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Tax mimicking in Spanish municipalities: expenditure spillovers, yardstick competition, or tax competition?

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Abstract

This paper evaluates whether the agency problem in public administration shapes Spanish municipalities' tax policy. To this aim, we have considered 2,431 Spanish municipalities for the period from 2002 to 2013.

We find significant evidence of tax mimicking of neighboring municipalities, in both property tax and car tax. However, incumbents are not signaling their competence through tax competition. Rather, expenditure spillovers explain this interaction. Municipalities seek to have the same services and infrastructures as their neighbors. The fact that there is not tax benchmarking does not mean that the agency problem is not present in Spanish municipalities. The agency problem is one of the reasons corruption is so widespread among Spanish municipalities. Regarding the further policy implications of our findings, legislation should direct municipal governments' decisions towards the real needs of their constituencies.

Keywords: property tax, car tax, tax mimicking, agency problem, municipal government

1 INTRODUCTION

This paper evaluates whether local governments make tax decisions just focusing on their economic or budgetary features or whether the tax rates of neighboring municipalities are also or mainly taken into account.

The theoretical framework surrounding this tax competition strategy would be the *principal-agent problem* (*agency problem*). This theory says that the agent is better informed than the principal in a political setting in which voters, as principals, elect politicians who, as agents, make policy choices that affect voters (Alt, Lassen and Shanna, 2006). The *principal-agent theory* shows that lack of transparency may create an advantage for policymakers in achieving their goals: incumbents may mimic neighboring tax rates to signal their competence with the aim of being re-elected. Electoral competition is an effective solution to the *principal-agent problem* among politicians and voters (Wittman, 1989). This author argues theoretically that competition, reputation and monitoring reduce opportunistic behavior on the part of politicians. Nevertheless, we assume that, in an environment of political competition, elected officials can be expected to exaggerate their accomplishments through budget manipulation (Mayper, Granof and Giroux, 1991). One way to signal their competence is to benchmark neighboring councils' tax rates.

Within the *agency theory*, the literature has used three specific mechanisms to explain this fiscal interaction or competition among local governments (municipalities, regions, or states): *expenditure spillovers*, *yardstick competition*, and *tax competition* (Manski, 1993).

First, according to the *expenditure spillovers* idea, since municipal expenditures tend to be correlated among neighboring municipalities, so will tax rates. In

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other words, expenditures on local public services can have an impact on nearby jurisdictions.

Second, the *tax competition theory*, posited by Tiebout (1956), shows that citizens will move to another town if taxes are much higher than those in neighboring municipalities.

Third, the logic of *yardstick competition*, was first shown by Salmon (1987), who states that *yardstick competition* is an issue stemming from information asymmetry, i.e. it is difficult or costly for voters to evaluate the performance of their government.

Each government has an incentive to do better than governments in other jurisdictions in terms of taxes and services. The strength of this incentive depends on the ability and willingness of citizens to assess comparative performance. If these conditions are met, comparisons will serve as a basis for assessing politicians in power. Thus, politicians in power will feel that a good relative performance will increase their probability of being re-elected.

In this respect, *yardstick competition* in Spanish municipalities would have a positive and a negative implication, simultaneously. Positive, for if incumbents try to signal their competence through fiscal policies, this means that citizens pay attention to municipal fiscal performance when voting. This is positive, since it means that tax payers care about the use of public funds and will not accept misuse of those funds. But if incumbents are setting tax policies according to their neighbors' tax levels instead of the real needs of their municipalities, the provision of public services will not be optimal.

The paper is organized as follows. Section 2 reviews the literature. Section 3 presents data, variables and the econometric model. Section 4 discusses results and section 5 concludes and suggests future research.

2 LITERATURE REVIEW

2.1 TAX MIMICKING AMONG GOVERNMENTS

Research on tax mimicking shows mixed evidence. Besley and Case (1995) find that if voters are against additional taxes, even a small increase may force them to look elsewhere. However, if taxes are rising everywhere, voters may be convinced that a tax increase is necessary. In this case, even a large increase may be politically acceptable. Provided that voters make comparisons among jurisdictions, incumbents may look at neighboring governments' taxing behavior before changing taxes at home. This would give rise to *yardstick competition* among jurisdictions, each caring about what the others are doing. Accordingly, tax changes seem to be a significant determinant of who is elected, rationalizing effort put into curbing tax increases that are not in line with those of the neighbors. Besley and Case (1995) also find that neighboring taxes only have an impact on tax decisions in

states where the governor runs for re-election, which is a clear indication that *yardstick competition* explains tax interaction. Solé-Ollé (2003) shows that tax rates are higher and the reaction to neighbors' tax rates is lower when the electoral margin is high and when left-wing parties control government. Delgado, Lago-Peñas and Mayor (2015), on a sample of 2,713 Spanish municipalities, find evidence of neighbor tax mimicking in the property tax and the motor vehicle tax.

Empirical analysis has found it difficult to identify which of the three possibilities (*expenditure spillovers*, *yardstick competition* or *tax competition*) is the main cause of tax mimicking strategy. The reasons for this research impediment arise from one (or both) of the following reasons (Bordignon, Cerniglia and Revelli, 2003): either the alternative theories may be observationally equivalent, or the available data set may not be rich enough to allow discrimination among their different predictions. Consequently, solving these problems requires the researcher either to re-examine carefully the implications of the theories to be tested, or to build a better data set. In this paper, we follow both strategies, checking evidence of tax mimicking on the most comprehensive dataset of Spanish local governments to date. Thus, our research question is to ascertain whether the *agency problem* in Spanish municipalities shapes tax mimicking with neighboring municipalities. According to Bordignon, Cerniglia and Revelli (2003), *yardstick competition* theory suggests that only incumbents that face uncertain electoral outcomes should interact strategically with their neighbors. If a local government is pretty confident of re-election regardless of its tax behavior, we should not expect to find its fiscal choices being affected by those of its neighbors.

Edmark and Ågren (2008) document a positive spatial dependence of local income taxes in Swedish municipalities. However, they find weak evidence supporting the proposition that the spatial correlation in taxes among Swedish local governments can be explained by incentives to attract mobile taxpayers (*Tiebout's tax competition* theory). Similarly, they find no support for the *yardstick competition* thesis.

Gérard, Jayet and Paty (2010) document the absence of interactions between Belgian neighboring municipalities in terms of property tax rates. These authors explain their result through the immobility of the property tax base. However, this result contrasts with Heyndels and Vuchelen (1998), who, for the same sample, find that tax rates are indeed copied among neighboring municipalities.

One tool incumbents may use is tax diversification, as explained by Heyndels and Smolders (1994) on a sample of Flemish municipalities. This means that, following the fiscal illusion hypothesis, municipal politicians could try to align with neighbors' taxes, so that their voters do not punish them for setting higher taxes than the neighbors. Accordingly, if expenditures raise above the neighbors' levels and they must be funded with extra tax liabilities, incumbents will diversify taxes to diminish the impact on taxpayers. This strategy is not feasible in Spain, since taxes are limited by law and no municipality can create new taxes and the tax rate is the only variable at stake.

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2.2 OTHER FACTORS AFFECTING MUNICIPAL TAX RATES (CONTROL VARIABLES)

This section reviews literature on the control variables for the proposed models. All these variables are shown in table 1.

According to Brett and Pinkse (2000), the political alignment of the municipal ruling party with the national government and regional government can have an influence on the municipal budget (variables *nation* and *region*).

Another control variable is the population of the municipality (variable *lnpopul*), which has an impact on tax rates. Bordignon, Cerniglia and Revelli (2003) find that population has a negative and significant impact on tax rates, which suggests economies of scale. Heyndels and Vuchelen (1998) and Delgado, Lago-Peñas and Mayor (2015) find that municipal tax rates are higher when population increases. However, Brett and Pinkse (2000) report no impact of population on municipal taxes. We take population in log, to reduce the scale differences (Brett and Pinkse, 2000).

The political literature posits that, in general, left-wing parties favor public spending increases while right-wing parties aim at budget reductions (Tellier, 2006) and smaller government size (variable *MCideology*). Cusack (1997) defines this idea as the "partisan politics matters" thesis.

We control for the electoral cycle through three dummy variables, *munpreelection*, *munelectionyear* and *munpostelection*, which take value 1 in the year before elections, in the election year and in the year after elections, respectively (Gérard, Jayet and Paty, 2010; Isen, 2014). Bordignon, Cerniglia and Revelli (2003), find opportunistic behavior on the part of municipal incumbents: tax rates tend to be systematically lower in election years.

Unemployment can be treated as a proxy of the local economic situation. A higher unemployment rate has a negative effect on tax rates (variable *unemploy*), as shown by Bordignon, Cerniglia and Revelli (2003), Gérard, Jayet and Paty (2010) and Cassette, Di Porto and Foremny (2012). However, Edmark and Ågren (2008) and Lyytikäinen (2012) find the unemployment rate has a positive impact on local tax rates.

Bordignon, Cerniglia and Revelli (2003) posit that theory does not univocally predict the effect of lump-sum grants on local tax rates. For instance, the existence of a "flypaper effect" would require a very small (negative) effect of grants on the local tax rate. Bucovetsky and Smart (2006) show theoretically how federal grants, measured in per capita terms (variable *r_transfpc*), can limit tax competition among subnational governments, correct fiscal externalities, and increase government spending. The previous section documented the neighbors' property tax as a regressor, to account for tax mimicking, i.e. interaction effects across municipalities (horizontal effect). Taking grants as right hand variable tackles the influence of central and regional government on municipal expenditure behavior (vertical effect). Delgado, Lago-Peñas and Mayor (2015) show negative and

significant coefficients for per capita grants, supporting the median voter model and rejecting the "flypaper effect".

Regarding income, Brett and Pinkse (2000) propose income as determinant of municipal property tax base (variable *income*). Specifically, they include it as an indicator of the willingness to pay for public services. Bordignon, Cerniglia and Revelli (2003) find that income does not appear to have any systematic impact on the tax rate. Gérard, Jayet and Paty (2010) show that higher income has a positive effect on local property tax, which agrees with the empirical literature, where demand for public services is often positively correlated with income. Edmark and Ågren (2008) also report a positive impact of income on local income tax.

Oates (1969) finds that local real estate values bear a significant negative relationship to the effective tax rate (variable *r_housevalue*).

