraction of tax revenue from income taxes has varied from 18% in Greece to 57% in Denmark. The fraction of expenditure taxes has ranged from 18% of GDP in Japan to 44% of GDP in Ireland.

At the same time, economic size and trade openness also differ substantially. As expected, the US is both the largest economy, accounting for 38% of the group's GDP, and the less open, with total trade (imports plus exports) equal to 19% of domestic GDP. Japan is the second largest economy, while at the other end there are several countries with economic size around 1% or less of group GDP. The most open economy in the sample is Luxembourg, with total trade equal to 200% of domestic GDP. As expected, the correlation between economic size and trade openness is negative.[6]

<<Table 1 here>>

In order to assess more formally the effects of country size and trade openness on tax design, we will estimate models of the basic form:

$$\tau_{i,t}^{Y} = \alpha_0 + \alpha_1 size_{i,t} + \alpha_2 open_{i,t} + \boldsymbol{\gamma}' \mathbf{X}_{i,t} + \varepsilon_{i,t}^{Y} \qquad (5)$$

and

$$\tau_{i,t}^{E} = \beta_0 + \beta_1 size_{i,t} + \beta_2 open_{i,t} + \boldsymbol{\delta}' \mathbf{X}_{i,t} + \varepsilon_{i,t}^{E} \qquad (6)$$

where the α's, β's, γ's, and δ's are parameters to be estimated, and $\mathbf{X}$ is a set of demographic, macroeconomic and political controls including: *i*) population; *ii*) rural population; *iii*) population density; *iv*) unemployment rate; *v*) a measure of income inequality (the Gini coefficient of income distribution); *vi*) a dummy variable that takes a value equal to 1 for a presidential regime and zero otherwise; *vii*) a dummy that takes a value equal to 1 for a proportional parliamentary system and zero otherwise; and *viii*) a dummy that takes a value equal to 1 for left government and zero otherwise. The error terms $\varepsilon_{i,t}^{Y}$ and $\varepsilon_{i,t}^{E}$ are modeled as $\varepsilon_{i,t}^{Y} = \mu_i^{Y} + \lambda_t^{Y} + v_{i,t}^{Y}$ and $\varepsilon_{i,t}^{E} = \mu_i^{E} + \lambda_t^{E} + v_{i,t}^{E}$, where the μ's and λ's can be estimated as fixed or random effects.

Thus, an additional difference between our paper and Hines-Summers [2009] is that we include both *size* and *openness* in the estimated models simultaneously. Note that the Hines-Summers Hypothesis predicts $\alpha_1 > 0$, $\alpha_2 < 0$, $\beta_1 < 0$, and $\beta_2 > 0$.

RESULTS

The estimation results of equations (5) and (6) are displayed in Tables 2 and 3. All models have been estimated both for the entire sample of 30 economies and for the 23 countries in the Full-Data sample, but the tables focus on the full-sample results to preserve space.

Starting with Table 2, the dependent variable is τ^{Y}, the fraction from income taxes. Column (1) of the table reports the estimation results obtained when the fraction from income taxes is regressed only on *openness* and *size*. The estimated coefficient of

size is statically significant and positive, and therefore consistent with the Hines-Summers Hypothesis. The coefficient of *openness* is negative, as predicted by the theory, but not statistically significant at 10%. Country fixed effects are jointly statistically significant and the high R^2 suggests that a large part of the variation of the fraction from income taxes is explained.

<<Table 2 here>>

At the same time, however, additional variables may significantly influence our dependent variable, in which case the estimates of column (1) could be biased. To allow for this we repeat the estimation including various sets of the controls identified in the previous section. These are reported in columns (2)–(5) of Table 2 and show the controls to be statistically significant most of the time. More important for our purposes, however, is that the inclusion of these controls does not alter the signs of the *size* and *openness* coefficients, which remain consistent with the Hines-Summers Hypothesis. Moreover, the coefficients of both variables are generally statistically significant when the controls are included.

Table 3 presents the results obtained when the dependent variable is τ^E. Columns (1) – (5) of Table 3 are organized in a manner similar to that of Table 2. It is apparent that the results from all the different specifications estimated are consistent with the Hines-Summers Hypothesis. In particular, the estimated coefficient of *size* is negative and statistically significant, while the coefficient of *openness* is positive and statistically significant, as well. It is also worth noticing that most of the controls enter the τ^E and τ^y regressions with opposite signs, so that *size* and *openness* are not unique in that regard.

<<Table 3 here>>

For robustness purposes we have also estimated equations (5) and (6) with several different methods: i) country-specific fixed effects (our baseline method); ii) country- and time-specific fixed effects, iii) country-specific fixed effects and random time effects; iv) Instrumental Variables, in which openness and size are instrumented by their own lags; and v) Instrumental Variables and time-specific fixed effects.

The results (not reported here because of space considerations, but available on request) confirm the validity of the Hines-Summers Hypothesis. In particular, for the fraction of revenue from income taxes the coefficient of *openness* is negative and that of *size* is positive; while for the fraction of revenue from expenditure taxes the coefficient of *openness* is positive and the one associated with *size* is negative.

