Online appendix

Contextual variation in interdependent policy making: The case of tax competition

Fabio Wasserfallen*

April 2014

Published in the *European Journal of Political Research*

A1 Robustness checks

Table 1 presents three robustness checks. The first two sets of robustness checks (I and II) analyze whether the results are sensitive to the choice of the mean as the travel distance estimate for the construction of the spillover variable and the spatial lag. They show the results using the 1st quartile (1Q), instead of the mean, for the construction of the spatial lag (I) and the spillover variable (II), respectively.

The third set of robustness checks (III) reports findings using instrumented spatial lags. Following the literature, I model tax competition as strategic interaction. Accordingly, the cantons' tax decisions affect one another simultaneously, which might bias the estimates because the tax rate changes of canton i affect the tax policy making of canton j, while the tax rate changes of canton j also affect the tax rate changes of canton i (Franzese & Hays 2007). A possible fix to the simultaneity bias is the use of instrumented spatial lags. Instrumented spatial lags are estimated using the predicted tax rate of competitors, which are a function of valid instruments ($\mathbf{W}\widehat{\mathbf{y}}_t{}^w$). The equation estimating the predicted tax rates includes as explanatory variables partisan, economic, and fiscal measures, as well as a series of cantonal budgetary

*Department of Political Science, University of Zurich, Switzerland. Email: wasserfallen@ipz.uzh.ch URL: www.fabiowasserfallen.ch.

items – such as agriculture, education, and administration spending.[1] The instruments are strong, as they explain tax rates quite precisely, and they should be valid (Sovey & Green 2011).[2] A validity concern might be that budget making is influenced by the tax rate changes of competitors. However, the exclusion restriction also holds for the budgetary variables because the tax rate changes of competitors do not *immediately* affect the rather long-term budget planning of Swiss cantons (note that the endogeneity problem is because of the simultaneity bias). At most, they might have some effect on future spending.

Table 1 shows varying-intercept models [1], varying-slope models [2], and cross-level interaction models [3]. The first two sets of models (I and II) use the 1st quartile, instead of the mean, as travel distance measure for the construction of the spillover variable (I) and the spatial lag (II). The models of the third set (III) are specified using instrumented spatial lags. All control variables are included but not shown. Reported are the point estimates, the standard errors, and the significance levels of the spatial lag and the spillover variables, and the interaction of the two (*** $p > 0.01$, ** $p > 0.05$, * $p > 0.1$) . Findings are robust to all of these alternative specifications: the spatial lag coefficients are significant, allowing the spatial lag slopes to vary increases the model fit substantially, and the estimates of the cross-level interaction model show that the spillover variable explains part of the variation in tax responsiveness between cantons.

[1]Many thanks to Lukas Schmid (University of St. Gallen) for sharing cantonal budgetary data.
[2]The R-squared of the first stage regression is 0.794.

Table 1: *Robustness checks.*

		[1]	[2]	[3]
I)	Spillover (1Q)	-0.660	-0.874**	-0.604
		[0.456]	[0.409]	[0.433]
	Spatial lag (mean)	0.484***	0.506***	0.262*
		[0.050]	[0.070]	[0.147]
	Spillover $*$ spatial lag			0.103*
				[0.056]
	Deviance	933.0	917.2	913.6
II)	Spillover (mean)	-0.965*	-1.223**	-0.900*
		[0.543]	[0.480]	[0.509]
	Spatial lag (1Q)	0.473***	0.499***	0.245
		[0.050]	[0.070]	[0.153]
	Spillover $*$ spatial lag			0.120*
				[0.065]
	Deviance	933.9	916.6	913.0
III)	Spillover (mean)	-0.965*	-1.265***	-0.946*
		[0.543]	[0.475]	[0.507]
	Instrumented spatial lag (mean)	0.523***	0.540***	0.287*
		[0.050]	[0.071]	[0.157]
	Spillover $*$ spatial lag			0.120*
				[0.067]
	Deviance	918.5	899.0	895.6
	N (20 years $*$ 26 cantons)	520	520	520
	Varying intercepts	Yes	Yes	Yes
	Varying spatial lag coefficients	No	Yes	Yes
	Cross-level interaction	No	No	Yes

A2 Summary statistics

Table 2 shows the summary statistics of the variables used in the analysis. Following the set-up of the presented multilevel model specifications, the variations between and within cantons are separated. Level-2 reports the variation between cantons, which is for all variables the variance of the mean over the investigated time period from 1990 to 2009, except in the case of the spillover variable, which has no time-varying dimension. Level-1 shows the temporal variation of the within-canton transformed variables, which are simply the deviations of the observations from the mean (e.g., ${x_{it}}^w = x_{it} - \overline{x}_i$).

Table 2: *Summary statistics*

Variable	Min.	Median	Max.	S.D.
Level-2 (variation between units, $N = 26$)				
Tax rate	8.203	15.963	18.922	2.611
Spillover	0.000	2.131	3.637	0.959
GDP per capita (in CHF)	38,271	49,793	120,616	17,439
Leftist government participation	0.000	0.214	0.430	0.114
Debt per capita (in CHF)	3,102	5,104	27,125	5,618
Population size	14,805	207,642	1,212,367	283,952
Level-1 (variation over time, $N = 520$)				
Tax rate	-3.303	0.160	1.944	0.894
Spatial lag	-1.555	0.139	0.817	0.535
GDP per capita (in CHF)	-23,333	-310.93	33,864	4,985
Leftist government participation	-0.336	0.000	0.236	0.077
Debt per capita (in CHF)	-1,369	59.00	914.50	201.40
Population size	-67,467	161.00	120,360	1,644

References

Franzese, Robert J. & Jude C. Hays. 2007. "Spatial Econometric Models of Cross-Sectional Interdependence in Political Science Panel and Time-Series-Cross-Section Data." *Political Analysis* 15:140–164.

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