Our variable *autcom* controls for the impact of the regional shocks on municipal taxes (Isen, 2014).

The majority enjoyed by a municipal government has also an impact on taxes. Increased council fragmentation is associated with higher taxes (Roubini and Sachs, 1989; Fiva and Rattsø, 2007; Delgado, Lago-Peñas and Mayor, 2015). If a one-party majority applies the local coefficient, voters know exactly who to blame for it, but if there are many different parties, it will be the fault of all of them and the voter is going to make his choice based on other factors than the local coefficient application. Similarly, the higher the number of government changes, the weaker the political situation of the incumbents (Edmark and Ågren, 2008). These authors assume that an incumbent with a weak political majority will pay closer attention to the neighbors' tax policy than an incumbent with a strong majority, who is likely to win the election irrespective of neighbors' policies. Thus, tax rate mimicking is expected to be stronger in municipalities where the ruling majority is weak. In the presence of *yardstick competition*, these interaction coefficients should be positive and statistically significant, and should be higher the more changes in government take place. This theoretical issue is controlled for with variables *cgov_1*, *cgov_2* and *cgov_3*, which will interact with the key independent variables *neig_uproptaxrate* and *neig_cartaxaveragerate*.

We also control for three additional factors with an impact on municipal taxes. First, Revelli (2002) finds that incumbent popularity is damaged by own tax increases and enhanced by neighbors' tax increases. However, after controlling for the influence of national politics, the estimated electoral consequences of local tax increases become less significant. Accordingly, we control whether the municipal party belongs to one of the two main national parties (variable *bipartisan*). Second, we check if there was a cadastral value revaluation (*dumm_yearvaluerev*). The third factor is the total fiscal burden of the municipality (*r_revenue1pc*), which determines to some extent how much municipalities can increase tax rates.

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3 ECONOMETRIC MODEL, DATA AND VARIABLES

Our initial sample consists of a panel data of 2,431 observations, which covers the vast majority of Spanish municipalities over 1,000 inhabitants in the 2002 to 2013 period. This is the largest Spanish sample on tax mimicking to date. This panel data approach overcomes the drawbacks shown by Bordignon, Cerniglia and Revelli (2003) on cross-sectional data. First, panel data allow us to control for fixed jurisdiction effects (unobserved heterogeneity). Second, the potential endogeneity of the mayor status and other variables may be controlled.

Our sample is more comprehensive than the two most relevant tax mimicking papers on Spanish municipalities to date. In the first, Solé-Olle (2003) considers the panel data (1992-1999, 8 years) of municipalities of over 5,000 inhabitants from one Spanish province (105 municipalities). In the second, Delgado, Lago-Peñas and Mayor (2015) use cross-sectional data for the year 2005 for Spanish municipalities of over 1,000 inhabitants (2,713 municipalities). Our data also cover the whole country for 12 years (2002-2013), being a bit smaller because municipalities should be greater than 1,000 inhabitants for the whole time window.

Our Generalized Method of Moments (GMM) general equation is:

$$y_{it} = \alpha y_{it-1} + \sum \beta_j x_{jit} + c_i + \varepsilon_{it} \quad (1)$$

Where y_{it} represents either property tax rate or car tax rate. These two taxes were chosen because they are the most important considering the non-financial revenues of Spanish municipalities. Thus, as of 2013, property tax accounts for 29.02%, and car tax rate represents 5.12% of total non-financial revenues.

Budget figures usually follow an incremental approach (Dezhbakhsh, Tohamy and Aranson, 2003). To control for this budgetary inertia, we include the lagged dependent variable as regressor (αy_{it-1}) (Revelli, 2001).

X_{jit} is the vector of explanatory variables, i.e. socio-economic characteristics and further control variables (see section 2.2)

Unobservable heterogeneity is represented by c_i, and ε_{it} stands for random disturbances.

Starting from this general equation, we include the spatial effect:

$$y_{it} = \alpha y_{it-1} + \rho \left(\sum y_{jt}/n\right) + \sum \beta_k x_{kit-1} + c_i + \varepsilon_{it} \quad (2)$$

As indicated by Manski (1993), social forces act on the individual with a lag (Edmark and Ågren, 2008), thus, socio-economic features of municipalities are one year retarded ($\sum \beta_k x_{kit-1}$). However, neighboring tax rates are introduced without time lag. Neighboring tax rates are known by the neighboring politicians in

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advance of the fiscal year, since they are shown on the budget. Therefore, all neighboring municipalities know the tax rates of the remaining municipalities before the fiscal year starts, and they can react to that information in their own taxes and budgets. Neighbors are defined as those municipalities sharing a common geographical border, in agreement with the literature. Information about local tax rates is spread mainly through local and regional newspapers and television (Allers and Elhorst, 2005). Heyndels and Vuchelen (1998) and Edmark and Ågren (2008) show that municipalities that share borders with immediate neighbors exert an influence on these neighbors' tax choices. Similarly, Isen (2014) shows that among the theories of spillovers, spatial proximity is particularly relevant. Besley and Case (1995) provide two arguments to support this definition of neighborhood. First, geographic neighbors are quite likely to experience similar shocks to their tax bases. This, besides, is controlled through time dummies and regional dummies in our regressions, to absorb the impact of changes in national economic climate and changes in national fiscal behavior or regional fiscal behavior. Second, geographic neighbors belong to the same media market, thus they have good information about what is happening close by.

Following Edmark and Ågren (2008), we take the average tax rates of neighbors: $\rho\ (\sum y_{jt}/n)$, where y_{jt} stands for the property tax rate of municipality j in year t (there are 1…n "j" neighboring municipalities per municipality "i").

Pinkse, Slade and Brett (2002) point out as GMM valid instruments those continuous variables that are different at each location. Accordingly, we take some municipal economic continuous variables as instruments. Among the endogenous variables, we must consider own taxes and neighbors' taxes (y_{it} and y_{jt}). As Isen (2014) indicates, there is a correlation between the fiscal behavior of neighbors that cannot be interpreted causally, i.e. there is a reciprocal influence.

As Cassette, Di Porto and Foremny (2012) show, GMM specification with time lagged dependent variable remains the most reliable specification based on our data. Table 1 presents variables and depicts descriptive statistics.

Table 1

Information on variables and descriptive statistics

Variable	Calculation	Literature	Mean	Std. dev.	Min.	Max.
uproptaxrate	Tax rate to be multiplied by tax base (urban property value)	Solé-Ollé (2003), Lyytikäinen (2012), Baskaran (2014), Allers and Elhorst (2005), Isen (2014), etc.	.62	.17	.2	1.23
neig_uproptaxrate	Average neighboring uproptaxrate		.62	.13	.35	1.14
cartaxaveragerate	Vehicle tax liability of municipality *i*, year *t* /minimum vehicle tax liability according to law 2/2004, year *t*	Besley and Case (1995), Solé-Ollé (2003), Delgado, Lago-Peñas and Mayor (2015)	1.35	.29	1	2
neig_cartaxaveragerate	Average neighboring cartaxaveragerate		1.36	.23	1	2.00
r_revenue1pc	Municipal direct and indirect taxes per capita (real 2002 €)	Solé-Ollé (2003)	251.76	199.26	23.37	5633.85
r_transfpc	Transfers received from upper-level governments per capita (real 2002 €)	Revelli (2001), Bordignon, Cerniglia and Revelli (2003), Bucovetsky and Smart (2006), Lyytikäinen (2012), Delgado, Lago-Peñas and Mayor (2015), Edmark and Ågren (2008), Baskaran (2014)	377.75	203.29	45.24	4228.01
income	Per capita income of the municipality (real 2002 income levels). Ranging from 1 (lowest) to 10 (highest)	Besley and Case (1995), Brett and Pinkse (2000), Bordignon, Cerniglia and Revelli (2003), Gérard, Jayet and Paty (2010), Edmark and Ågren (2008), Lyytikäinen (2012), Cassette, Di Porto and Foremny (2012)	5.15	2.30	1	10
unemploy	Unemployment rate (%)	Besley and Case (1995), Revelli (2001), Bordignon, Cerniglia and Revelli (2003), Gérard, Jayet and Paty (2010), Lyytikäinen (2012), Cassette, Di Porto and Foremny (2012), Edmark and Ågren (2008), Delgado, Lago-Peñas and Mayor (2015)	8.56	4.97	.5	36.97
lnpopul	Natural logarithm of municipality population	Bordignon, Cerniglia and Revelli (2003), Heyndels and Vuchelen (1998), Delgado, Lago-Peñas and Mayor (2015), Brett and Pinkse (2000), Edmark and Ågren (2008)	8.63	1.21	6.90	15.00
r_housevalue	Tax base (real estate value) according to municipal government's urban property value (real 2002 thousand €)	Oates (1969)	30.43	23.11	2.65	196.83
MCideology	Municipal Council political sign (0 left; 1 right)	Bordignon, Cerniglia and Revelli (2003), Edmark and Ågren (2008), Delgado, Lago-Peñas and Mayor (2015)	.49	.49	0	1

Table 1

Information on variables and descriptive statistics (continued)

Variable	Calculation	Literature	Mean
majority	Majority of one party in municipal council=1, 0 otherwise	Solé-Ollé (2003), (2016), Delgado, Lago-Peñas and Mayor (2015), Fiva and Rattsø (2007), Roubini and Sachs (1989)	.66
munelectionyear	Dummy election year (1 election year; 0 no election year)	Besley and Case (1995), Bordignon, Cerniglia and Revelli (2003), Edmark and Ågren (2008), Gérard, Jayet and Paty (2010), Isen (2014)	.25
munpreelection	Dummy pre-election year (1 pre-election year; 0 no pre-election year)		.26
munpostelection	Dummy post-election year (1 post-election year; 0 no post-election year)		.23
dumm_yearvaluerev	Property values have been updated by the municipality *i* in year *t*=1, 0 otherwise	Revelli (2002), Solé-Olle (2003)	.03
bipartisan	Municipal ruling party belongs to the two main national parties (1 belongs to one of the two main political parties; 0 doesn't belong)	Revelli (2002)	.74
nation	National government alignment with municipal government. If both are conservative or both are progressive, dummy takes value 1. Value 0 otherwise	Brett and Pinkse (2000)	.52
region	Regional government alignment with municipal government. If both are conservative or both are progressive, dummy takes value 1. Value 0 otherwise		.62
cgov_1	Takes 1 if there was one change in municipal government stemming from elections in 2002-2013. Takes 0 otherwise	Edmark and Ågren (2008)	.28
cgov_2	Takes 1 if there were two changes in municipal government stemming from elections in 2002-2013. Takes 0 otherwise		.29
cgov_3	Takes 1 if there were three changes in municipal government stemming from elections in 2002-2013. Takes 0 otherwise		.13
autcom	Autonomous community (region) where the municipality is located	Besley and Case (1995), Isen (2014)	Non reported

Variable income *is only available as a discrete variable in levels 1-10 for the time window. It was constructed by the Klein Institute (Autonomous University of Madrid). Descriptive statistics of variable* autcom *are not reported because they are not relevant for the analysis. They are N-1 dummy variables representing the region where the municipality is located. Thus, 16 more rows would make the table more complex, without adding meaningful information for the reader.*

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4 TAX MIMICKING IN SPANISH MUNICIPALITIES

Tables 2a and 2b show our models (equation 2). As Edmark and Ågren (2008) document, a positive coefficient for neighbors' tax rates, i.e. ρ in equation (2), is consistent with the theories of *tax competition* and *yardstick competition*. As explained in the introduction, we also consider the *spillover* hypothesis. In our regressions, these coefficients are represented by variables *neig_uproptaxrate* and *neig_cartaxaveragerate* on tables 2a and 2b, respectively.