As an additional robustness check we try to assess whether our findings would be robust to different measures of "openness". In particular, we ask whether our results are robust to using financial openness instead of trade openness. To this purpose we use the two measures of financial integration proposed by Lane and Milesi-Ferretti [2007]. The first is the share of the total stock of external asset and liabilities to GDP, while the second is the share of the sum of the total stock of portfolio asset and liabilities and the stock of direct investment asset and liabilities to GDP. The results we obtain when equations (5) and (6) are estimated for these two alternative measures of openness are reported in Table 4. These results confirm for both measures the negative relationship between financial openness and the income tax share, and the positive relationship between financial openness and the expenditure tax share. This, together with the fact that the results obtained for the coefficients of *size* are unaffected, is once again consistent with the Hines-Summers Hypothesis.

<<Table 4 here>>

Finally, we combine the models of equations (5) and (6), using the ratio of income to expenditure taxes as the dependent variable:[7]

$$\frac{\tau_{i,t}^{Y}}{\tau_{i,t}^{E}} = \theta_0 + \theta_1 size_{i,t} + \theta_2 open_{i,t} + \boldsymbol{\delta}' \mathbf{X}_{i,t} + \varepsilon_{i,t}^{R} \qquad (7)$$

The predictions of the Hines-Summers Hypothesis now become $\theta_1 > 0$, and $\theta_2 < 0$. Table 5 reports various specifications of model (7). As expected, the coefficients of *size* are indeed positive and statistically significant, while those of *openness* are negative and also statistically significant. This of course confirms that larger and/or less open economies have higher ratios of income to expenditure taxes.

<<Table 5 here>>

Summarizing, we find that our results paint fundamentally the same picture: all components of the Hines-Summers Hypothesis can claim broad, statistically significant, and robust empirical support.

CONCLUSION

This paper investigated the effects of economic size and trade openness on tax design in the OECD. We believe this is a worthwhile exercise not only because different types of taxes are well known to have different effects on economic activity and welfare, but also because observable differences in tax design across OECD countries are quite large.

Our main goal has been to test the Hines-Summers [2009] hypothesis which predicts that the reliance on income taxes should be increasing with economic size and

decreasing with openness; while, on the contrary, reliance on expenditure taxes should be decreasing with economic size and increasing with openness.

Our results show that the Hines-Summers Hypothesis can claim broad, statistically significant, and robust empirical support in the OECD data sets we examined. In particular, the smaller the size and the greater the openness of the economy, the more it has relied on expenditure taxes and the less on income taxes.

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Notes

1. For a comprehensive review on tax competition see Wilson [1999].

2. See; for example; Tanzi [1995]; Dhillon et al .[1999]; Peralta and van Ypersele [2002]; Brueckner [2006]; Dhillon et al. [2007]; Devereux et al. [2008]; Hauptmeer et al. [2009].

3. These hypotheses have been extensively tested in the literature [Garrett (1996); Garrett (1998a); Garrett (1998b); Rodrik (1997); Hallerberg and Badinger; (1998); Swank (1998); Grubert (2001); Swank and Steimmo (2002); Slemrod (2004)].

4. As Table 1 below makes clear, $\tau_{i,t}^{E}$ and $\tau_{i,t}^{Y}$ do not add up to one because of the existence of other categories of taxes, such as property taxes, social security contributions, and "other" taxes.

5. Country selection is dictated by data availability only.

6. The correlation coefficient is –0.40 for the sample of all 30 countries, and –0.40 for the Full-Data subsample.

7. We are grateful to an anonymous referee for suggesting this test.

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Table 1. Sample Means

	$\overline{\tau^Y}$	$\overline{\tau^E}$	$\overline{size}$	$\overline{open}$
1. **Australia**	55.6	30.1	1.55	33.4
2. **Austria**	26.8	31.9	0.81	71.2
3. **Belgium**	37.0	28.1	1.01	127.8
4. **Canada**	45.6	29.7	2.87	56.9
5. Czech Republic	24.1	31.3	0.24	120.2
6. **Denmark**	57.1	35.2	0.70	71.3
7. **Finland**	40.5	34.0	0.50	57.8
8. **France**	18.2	30.3	5.72	42.6
9. **Germany**	32.4	28.1	8.19	61.4
10. **Greece**	18.0	43.0	0.65	44.7
11. Hungary	23.5	38.5	0.23	111.8
12. Iceland	31.9	51.7	0.03	72.1
13. **Ireland**	35.0	43.9	0.28	115.2
14. **Italy**	30.0	29.4	4.80	41.7
15. **Japan**	42.5	18.0	19.16	21.9
16. Korea	28.5	49.5	1.34	65.0
17. **Luxembourg**	39.6	24.4	0.06	201.6
18. Mexico	26.4	55.0	2.16	34.3
19. **Netherlands**	30.3	27.1	1.55	107.8
20. **New Zealand**	63.0	29.5	0.23	55.3
21. **Norway**	39.2	36.3	0.64	73.6
22. Poland	26.7	34.9	0.67	57.4
23. **Portugal**	23.7	43.6	0.42	58.3
24. Slovakia	20.4	36.3	0.09	139.6
25. **Spain**	26.0	28.9	2.33	38.6
26. **Sweden**	43.7	26.3	1.10	65.0
27. **Switzerland**	44.7	23.8	1.21	71.0
28. **Turkey**	35.3	39.2	0.95	25.5
29. **UK**	38.7	30.6	6.34	51.3
30. **USA**	47.1	18.4	37.96	18.9