Columns two to five of tables 2a and 2b show GMM regressions. Hansen tests on tables 2a and 2b indicate weak instruments, therefore we provide robustness checks: instrumental variable (IV) regressions (columns six to nine on tables 2a and 2b). We report the corresponding regression, either random or fixed effects, after checking with Hausman test. The fixed effects IV equation and random effects IV equation are, respectively:

$$y_{it} - \bar{y} = \alpha y_{it-1} - \bar{y} + \rho[(\sum y_{jt}/n) - (\overline{\sum y_{jt}}/n)] + \sum[\beta_k x_{kit-1} - \bar{x}] + \sum[\beta_k \widehat{x_{kit-1} - \bar{x}}] + \varepsilon_{it} \quad (3)$$

$$y_{it} - y_i = \alpha y_{it-1} + \rho\,(\sum y_{jt}/n) + \sum \beta_k x_{kit-1} + \sum \beta_k \widehat{x_{kit-1}} + c_i + \varepsilon_{it} \quad (4)$$

As Baskaran (2014) points out, the evidence for tax mimicking found in much of the previous literature might be questionable. One explanation for Baskaran's finding is that intergovernmental transfers reduce the incentives to engage in tax competition. To control for this issue, we add inter-governmental transfers as independent variable (*r_transfpc*), as explained on section 2.2.

The second criticism Baskaran (2014) raises is that local governments might set their tax rates primarily according to the preferences of their citizens and consider their neighbors' tax policies negligible. Such an explanation is consistent with Tiebout (1956).

The third shortcoming cited by Baskaran (2014) has to do with the weak instruments used by the literature. In fact, we report the same problem with Spanish municipalities, and accordingly, we present IV regressions as robustness checks.

Lyytikäinen (2012) finds that the standard spatial econometrics methods may have a tendency to overestimate the degree of interdependence in tax rates. This problem appears in our regressions, since property tax mimicking coefficients in GMM regressions are 2 to 12 times bigger than IV property tax regressions (variable *neig_uproptaxrate* on table 2a). However, in the car tax regressions, results appear the other way: IV coefficients are higher than their GMM counterparts. In agreement with all the above mentioned, we present the coefficients of both GMM and IV regressions and both estimations should be considered when drawing conclusions about our regression coefficients.

TABLE 2A

Property tax regressions

Dependent variable	***upropitaxrate***								
Estimation method	**GMM**					**IV**			
Sample	**Whole sample**		**Sub-samples**			**Whole sample**		**Sub-samples**	
	Basic model	**Interaction**	**Majority=0**	**Majority=1**		**Basic model**	**Interaction**	**Majority=0**	**Majority=1**
	2	3	4	5		6	7	8	9
neig_upropitaxrate	*** .2576	*** .2466	*** .1772	*** .2366		*** .0196	*** .0211	.0239	** .1207
	8.90	9.65	3.78	7.10		3.29	3.41	0.37	2.50
upropitaxrate $_{(t-1)}$	*** .9543	*** .9292	*** .9125	*** .9327		*** .9411	*** .9407	*** .7594	*** .6557
	39.83	41.92	32.30	31.53		198.27	199.42	24.09	18.25
r_revenuelpc $_{(t-1)}$	-.0000	-.0000	.0000	.0000		.0001	.0001	* -.0001	*** -.0001
	-0.98	-0.33	0.60	0.14		1.14	0.95	-1.95	-4.28
r_transfpc $_{(t-1)}$	*** -.0000	*** -.0000	-.0000	*** -.0000		.0000	.0000	.0000	** .0001
	-2.83	-3.62	-1.52	-3.65		0.51	0.44	0.30	2.33
income $_{(t-1)}$	*** -.0027	*** -.0027	*** -.0037	*** -.0034		*** -.0263	*** -.0265	** -.0261	.0007
	-5.88	-6.36	-4.03	-5.87		-2.79	-2.81	-2.39	0.14
unemploy $_{(t-1)}$	* .0003	*** .0006	** .0008	*** .0006		*** -.0213	*** -.0213	.0056	** -.0224
	1.77	4.09	2.51	3.36		-3.18	-3.16	0.38	-2.25
lnpopul $_{(t-1)}$	* .0022	*** .0026	*** .0047	* .0020		-.0014	-.0014	-.1580	-.0186
	1.95	2.69	3.41	1.66		-1.00	-0.97	-1.63	-0.29
r_housevalue $_{(t-1)}$	*** -.0004	*** -.0004	*** -.0006	*** -.0003		*** -.0005	*** -.0005	*** -.0005	-.0004
	-6.49	-7.83	-7.44	-5.00		-7.92	-8.10	-3.80	-1.45
MCideology $_{(t-1)}$	*** .0298	*** .0175	* .0131	.0012		-.0011	-.0014	.0015	-.0072
	4.76	3.58	1.82	0.16		-0.78	-0.94	0.30	-1.09
majority $_{(t-1)}$	-.0023	-.0059				.0016	.0012		
	-0.31	-1.12				1.36	1.06		
munelectionyear	*** -.0083	*** -.0097	*** -.0147	*** -.0075		** .0373	*** .0377	-.0184	-.0094
	-9.19	-11.50	-8.35	-7.14		2.57	2.60	-0.98	-0.81
munpreelection	*** -.0082	*** -.0092	*** -.0107	*** -.0071		*** .0397	*** .0398	.0104	** .0401
	-8.98	-10.83	-6.26	-7.16		2.78	2.78	0.44	2.05

munpostelection	.0003 0.37	-.0001 -0.15	*** -.0050 -2.79	** .0026 2.23	*** .0351 3.88	*** .0354 3.92	-.0045 -0.35	-.0212 -1.33
dumm_yearvaluerev $_{(t-1)}$	** -.0105 -2.13	-.0073 -1.45	-.0085 -1.14	-.0044 -0.74	*** -.0078 -2.81	*** -.0078 -2.81	.0044 0.55	.0061 0.90
bipartisan $_{(t-1)}$	** .0150 2.36	** .0103 2.41	.0058 0.93	** .0220 2.49	.0006 0.42	.0003 0.21	-.0046 -0.66	.0004 0.05
nation $_{(t-1)}$	*** .0163 4.89	*** .0102 4.28	.0040 0.77	*** .0121 4.28	*** -.0040 -2.63	*** -.0041 -2.67	** -.0103 -2.10	.0014 0.44
region $_{(t-1)}$	.0030 0.74	.0016 0.51	* -.0089 -1.88	.0042 1.41	-.0006 -0.56	-.0007 -0.67	.0031 0.58	-.0003 -0.07
cgov_1xneig_uptaxrate		-.0049 -0.81				-.0024 -1.18		
cgov_2xneig_uptaxrate		-.0060 -0.99				-.0016 -0.75		
cgov_3xneig_uptaxrate		-.0025 -0.32				-.0032 -1.21		
m(2) test	z=1.89 Pr=.059	z=1.81 Pr=.070	z=0.68 Pr=.500	z=1.15 Pr=.251				
Hansen test	chi2=808 Prob=.000	chi2=1016 Prob=.000	chi2=454 Prob=.002	chi2=595 Prob=.000				
Hausman					chi2=20 Prob=0.467 RE	chi2=22 Prob=0.455 RE	chi2=877 Prob=0.000 FE	chi2=474 Prob=0.000 FE
R-sq overall					0.8933	0.8937	0.2313	0.4531

All models include:

– A constant, which is not shown.

*– Dummy variables for Spanish regions, which are not shown. This variable adds to the income variable (*income*) to control for differences in economic development among Spanish regions (autonomous communities).*

Below each coefficient, z *value is reported. Significance: *10%, **5%, ***1%.*

RE=random effects IV regression. FE=fixed effects IV regression.

IV regression: Instrumented variables=neig_uproptaxrate r_revenue1pc r_transfpc income unemploy. *Instruments*=lnpopul, munelectionyear, munpreelection, munpostelection, r_debtpc cartaxaveragerate, propimmigrants, dumm_yearvaluerev.

Table 2b

Car tax regressions

Dependent variable	***cartaxaveragerate***								
Estimation method	**GMM**					**IV**			
Sample	**Whole sample**		**Sub-samples**			**Whole sample**		**Sub-samples**	
	Basic model	**Interaction**	**Majority=0**	**Majority=1**		**Basic model**	**Interaction**	**Majority=0**	**Majority=1**
	2	3	4	5		6	7	8	9
neig_cartaxaverageragerate	*** .0571	*** .0520	* .0362	** .0346		*** .7573	*** .1813	*** .2608	*** .4249
	4.47	4.41	1.80	2.35		2.93	4.89	4.83	8.20
cartaxaveragerate $_{(-1)}$	*** .8943	*** .9026	*** .9431	*** .9165		*** .4317	*** 1.1178	*** .6133	*** .6093
	48.48	52.87	43.05	44.93		9.60	28.39	31.85	45.62
r_revenue1pc $_{(-1)}$	** -.0000	* -.0000	*** -.0000	* -.0000		* .0005	*** -.0004	.0082	** -.0109
	-2.51	-1.86		-1.82		1.66	-4.96	1.23	-2.56
r_transfpc $_{(-1)}$	-.0000	*** -.0000	.0000	** -.0000		*** -.0002	* .0003	.0015	** -.0059
	-1.60	-2.64	0.18	-2.36		-2.92	1.71	0.43	-2.38
income $_{(-1)}$	*** -.0014	** -.0010	** -.0024	*** -.0016		-.0353	*** .0987	.0004	* .0016
	-3.44	-2.50	-2.44	-2.84		-1.60	4.70	0.37	1.77
unemploy $_{(-1)}$	* -.0004	*** -.0005	*** -.0018	-.0003		-.0047	*** -.0298	-.0000	-.0002
	-1.87	-2.69	-4.80	-1.22		-1.15	-5.49	-0.05	-0.41
lnpopul $_{(-1)}$	*** .0153	*** .0137	*** .0116	*** .0139		.1141	-.0236	** .0485	-.0173
	7.95	7.79	4.63	7.07		1.06	-1.29	2.34	-1.19
r_housevalue $_{(-1)}$	*** -.0001	*** -.0002	*** -.0002	*** -.0001		-.0002	** -.0004	*** -.0085	*** -.0090
	-4.75	-5.57	-4.00	-2.78		-1.05	-2.33	-2.80	-4.04
MCideology $_{(-1)}$	*** -.0195	*** -.0170	.0023	*** -.0225		.0015	-.0078	-.0037	*** -.0093
	-3.74	-3.78	0.31	-2.99		0.22	-1.23	-1.44	-3.07
majority $_{(-1)}$	.0025	-.0048				-.0038	-.0076		
	0.41	-1.01				-0.64	-1.39		
munelectionyear	*** -.0126	*** -.0115	*** -.0148	*** -.0107		.0032	*** .0633	*** -.0134	*** -.0088
	-14.54	-13.59	-7.62	-10.05		0.27	3.49	-4.68	-3.85
munpreelection	*** -.0086	*** -.0079	*** -.0091	*** -.0073		.0171	** .0237	*** -.0085	*** -.0062
	-9.05	-8.56	-4.21	-6.45		1.45	2.15	-3.18	-3.02

munpostelection	*** .0044 3.80	*** .0053 5.27	.0000 0.02	*** .0067 4.80	.0079 1.53	*** .1072 5.62	.0007 0.27	*** .0071 3.93
dumm_yearvaluerev $_{(t-1)}$	** .0079 2.52	*** .0108 3.42	.0054 0.91	.0033 1.01	.0044 0.89	-.0108 -1.12	** .0103 2.44	.0052 1.58
bipartisan $_{(t-1)}$	*** -.0200 -3.73	-.0037 -0.79	-.0080 -1.37	-.0050 -0.59	.0115 1.58	* .0113 1.86	-.0048 -1.70	-.0065 -1.71
nation $_{(t-1)}$	-.0019 -0.76	-.0033 -1.59	-.0047 -0.93	-.0038 -1.60	-.0002 -0.05	*** -.0159 -3.28	.0006 0.31	** -.0034 -2.27
region $_{(t-1)}$	-.0033 -0.91	.0019 0.64	.0052 1.04	** .0058 2.00	-.0003 -0.06	-.0011 -0.17	* .0044 1.90	-.0012 -0.53
cgov_1xneig_cartaxrate		-.0009 -0.50				-.0022 -0.61		
cgov_2xneig_cartaxrate		-.0004 -0.20				.0013 0.29		
cgov_3xneig_cartaxrate		-.0026 -0.94				-.0052 -1.14		
m(2) test	z=-0.02 Pr=0.983	z=-0.04 Pr=0.966	z=-1.00 Pr=0.318	z=0.99 Pr=0.321				
Hansen test	chi2=607 Prob=.000	chi2=840 Prob=.000	chi2=440 Prob=.006	chi2=464 Prob=.001				
Hausman					chi2=7584 Prob=.000 FE	chi2=11 Prob=.885 RE	chi2=1843 Prob=.000 FE	chi2=665 Prob=.000 FE
R-sq overall					0.6487	0.6693	0.9134	0.8221

All models include:

– A constant, which is not shown.

– Dummy variables for Spanish regions, which are not shown. This variable adds to the income variable to control for differences in economic development among Spanish regions (autonomous communities).

*Below each coefficient, z value is reported. Significance: *10%, **5%, ***1%.*

IV regression: Instrumented variables=neig_uproptaxrate r_revenue1pc r_transfpc income unemploy. *Instruments*=lnpopul, munelectionyear, munpreelection, munpostelection, r_debtpc cartaxaveragerate, propimmigrants, dumm_yearvaluerev.

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Regarding property tax (table 2a), *neig_uproptaxrate* is significant in all regressions except majority=0 IV regression (column eight). As far as car tax is concerned (table 2b), *neig_cartaxaveragerate* is significant in all regressions, both GMM and IV. This indicates the existence of tax competition in Spanish municipalities, in both property tax and car tax. However, the quantitative impact is limited, because we should be prudent and take the minimum coefficient between GMM and IV. Our data show that a 10% increase in a neighboring municipality's property tax rate leads to a 1.3% increase in property tax rate or 2.3% for car tax rate. Therefore, our coefficients are lower than the average found by the literature, which ranges from .2 to .9. For example, Revelli (2001) reports that a 10% increase in the local property tax rate of a UK district's neighbors leads to an increase of 4-5% in its own property tax rate.

Regarding the robustness of our estimations, both GMM and IV show that there is tax mimicking, both in property tax and in car tax. Another point that confirms the robustness and economic rationality of our regressions is the value of the lagged dependent variable, which in all regressions except one, ranges from .43 to .95 (less than unity), which indicates that the time series are stationary, i.e. that the process converges in expectation (Blundell and Bond, 1998).

In all regressions the lagged dependent variable (*uproptaxrate* $_{(t-1)}$ and *cartaxaveragerate* $_{(t-1)}$, respectively) shows the highest explanatory power, which agrees with the budgetary incrementalism predicted by Dezhbakhsh, Tohamy and Aranson (2003).

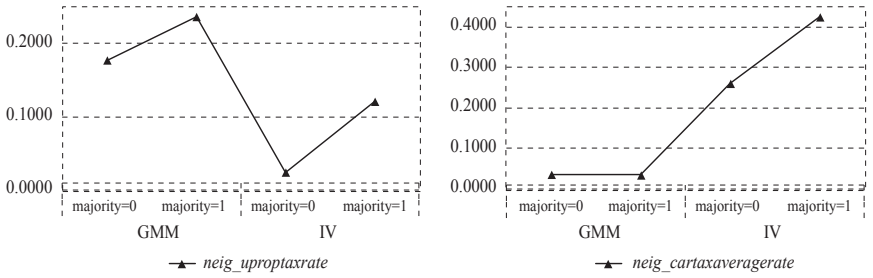
The *yardstick competition* hypothesis is checked through two sets of regressions (Bordignon, Cerniglia and Revelli, 2003). First, columns three and seven in tables 2a and 2b show the regressions with interaction coefficients (*cgov_1xneig_uptaxrate*, *cgov_2xneig_uptaxrate* and *cgov_3xneig_uptaxrate*; *cgov_1xneig_cartaxrate*, *cgov_2xneig_cartaxrate* and *cgov_3xneig_cartaxrate*), which account for the interaction between the number of government changes after municipal elections (*cgov_1*, *cgov_2* and *cgov_3*) and neighbors' tax rates (*neig_uptaxrate* and *neig_cartaxrate*). As discussed in section 2.2., Edmark and Ågren (2008), expect tax rate mimicking to be stronger in municipalities where the ruling majority is weak. In the presence of *yardstick competition*, these interaction coefficients should be positive and statistically significant, and should be higher the more changes in government take place (*cgov_1xneig_uptaxrate* < *cgov_2xneig_uptaxrate* < *cgov_3xneig_uptaxrate*; *cgov_1xneig_cartaxrate* < *cgov_2xneig_cartaxrate* < *cgov_3xneig_cartaxrate*). We find the opposite, i.e. coefficients of these three interaction variables are negative and not significant. Our interaction regressions, therefore, reject the *yardstick competition* hypothesis.

Second, we split the sample into two sub-samples, depending on whether or not the mayor has a majority in the municipal council (columns four, five, eight and nine on tables 2a and 2b). In the subsample with a majority, there should not be tax mimicking (majority=1: columns five and nine on tables 2a and 2b). As Bordignon,

Cerniglia and Revelli (2003) and Costa-Font, De-Albuquerque and Doucouliagos (2015) point out, politicians with a majority in government have no incentives to benchmark their neighbors' tax policies. In other words, only incumbents that face uncertain electoral outcomes interact strategically with their neighbors. In our regressions, both in property tax and car tax, we get exactly the opposite coefficients: municipalities with a majority in the council mimic their neighbors' tax policies more (figure 1). Only in one case, car tax GMM, is the majority coefficient slightly smaller than the no-majority coefficient. Even in this case, first, the difference in the coefficient is only .0016, and second, the significance of the majority sample is higher than the no-majority sample (*z* values 2.35 vs 1.80, respectively).

Figure 1

Majority impact on tax mimicking



These two additional checks (interactions and majority subsamples) clearly reject the *yardstick competition* hypothesis. Therefore, our data confirm tax competition, but the explanation does not seem to constitute *yardstick competition*.

To check whether *tax competition* explains the tax mimicking, we run an additional GMM regression where the dependent variable is the average population change of the neighboring municipalities divided by the population change of each municipality (variable *movetoneigh*). If this variable is higher than one, it means that on average, the neighboring municipalities' populations are growing more than that of the municipality at stake. As independent variables related to the *Tiebout* hypothesis, we take the neighboring municipalities' average urban property tax rate and car tax rate divided by the municipality at stake: *uproptax_rel*, *cartax_rel*, respectively. Other factors that could influence this population change are the municipal income level, municipality unemployment and real house value of neighbors divided by the municipality at stake: *income_rel*, *unemploy_rel*, *r_housevalue_rel*, respectively. Finally, other control variables are included in the regression (see table 3).