Notes: τ_Y is the fraction of total tax revenue from income taxes (defined as taxes on income, profits and capital gains); τ_E is the fraction of total tax revenue from expenditure taxes (defined as taxes on goods and services); *size* is the country's GDP in US dollars as a fraction of total OECD GDP in US dollars; and *open* is trade openness measured by the sum of exports plus imports divided by GDP.

The 23 countries in bold (the Full-Data countries) have data available for the entire period of 1965-2007. The other seven economies have shorter time periods.

Table 2. Dependent Variable: *Income tax share* -- Country Fixed Effects

		(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Openness	-0.017	-0.014	-0.029	-0.026	-0.044
		(-1.49)	(-1.22)	(-2.31)**	(-2.02)**	(-3.55)***
	Size	2.068	6.454	4.184	1.745	8.261
		(3.94)***	(10.38)***	(7.32)***	(2.12)**	(8.12)***
Demographic controls	Population	-	-0.103	-	-	-0.040
			(-6.03)***			(-2.08)**
	Rural Population	-	0.158	-	-	0.141
			(3.85)***			(3.03)***
	Population Density	-	-0.133	-	-	-0.183
			(-10.19)***			(-9.63)***
Macroeconomic controls	Unemployment rate	-		-0.067	-	-0.276
				(-1.35)		(-4.99)***
	Inequality (Gini coefficient)	-		-46.724	-	-40.690
				(-7.28)***		(-6.13)***
Political controls	Presidential	-		-	3.978	2396.125
					(4.80)***	(5.03)***
	Proportional	-		-	-0.001	-4.784
					(-0.28)	(-5.02)***
	Left	-		-	-0.162	-0.362
					(-0.60)	(-1.37)
Adjusted-R^2		0.87	0.89	0.89	0.91	0.93
N		1109	1073	927	724	607

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5% and 1%, respectively.

Table 3. Dependent Variable: *Expenditure tax share* -- Country Fixed Effects

		(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Openness	0.062	0.039	0.066	0.034	0.025
		(6.69)***	(4.01)***	(6.30)***	(3.15)***	(2.31)***
	Size	-8.214	-8.861	-9.994	-3.781	-8.304
		(-17.93)***	(-17.23)***	(-20.34)***	(-5.34)***	(-10.61)***
Demographic controls	Population	-	0.041	-	-	0.025
			(3.16)***			(2.34)**
	Rural Population	-	-0.066	-	-	-0.165
			(-1.53)			(-3.77)***
	Population Density	-	0.074	-	-	0.158
			(6.27)***			(9.72)***
Macroeconomic controls	Unemployment rate	-		-0.112	-	0.085
				(-2.73)***		(1.76)*
	Inequality (Gini coefficient)	-		51.690	-	12.385
				(8.98)***		(1.88)*
Political controls	Presidential	-		-	-1.947	-4524.125
					(-1.55)	(-6.98)***
	Proportional	-		-	0.004	9.050
					(1.51)	(-6.98)***
	Left	-		-	0.655	0.179
					(2.29)**	(0.76)
Adjusted-R^2		0.85	0.85	0.88	0.88	0.91
N		1109	1073	927	724	607

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5% and 1%, respectively.

Table 4. Two Measures of Financial openness -- Country Fixed Effects

		Income tax share		***Expenditure tax share***	
		1st measure	**2nd measure**	**1st measure**	**2nd measure**
	Openness	-0.069	-1.000	0.073	0.116
		(-1.92)*	(-2.09)**	(2.68)***	(3.32)***
	Size	8.328	8.155	-9.214	-9.059
		(9.69)***	(9.59)***	(-13.58)***	(-13.92)***
Adjusted-R^2		0.94	0.94	0.92	0.92
N		542	542	607	607

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5% and 1%, respectively. Estimates relative to the full specification in which all controls are included, but not reported.

Table 5. Dependent Variable: *Ratio of Income to Expenditure taxes*

		Baseline	**D**	**M**	**P**	**D+M+P**
	Openness	-0.002	-0.002	-0.003	-0.001	-0.002
		(-3.00)***	(-2.39)**	(-3.40)***	(-1.31)	(-2.13)**
	Size	0.253	0.363	0.392	0.021	0.475
		(7.60)***	(10.36)***	(10.61)***	(0.37)***	(7.18)***
Adjusted-R^2		0.83	0.83	0.84	0.84	0.87
N		1109	1073	927	724	607

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5% and 1%, respectively. D refers to the inclusion of demographic controls; M refers to the inclusion of macroeconomic controls; P refers to the inclusion of political controls; D+M+P all controls are included. Estimates relative to the full specification in which all controls are included, but not reported.