TABLE 3

Tax competition (Tiebout) regression

		Variable description
Dependent variable	*movetoneigh*	Neighbors' population change/municipality$_i$ population change. Population change=population$_t$/population$_{t-1}$
uproptax_rel $_{(t-1)}$	.0061 0.92	Average of neighbors' urban property tax rate/ municipality$_i$ urban property tax rate
cartax_rel $_{(t-1)}$	-.0003 -0.48	Average of neighbors' car tax rate/municipality$_i$ car tax rate
income_rel $_{(t-1)}$	.0013 0.63	Average of neighbors' income level/ municipality$_i$ income level
unemploy_rel $_{(t-1)}$	.0034 1.25	Average of neighbors' unemployment rate/ municipality$_i$ unemployment rate
r_housevalue_rel $_{(t-1)}$	.0000 0.24	Average of neighbors' real house value/ municipality$_i$ real house value
r_transfpc $_{(t-1)}$	-.0000 -1.22	See table 1
MCideology $_{(t-1)}$	.0056 1.18	
majority $_{(t-1)}$	-.0021 -0.49	
munelectionyear	*** .0020 2.78	
munpreelection	*** .0022 2.84	
munpostelection	*** .0017 2.83	
dumm_yearvaluerev $_{(t-1)}$	-.0048 -1.29	
bipartisan $_{(t-1)}$	*** .0182 2.62	
nation $_{(t-1)}$	.0049 1.63	
región $_{(t-1)}$	.0006 0.18	
propimmigrants $_{(t-1)}$	.0142 0.66	Municipality$_i$ immigrant population/ municipality$_i$ total population
m(2) test	z=0.45 Pr=0.656	
Hansen test	chi2=82.65 Prob=.338	

All models include:
– A constant, which is not shown.
– Dummy variables for Spanish regions, which are not shown.
*Below each coefficient, z value is reported. Significance: *10%, **5%, ***1%.*

As table 3 indicates, there is no impact of either property tax rates or car tax rates relative to those of the neighbors on population changes, which means that people are not "voting with their feet" and leaving the town because its property and car

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taxes are higher than in neighboring municipalities. We confirm this feature with two univariate analyses. Correlation between *movetoneigh* and *uproptax_rel*: -0.0038, p value 0.5034; correlation between *movetoneigh* and *cartax_rel*: -0.0058, p value 0.3064 (correlation table available upon request to the authors). These results again reject the relationship of differences of tax rates among neighbors and population changes. These results make sense because in Spain it is not plausible for someone to move to another municipality, considering all the costs connected with this move, just because in the other municipality there are lower property and car tax rates. It does happen in Spain, though, that drivers fill their fuel tank in a region with lower gasoline tax, because in this case, the tax base can be easily moved just by driving some additional kilometers. However, changing residence is much more costly and would not withstand a simple cost-benefit analysis.

The last hypothesis that could reasonably explain this tax mimicking is the *expenditure spillovers* idea, i.e. since municipal expenditures tend to be correlated among neighboring municipalities, so will tax rates. From our point of view, this is the hypothesis that explains the Spanish municipalities' tax mimicking. The Spanish quasi-federal system that has led regions to mimic their neighbors has been replicated at the municipal level, according to our data. As an example of what has happened in the regions, we have the case of airports built by regional governments. Currently, Spain has many regional airports that either do not work because they were not necessary, or the number of flights is so small that regional governments have to subsidize them so much that in fact they are not feasible from a budgetary point of view. Most of them were built in order for one region to have the same infrastructure as a neighboring region, without any rational economic analysis. This behavior has been mimicked by municipalities, who want to have, for example, a swimming pool like the neighboring municipality, a sports center, and so on. This has led to a huge number of infrastructure facilities that municipalities keep closed because they cannot afford their operating costs. It is worth noting that the property bubble that brought billions of euro to the revenues of municipal budgets helped municipalities to start this *infrastructure race* among neighboring cities and towns.

The *expenditure spillovers* found confirm previous literature on tax competition, such as Baicker (2005), who shows that individual state spending has spillover effects on its neighbors' spending. Finally, our results are in line with Costa-Font, De-Albuquerque and Doucouliagos (2015), who find inter-jurisdictional expenditure interdependence among municipalities. This means that, for example, if one government increases the supply of public schools, this is likely to impact on school supply decisions in neighboring jurisdictions.

Regarding political variables, only *munpostelection* shows an unambiguous pattern in both property tax and car tax, with coefficients on eight regressions being positive and significant (only property tax GMM majority=0 regression shows a negative coefficient). These positive and significant coefficients indicate that municipalities engage in political budget cycles, by increasing tax rates one year

after the election. Increasing taxes this year allows three years till the next election year, so that tax payers forget about this tax rise and it has little or no impact on the electoral outcome. Our results are in line with Gérard, Jayet and Paty (2010) and Bordignon, Cerniglia and Revelli (2003), who support the hypothesis of an electoral cycle on property tax rates.

The municipal council ideology (*MCideology*) shows mixed results if we compare GMM and IV regressions and property tax and car tax. To provide a specific insight on the effect of ideology, table 4 presents a t-test of mean difference in variables *uproptaxrate* and *cartaxaveragerate*.

Table 4

Impact of municipal council ideology

		uproptaxrate			
Group	**Obs.**	**Mean**	**Std. err.**	**Std. dev.**	**Significance**
0 (left-wing)	11,683	*** .6333	.0015	.1627	t=8.3309
1 (right-wing)	11,427	*** .6151248	.0016	.1694	Pr(T > t)=0.0000
		cartaxaveragerate			
0 (left-wing)	11,683	*** 1.3852	.0026	.2840	t=13.8303
1 (right-wing)	11,427	*** 1.3328	.0027	.2919	Pr(T > t)=0.0000

*Significance: *10%, **5%, ***1%.*

As table 4 indicates, right-wing parties set lower property tax rates and lower car tax rates. This finding agrees with the general political literature, which states that left-wing parties set higher tax rates than their conservative counterparts (Cusack, 1997; Tellier, 2006). If we focus on the tax mimicking literature, our results confirm Delgado, Lago-Peñas and Mayor (2015), who show that leftist governments tend to set higher taxes.

5 CONCLUSIONS, LIMITATIONS AND FURTHER RESEARCH

Our research questions are whether tax mimicking exists in Spanish municipalities, and, if so, the identification of the source of this interaction. We consider the largest sample of Spanish municipalities used so far: 2,431 municipalities over 1,000 inhabitants for 2002-2013.

Within the general framework of the *agency problem*, we find significant evidence of tax mimicking, in both property tax and car tax. Subsequently, we add analyses to check whether *yardstick competition* hypothesis or *tax competition* (*Tiebout hypothesis*) is the source of this tax mimicking. These further analyses reject both hypotheses.

Therefore, our results point to *expenditure spillovers*. In that respect, it seems municipalities are behaving like Spanish regional governments, which following the Spanish quasi-federal system, try to match central government's institutions and services. Here, municipalities seek to have the same services and infrastruc-

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tures of their neighbors. Thus, municipalities seek to set similar levels of taxes and expenditures as their neighboring municipalities.

The fact that incumbents are not signaling competence through neighbor-benchmarking tax policies does not mean that the *agency problem* is not present in Spanish municipalities. In fact, it is indicating another problem, i.e. incumbents do not think this strategy is worthwhile because they think that citizens do not pay attention to their municipal fiscal indicators when making voting decisions or when evaluating their politicians. This is something the central government is trying to change by teaching young generations about the importance of public goods and the need to pay taxes fairly so that public services are funded. As a government policy, further steps should be taken in this regard. Unfortunately, in Spain, parties involved in corruption have not been penalized by voters in the elections. Thus, there is still a long way until the Spanish population demands fiscal performance and appropriate use of public funds from politicians. This lack of concern about public funds misuse is one of the reasons corruption is so widespread among Spanish municipalities.

Regarding another policy implication of our findings, we must bear in mind that local governments are under reform in several European countries. For example, The Netherlands is merging municipalities; France simplified the local government sector to increase efficiency and to limit taxes. Knowing if *yardstick competition* is a real phenomenon may help them design a better institutional framework. In this point, as Bordignon, Cerniglia and Revelli (2003) indicate, *Tiebout's "voting with your feet"* (*tax competition*) is less relevant in Europe than in the United States, for example. In Spain, legislation should be aimed in such a way as to direct municipal governments' decisions towards the real needs of their constituencies, rather than allowing incumbents to compete with neighboring municipalities' tax and spending policies. In this respect, participatory budgets should be used as a way to empower tax payers about spending priorities of their municipality. However, getting citizens involved in municipal issues is complicated (McKenna, 2011).

As limitations, we can point out that it is difficult to identify whether tax mimicking stems from *tax competition*, from *yardstick competition*, or both, because the spatial reaction function of both theories is the same (Allers and Elhorst, 2005). This is a problem common to all papers on tax competition. In our case, these two theories have been rejected. As for the *tax competition theory*, our available data did not allow us to distinguish, within the population change, any city from which people were moving to other cities, as a way to clearly identify *Tiebout's "voting with your feet"* phenomenon. Besides, a questionnaire would have had to have asked why each and every citizen moved from one city to another, which is almost impossible.

As far as further research is concerned, we will investigate whether municipal tax base revisions (cadastral values revaluation) follow a tax competition strategy. In other words, check whether municipalities decide to postpone the revaluation

until their neighbors have already revalued, and therefore, the former are not penalized in a comparative assessment with the latter. Besides, further research should investigate if these revaluations follow an electoral budget cycle. Also, the expenditure patterns among Spanish municipalities could be investigated further. The idea would be to explore what determines expenditure patterns of municipalities (for example the ratio of material and employee expenses, etc.) in a spatial context (the effect of space, time and space-time parameters). Finally, as Manski (1993) points out, future research could add new experimental data to the analysis, such as questionnaires sent to municipal incumbents. This would overcome, at least partially, the limitation stated above.

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No potential conflict of interest was reported by the authors.

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A proposal for a simple average-based progressive taxation system

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Abstract

This paper is a first theoretical presentation of a simple progressive taxation system. The system is based on two adaptations of one easily calculable formula that is based on the societal average income of the previous year. The system contributes to academic discussions as it is a novel approach. It is a progressive tax that does not discriminate against anyone as the progression increases continuously and the increase in tax payment does not go beyond the additional income. The analysis in the paper shows that the core advantage of the system is its simple, transparent and adaptable mechanism.

Keywords: taxation, flat tax, progressive tax, taxation efficiency

1 INTRODUCTION

Complicated taxation systems do not only lead to a significant increase in administrative costs for all parties involved, but they can also lead to unjustified tax exemptions and loopholes. This paper introduces a concept for a simple progressive taxation system, which enables citizens, the economy and the state to save significant amounts of money by decreasing the time invested in administering the taxation process. The concept facilitates fast tax reporting and also a fast and simple auditing process, which saves time and money for all stakeholders. The simplicity of the system makes it calculable for anyone and creates transparency within the system. The simplicity extends to the optimization of the tax rate and progression, if it is in the interest of the political power to change one of the factors. The proposed concept employs only two simple formulas and closes most loopholes in the tax code with this simplicity. The simple progressive tax (SPT) enables hence a transparent process for all citizens and they have the same process to go through without differentiation. It is a progressive counterpart to the flat tax. In contrast to the flat-tax concept, the SPT obviates several of the current conflicts regarding income inequality and some of the usual dilemmas of progressive taxation systems. In the existing literature on taxation, such a system is still missing and this paper tries to shed light on this important gap.

This article is a first theoretical introduction to the concept. The first demonstration of the SPT concept is provided by simplified examples. A simple quantitative comparison of the results of the SPT with those of the current taxation systems of Germany and Estonia is offered. The two countries have very different approaches towards taxation: Germany with its progressive and complex system and Estonia with its flat tax system. For this first introduction, we limit our analysis to these two countries in order to keep the paper understandable. The goal is to show the differences of the SPT for two diametrically different taxation systems. The system proposed aims to combine the beneficial parts from both systems in order to facilitate the creation of a potentially simple progressive taxation system.

The empirical part shows that the SPT works as claimed and emphasizes the differences to the systems that are currently in place. It also shows that the SPT

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provides a slow and long-lasting progression, which might create a system that does not affect any taxpayer over proportionally. The study uses the Luxembourg Income Study Database and the German statistical office data. The remainder of the paper is organised as follows: section 2 discusses different theories behind taxation systems in order to explain the rationale behind the SPT, section 3 describes the SPT in theory and section 4 discusses the dataset while section 5 provides some first empirical example cases. Section 6 discusses the potential outcomes from the application of the theoretical model while section 7 concludes the paper.

2 FLAT AND PROGRESSIVE TAXATION: A BRIEF OVERVIEW

Going briefly back into history, it becomes obvious that taxation depends highly on the individual perception of justice and fairness. Frank (1995) illustrates that in medieval times a system close to the modern flat-tax approach was already introduced, for in feudal Europe taxation consisted of the land owners taking a fixed proportion of agricultural production. In *Leviathan,* 1651, Hobbes (2006) argued that individuals should be taxed in proportion to the benefits they received from the state, which is measured by consumption and not by income or property. For him, the link between proportionate taxation and the use of consumption as a tax base is not necessary even if that relation is common among those who support the single-rate taxation.

Adam Smith, in his iconic work *The Wealth of Nations* (1776), muddled his stance on progressive taxation. He claims: "It is not very unreasonable that the rich should contribute to the public expense not only in proportion to their revenue, but something more than in proportion", but he endorsed proportional rates, suggesting that "subjects of every state ought to contribute towards the support of the government, as nearly as possible in proportion to their respective abilities, that is in proportion to the revenue which they respectively enjoy under the protection of the state" (Smith, 1776, V.II.I. p. 911). In fact, Smith's argument for proportionality seems more consistent with his broader discussion on taxation.

Flat-tax supporters often refer to John Stuart Mill's work (1852), recalling his observation that progressive taxes were "a mild form of robbery". However, Mill endorsed digressive taxation, with an exemption to allow for necessities. Seligman (1894) believed that this deviation from true proportionality vitiated Mill's entire case for flat rate taxes, opening the door to any sort of progressive rate structure. The introduction of the concept of flat tax has its roots in the mid-twentieth century as a product of the conservative intellectual renaissance from the USA. In 1962, Friedman discussed progressive taxation. He preferred a flat-rate income tax[1] also as a means to alleviate poverty. Milton Friedman hence relaunched the idea of competition between proportional and progressive taxation (Friedman, 1962). Hayek (1960) also developed arguments against the idea that progressive taxation is essential to ensure a redistribution of income in favour of the poor.

[1] Friedman wrote: "I find it hard, as a liberal, to see any justification for graduated taxation solely to redistribute income" (Capital and Freedom).

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One particularly interesting approach for finding a just income taxation system, developed by Bamford (2015), is the hourly average approach. It is based on the average of two key figures. The first is the lifetime-worktime indicator, which is a bundle of all working hours accumulated over a person's life. The second is the lifetime income, which is the indicator for all income earned over the lifetime already lived. These numbers get accumulated and averaged. The outcome then is an average hourly income. This average can be the basis for the particular tax burden. In the concept, the burden would increase with a higher average income per hour (Bamford, 2015). The system may not be very practical, but it respects the aspect of earning per hour which the "normal" taxation system does not take into account. Additionally, this is one of the few average-income-based taxation systems in existence.

2.1 FLAT TAXATION

Hayek and Friedman advocated a flat tax (Friedman, 1962; Hayek, 1956, 1960). The original starting point for flat taxes was Hall and Rabushka's book (1983). The flat tax system grew in Europe in the years after the collapse of the Soviet Union and the European Union enlargement to post-communist countries that have adopted such systems.

Hall and Rabushka (1983) are the pioneers in academic works about flat tax and they consider a single tax rate applied to both personal and corporate income beyond a given threshold or "basic allowance", but in practice none of the countries mentioned above have adopted a pure flat tax system. The concept of a flat tax is much more discussed in the USA than in Europe and it has created a debate both in the academic and in the political sphere. The European discussion took shape on the shores of the Baltic Sea, when Estonia enacted a flat-rate income tax in 1994. Since 2001, other Central and Eastern European (CEE) countries have followed the Estonian example (Keen, Kim and Varsano, 2006).

In post-communist CEE countries, the introduction of the flat tax has developed since 1994, when Estonia was the first European country to introduce it. In the meantime, other CEE countries have followed its example.[2] Estonia replaced a progressive personal income tax-rate system (16, 24 and 33, and 50 per cent) with a proportional 26 per cent rate in 1994, gradually reduced to 20 per cent by 2015 and still standing at 20 per cent (Trasberg, 2011; Estonian Tax and Customs Board, 2019).

Some countries have maintained different income and corporate tax rates. In most cases flat tax refers only to income tax. The political and economic debates in Eastern Europe have been dominated by discussions about flat tax for almost twenty years (Evans and Aligica, 2008).

[2] Russia in 2001, Serbia in 2003, Slovak Republic and Ukraine in 2004, Romania and Georgia in 2005.

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Nowadays, the European countries that have adopted the flat-tax system are all former Communist nations (except the Channel Islands). The core idea of the flat-tax concept is that everybody pays the same tax rate regardless of income or fortune. This pure form of proportional taxation is obviously not the only possible design that has been developed over the years.

Only a few empirical studies have considered previous flat-tax reforms in detail. The most attention has been paid to the Russian flat-tax reform of 2001 (Gorodnichenko, Martinez-Vazquez and Peter, 2008). They used the Difference-in-Differences approach to study the effects of Russia's flat-rate income-tax reform on consumption, income and tax evasion. Their findings show that the adoption of a flat-rate income tax is not expected to lead to significant increases in tax revenues, and although they find tangible efficiency gains from the tax reform, they are not as large as implied by conventional approaches. Reynolds (1999) discusses how Hong Kong has had a flat tax for more than half a century after the Second World War, similar to the Channel Islands (Fuest, Peichl and Schaefer, 2008), but Hong Kong and the Channel Islands are not independent or autonomous nations like Estonia, the first European country to introduce a flat rate of 26 per cent on personal income and corporate profits in 1994.

Fuest, Peichl and Schaefer (2008), using income-tax microdata and household survey data, asked whether a flat tax would be feasible in Germany. Their study shows that a flat-rate tax with a low tax rate and a low basic allowance yields positive static welfare effects amounting to approximately 1.8 per cent of income-tax revenue, but it increases income inequality at the same time. In their model, the increase in income inequality can be avoided by combining a higher tax rate with a higher basic allowance, and in that case, the efficiency gains vanish. Their conclusion is that due to their limited efficiency effects and the problematic distributional impact, flat-tax reforms are unlikely to spill over to Western European countries.

The introduction of flat-rate tax systems is associated with a possible boost in efficiency, employment and growth through simplification and better incentives, but at the same time it is associated with an increase in inequality. Keen, Kim and Varsano (2006) stressed that the empirical evidence on the effects and impact factors of the flat tax is limited to several countries that have adopted it in recent years, but they found no sign of Laffer-type behavioural responses, which means that tax cuts would generate revenue increases. Paulus and Peichl (2009) studied the possibility of applying a flat tax in Western European countries using simulation and the EUROMOD dataset, given that flat taxes have not yet been implemented in Western European countries. In their paper, they claim that in most countries the relative loss in disposable income is high or even highest for middle-income households. If the importance of these groups for the political process in Western Europe is taken into account and correlated with the effects of a flat tax system, it might be possible to explain why Western European countries are not keen on introducing a flat tax.

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No implemented flat-tax system meets all the additional requirements needed for an "orthodox" flat tax (as proposed by Hall and Rabushka, 1983), namely that there be no tax on savings (including pensions), no tax on foreign earnings, no tax on capital gains, no tax on inheritances, no tax on charities, no allowances and reliefs, while business be taxed on cash flow and not on profits (Murphy, 2006).

One argument important for the advocates of a flat tax is that it would help to improve tax collection by lowering tax evasion, broadening the tax base and increasing the budget revenues. Keen, Kim and Varsano (2006) show in their paper that the revenues from the personal income tax, as share of GDP, dropped in Estonia in the first year after the introduction of a flat tax. In terms of fiscal pressure for low-income earners, Staehr (2004) mentions that the flat tax might be a factor leading to societal fragmentation and unemployment.

Turning a flat tax into a progressive tax by adding tax-free thresholds would be the closest to the concept proposed here. The difference is that the SPT works without stages, barriers or limits, it is transparent and treats all income receivers equally, by applying the same two formulas to each individual. The SPT is also based on the societal average income and hence relates the individual tax rate to the income distribution in the society. There are no levels that might prevent employees from aiming to gain more, by requiring them to pay more taxes than income gained. There is also no mid-income trap or any issue similar to this. Each euro of additional income is taxed more than the last one, but the taxation system never eliminates the gain entirely. Every income is beneficial to the individual gaining it, regardless if the person is in the lowest or the highest quantile of the income distribution.

The undeniable advantage of a flat tax is that the administrative costs and the time required are rather low for all parties involved. This is also one of the core strengths that the SPT is built on.

A hypothesis that we would like to test in another paper is that simplicity might be able to promote legitimacy among the population, which might be of particular interest for governments in times like these. The SPT would provide such an advantage for the government, but further research would be required to find out if such a hypothesis can hold up.

2.2 PROGRESSIVE TAXATION

The impact of every progressive system depends hugely on its particular design. There are rather extreme cases of progressivity, in which authors call for a taxation in which the highest incomes within a society should be taxed with increasing marginal rates, while low incomes should receive tax subsidies (Diamond and Saez, 2011), but this is not a necessary condition for a progressive taxation system.

Support for a progressive system comes from the idea of giving the poor a chance to alleviate their situation (Schweiger, 2015). Another argument is given by the

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theory of positional externalities, which claims that people with higher incomes spend more money on positional goods, like art, luxury cars or larger houses that do not provide a lot of utility except for prestige. These investments would decrease with a progressive tax and would enable an investment of the money into public goods (Krueger and Ludwig, 2016).

In Germany, one basic tendency that dominated the taxation debate over the last few decades was mentioned by the German Federal Constitutional Court in 1992. The basis for tax estimations should not just reflect income, but it should also recognize the momentary situation in the economy and the existential needs of the citizens (BVerfGE 87, 153). According to a study from 2010, most German taxpayers are in favour of a progressive tax anyway. The important question remains how to design and justify such a system (Hennighausen and Heinemann, 2010).

Effectively, Germany has a taxation system that has progressive tendencies and thus already reduces income inequality, but the system is rather complex and high in administrative costs (Bach, Corneo and Steiner, 2006). Schweiger (2015) has emphasized the ability-to-pay argument and the argument of limiting inequalities against flat taxes. The ability-to-pay argument is the idea that every citizen should pay a tax that is not overburdening, which means that the taxation should respect the need of poorer citizens to invest a higher share of their monthly income in their costs of living than richer citizens. Limiting inequality is an intrinsic idea for the social state, which tries to enable the poorest to emerge from their poverty and thus needs the richest to pay a higher share of their income (Schweiger, 2015). Both of these arguments might lead to the outcome that a progressive tax could be seen as closer to a just taxation system than a flat-tax system. However, these are only two arguments, and the personal perception of justice remains subjective. These perceptual differences have led to so many different systems that the flat tax is only one of many (Nerré, 2008), but for this paper the example is important as it can help to clarify the purpose, advantages and effectiveness of a simple system.

Kirchhof (2010), for example, has argued for years for a simplification of the German taxation systems. In his paper, he wrote that the taxpayer has to pay, just because she or he is able to do so because of the individual financial situation and not because she or he did not use the legally provided or accepted circumvention mechanisms. Taxation should not be a matter of tactics or strategy; it should be a process with an open visor, a card game with open cards and not the game of cat and mouse triggered by the current system. Kirchhof also made a big leap forward with the "Heidelberger Entwurf". The concept planned to reduce the more than 30 German taxes to four taxes: one income tax, one sales tax, one estate, inheritance and gift tax and one excise tax (Kirchhof, 2010). Only a few things out of those proposals were actually put into law in the end, but the approach to simplify triggered a large public discussion in Germany (Rixen, 2010).

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3 THEORETICAL PROPOSAL FOR A SIMPLE PROGRESSIVE TAXATION

The simplification aspects of the concept presented in this paper are based on similar ideas to those of Kirchhof, but SPT could move the simplification one step further, as it would be able to minimize the number of taxes to only two. An income tax that could also be used as a corporate tax, with some small alterations from the original design. A sales tax, which would be built on the same formula, but the indicators have to be different to make the system appropriate. Other taxes that are implemented to trigger behavioural incentives, like taxes on tobacco or sugar are not considered in this analysis, as they are created through the interest of public health, public security or something else and are not actually implemented for the pure need to finance the public administration.

This paper presents the system only as an income tax which is able to resolve several current conflicts regarding income inequality and regarding the consequences of complex taxation systems. The system we present can be designed in a way similar to the design presented in this paper, but it does not have to be so interpreted or designed. The formula is first of all an inspiration for further thought and its design is intended to facilitate the administration of the taxation system and to facilitate an individual optimization for the country applying it.

Additionally, a tax system is always one of the most direct and relevant points of contact between a state and the day-to-day lives of its citizens. The picture of a bureaucratic and wasteful public administration is strongly supported by a complex and even confusing taxation system. A formula which is understandable and calculable for everyone, on the other hand, might be able to give a more positive image to the taxpayers, and it might be able to show a closer proximity between the government, the administration and the citizens, but that is only an untested hypothesis that we would like to test in the future.

3.1 THE THEORETICAL MODEL OF THE SIMPLE PROGRESSIVE TAX

Our paper presents a simple taxation mechanism, which consists of two adaptations of one formula. The objective is to create a system that is easily understandable and fast to apply for all citizens. With increasing income the formula creates an increasing tax rate. The marginal tax rate never surpasses the marginal income gain. It is hence always beneficial for the individual to earn more. In this particular design of an income tax, all income, regardless of its source, is accounted for; hence it includes subsidies, transfers, inheritance, gifts, labour income and income from capital investment, interests and entrepreneurial activity. The point that gifts and inheritance are also included in this particular design is that it limits the incentives for strategic behaviour, but this issue will be discussed in detail later. This all including approach makes the income a rather general number and easy to control. In systems where simplicity is not the highest priority, inheritance and gift taxation could be excluded from income. An adaptation of the SPT to an inheritance tax system is easily possible and could hence be similarly easy to calculate. Such adaptation possibilities make the system flexible and simple, as there are very few

exceptions and no entrance borders or layers. All people generating income within the country pay income taxes, beginning from the first euro, while keeping the distribution of the tax adapted to the capabilities of the individual.

Basing the formula on the societal average income eases the individual's and societal income shifts by relating them to the development of the income of the entire society. It also automatically includes inflation and market-based income developments in every taxpayer's taxation payments. This means that, if an employee works in a labour market and receives an income below the average income increase, she or he has to pay lower taxes in the following year. The main model follows formula (1), which is the baseline. This is the formula that every taxpayer has to calculate for her- or himself. The taxpayer only needs to include the personal income and the personal volume of donations, while the societal average income of the past year is published by a public entity. The system is also designed in such a way that the tax rate never surpasses the volume of the additional income, so that more income equals more income in every case – which is not necessarily the case in every progressive taxation system.

$$\frac{Personal\ income - donations}{Societal\ average\ income\ of\ the\ past\ year * 1.4} = x \Rightarrow x * 30 = taxrate \quad (1)$$

$$\text{if } x \geq 1.6\overline{6} = use\ formula \quad (4)$$

Personal income in this case, as mentioned, includes capital income, gifts, inheritance and, generally speaking, all income accruing to the individual in that time period. For the empirical sections that follow the personal income is defined as the income upon which the current tax rate is calculated. The variable can hence be freely defined, but the simplicity and the distributional effects that the formula is supposed to trigger are most strongly achieved with an all-inclusive personal income definition. One-time incomes, such as gifts or inheritances and their fair accounting in the formula, as well as the variable donations, are discussed below. The denominators' main variable, the societal average income of the past year, implies an administrative challenge, especially in the transitional years when the concept is not yet fully established, as the average tax payment of the past year cannot necessarily be calculated that fast. If that is the case the average should be calculated by the last year where the full data is available multiplied by the inflation rates that occurred between that and the current year.

The indicators of 30 and of 1.4 are exemplified numbers. They can be changed flexibly to increase or decrease the progressivity and the average tax rate according to the needs and wishes of the implementing state or entity. Nevertheless, these values and the possible maximal level of this formula have to be carefully levelled to one another so that they lead to a clean mathematical limit without distorting effects within the system. The value of 1.4 is used to lower the progressivity and spread the curve over a larger share of the population. If the indicator

were closer to one, the steeper the progression would begin at lower income levels and the earlier the cut would be limited by the formula (4).

The impact factor of 30 has been chosen to create an average tax rate that lies close to a real average tax rate in Germany, as the resulting average tax rate is 21.43 per cent, i.e. the result of 30/1.4. These two indicators determine the progression as well as the effective average tax rate of the society. They are always strongly depending on another and need to be adapted together. A change of the tax rate factor from 30 to 45 would result in an average tax rate of 32.14, if the progression indicator were not adapted. If the progression indicator were changed to 2.0998 the resulting average tax rate would be 21.43, which produces exactly the same results under formula (1). The same accounts for the combination of 21.43/1. The same average tax rate can also be achieved via multiple combinations. The indicators can be chosen in any way, which means that the mathematical average of the tax rate can be zero or one hundred per cent as the other extreme. The indicators allow the implementing entity to steer the stronger progression to an earlier or later progression within the range of formula (1). Formula (4) is employed, the real function of the progression indicator comes into play as it allows the implementing state to create a progression that is steeper, as would be the case with the example of 21.43/1 or flatter as would be the case with the 45/2.0998 indicator. This claim is mathematically shown, based on the LIS dataset for Germany in 2007. According to the progression measure of Musgrave and Thin (Musgrave and Thin, 1948) the 21.43/1 indicator combination has the highest Average Rate of Progression (ARP).

It is calculated as follows:

$$ARP = \frac{ATR_1 - ATR_0}{\left(Y_1 - Y_0\right) - 1} \tag{2}$$

$$ATR = \frac{T}{Y} \tag{3}$$

where ATR is the Average Tax Rate, Y_0 and Y_1 are the personal incomes of two high income individuals and T are the tax liabilities. Y_0 and Y_1 are example selections, in order to show the progression under formula II (eq. 4). The incomes hence only have to be in the highest income groups, in order to ensure the use of formula II.

The results in table 1 clearly show that the lowest progression indicator results in the strongest progression within the range of formula (4).

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Table 1

Average rate of progression

	21.43/1	**30/1.4**	**45/2.0998**
Y_0	76,809	76,809	76,809
Y_1	165,850	165,850	165,850
$T(Y_0)$	39,510	38,460	37,683
$T(Y_1)$	90,002	86,395	83,602
ATR (Y_0)	0.51	0.50	0.49
ATR (Y_1)	0.54	0.52	0.50
ARP	0.02	0.02	0.01

Source: LIS 2007 Data for Germany.

Notes: authors' own calculation.

The influence of the indicators is hence multileveled and allows the implementing entity a rather broad freedom within the design of the taxation system that is supposed to be implemented.

The indicators also have to be calculated accordingly with the maximal level of x to enable a swift and fair transition to (4), the formula that applies only to wealthier taxpayers. If the indicators are not matched with each other and the beginning income for formula (4), a taxpayer earning more gross than another might end up earning less net, which is under no circumstances a just development.

Hence the purpose of the indicators 1.4 and 30 is to determine the tax rate and the progression. They are also responsible for a smoother increase in the tax rate and that no over-taxation of certain income groups occurs, thus a system that is fair to all citizens.

In the example that this paper uses to show the possibilities of the formula the tax rate, calculated with the first formula (1), is artificially limited to a spread from 0 per cent to up to 50 per cent. This artificial limit is implemented through the rule that if the tax rate of any taxpayer reaches a value that is $x \geq 1.6\overline{6}$, which equals a tax rate of 50 per cent, formula (4) comes into play, and y becomes the tax rate for that person. Formula (4) is nothing but a small adaptation of formula (1). The difference between these two formulas is the second term of the formula. The progressivity of (4) is much smaller than that in (1), which is made to show that this formula enables the tax rate to spread over a longer span and hence to diversify the progressivity of the tax rate to a wider spectrum of the population.

$$\frac{Personal\,income - donations}{Societal\,average\,income\,of\,the\,past\,year * 1.4} = x \Rightarrow x + 48.3\overline{3} = taxrate \quad (4)$$

$$For\ formula\ (4)\ min:\ x=1.6\overline{6};\ max:\ x=6.6\overline{6} \Rightarrow max:\ taxrate=55$$

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The tax rates here vary between 50 per cent and 55 per cent, 55 per cent being the highest percentage possible. This is why the indicator $48.3\overline{3}$ was chosen, as it adds up perfectly to the line of a 50-per cent tax rate. It adds up with a minimal x of $1.66\overline{6}$, which is the minimal level of x that demands the use of formula (4).

Formula (4) is exemplified here for the purpose of showing the possibility of implementing a slow progressivity over a large share of the population and of showing that fair tax rates above the levels where formula (1) produces an over burdening progression are possible. The design of formula (1) leads to an almost exponential increase for the individual tax rate above that line, at least this is the case in most adaptations of the design. Formula (4) hence shows how a further increase in a tax rate could work under SPT. Formula (4) could obviously also work in lower percentage tax rates, but its progressivity is too slow to really be applicable to an entire society. Formula (1) creates a stronger progressivity that frees low-income citizens, especially the weakest in the society, from higher tax burdens, as the tax rate is bound to the average income of the society. If a person's income lies beneath that line, he/she pays less than or equal to 21.43 per cent taxes. If the income is higher than the average, he/she pays more than 21.43 per cent taxes. This uneven number is a product of the design of the formula, which is created to keep the steepest areas of the progressivity above the line where formula (4) substitutes for formula (1). The calculation of the societal average income is based on the arithmetic median, as this simple method includes the outliers of the society, and it is more inclusive than other calculations of the society's average. The additional upside for the taxpayer is that due to the high-income outliers, a higher societal average is calculated. This decreases the tax rate for all taxpayers in comparison to a tax rate based on the median or other means to calculate the average. Calculating formula (4) is only necessary for the higher-income receivers in the society. It has to be said that there is one weaker aspect regarding these two formulas. The transition between the two formulas cannot be perfect. The progressivity of formula (1) is higher than the progressivity of formula (4), and that means that someone who earns slightly less than the split has to endure a higher increase in tax rate on the next additional euro than someone who is slightly above the line, as the progressivity decreases. However, just to clarify, the real tax rate and the actual tax payment is always higher for the person earning more, regardless of the size of their income. The issue between the formulas is minimized by the positioning and design of the formulas, but it cannot be eliminated. The impact is rather small and could be ignored, but in the spirit of transparency, these aspects should be mentioned.

Regarding one-time incomes, like gifts or inheritance, it is important to note that they are dividable and spreadable over the years. The tax payment should be spreadable, in an equally distributed fashion over a maximum period of up to 25 years to enable a sufficient protection of the heir. The allowed period depends on the gap between inheritance and yearly average income. The wider the gap between these two is and hence the higher the inheritance or gift, the longer the period of distribution. As a rule of thumb, the maximal spread of the tax payment

for inheritances or gifts should be distributed over one additional year per an increase of ten percentage points of the total income, over an averaged income period of five years. These calculations need to include inflation to eliminate gaming behaviour. In this way, an earlier payment is not a problem. The tax authorities have to be asked for permission to spread the income over the years. Every taxation system triggers particular incentives, and this system prides itself on triggering rather few incentives for gaming behaviour through its simplicity. It is a system that subjects everybody to the same easy mathematic basis, which ensures systemic fairness and equality, but individual needs cannot be taken into account, and hence absolute fairness cannot be guaranteed. Nevertheless, one important incentive that the system can trigger is the effect that larger inheritances and gifts are given or sold earlier and in smaller portions, so that a higher tax rate for the heir or benefiter of the gift is circumvented. This process is seen as acceptable, as it fulfils the purpose of the distributive effect of the tax system. The income loss for the state is acceptable, as a more continuous and earlier income flow is generated through the fact that private fortunes have to be shifted more actively and adequately in time to really enable an effect of saving for the taxpayers.

The system also minimizes the conflict of interest in the case of donations. Donations to publicly recognised charitable entities are deductible from the estimation base, which leads to the effect that a wealthier income taxpayer is able to profit disproportionally in comparison to a weaker taxpayer. The relative ability to donate increases with the increase of income, as a higher share of the income is not used for expenses of daily life. Nevertheless, the exception for donations is important regardless of its distorting impacts, as donations enable a more active and potent civil society. The supported entities not only enable a more socially engaged and active system, which makes them crucial for the life of a society, but they are able to take on tasks that otherwise the state would be obliged to cover. These entities are thus able to limit the expenditures for the state and limit the necessary tax income. They also limit a potentially all-surrounding state that has to occupy every inch of social life, as no private entities cover the unlimited number of socially, culturally or economically important aspects. To find a shared ground between these two aspects, a compromise of a maximum level of donations that is allowed to be deducted from the estimation basis of the tax formula is 5 per cent of the yearly income. This percentage is high enough to enable all donations, and the creation of foundations should not be endangered.

If the system was planned to be implemented for companies, as well, the limit for donation deduction would have to be lower for them due to the questionable influence that corporate social responsibility has (CSR) (Dahlsrud, 2008). Strict liberal theoreticians argued that profit was the only social responsibility of companies (Friedman, 1970), but today almost all administrations seem to disagree, as they implement rules to nurture CSR expenditures (Commission, 2013). Companies like CSR also because they can circumvent taxes and use it as a form of marketing. The public likes it as it makes brands more approachable and shows that a

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company cares. The last player in this equation is the state, which, in the cases of Italy and Germany, supports CSR activities (Porter and Kramer, 2002; Commission, 2013). Thus, all players seem to agree that this is an aspect worth nurturing, which is why the donations would remain within the formula even if it were supposed to be used for companies, as well.

4 DATA

For our exercise, we used values from the Luxembourg Income Study data form of the years 2007 and 2010. LIS is a data archive and research centre dedicated to cross-national analysis, and it released two databases: the Luxembourg Income Study Database (LIS) and the Luxembourg Wealth Study Database (LWS). The third source of our data is a report by the German statistical office from 2015 about data from 2011 (DeStatis, 2015).

The LIS is the largest available income database of harmonised microdata collected from about 50 countries from around the world, while the LWS is the first cross-national wealth database in existence and includes variables on assets and debt, market and government income, household characteristics, labour-market outcomes and, in some datasets, expenditures and behavioural indicators.

The main variable we are interested in is the "gross household income", which includes the total monetary payments from labour, property and social or private transfers. It also includes the total value of non-monetary goods and services received from labour and social or private transfers, excluding social transfers, such as universal health insurance, universal education benefits and near cash benefits from public housing.

In this first step of the concept, we use values for all workers without any distinction between full-time or part-time workers. We proceed to convert the values for Estonia into euros, given that in 2007 and 2010 Estonia was not yet in the European Monetary Union System.

We would also like to underline that this dataset does not contain any information about donations. This aspect forced us to ignore the impact factor "donation" for our examples in the following chapters. The aspect is important, but it does not change the underlying mechanism of the formula and can hence be ignored for the purpose of the examples.

5 EMPIRICAL COMPARISON

The following tables show the tax volume payable for both countries and years. The data presented here intends to illustrate the progressivity, and it exemplifies the development of the tax rate under SPT. The small section of "Cut for (4)" is introduced to show the imaginary line that triggers the application of formula (4), and it shows how small the percentage of people is who actually have to pay 50 per cent or more taxes. Two additional tables that show the Estonian

developments under the current system in 2007 and 2010 are in the appendix. These calculations describe the different progressions under the two formulas.

Table 2

Simple progressive tax results Germany 2007

2007	Germany		Tax rate	
Quantile	**Income in thousand €**	**x**	**Formula I**	**Formula II**
1	4.5	0.10	3.09	
5	8.4	0.19	5.71	
10	10.9	0.25	7.39	
25	18.0	0.41	12.25	
50	31.5	0.71	21.43	
75	51.9	1.18	35.30	
Cut for (4)	73.5	1.67	50.00	
90	76.8	1.74	52.27	50.10
95	99.0	2.25	67.37	50.58
99	165.9	3.76	112.87	52.10

Source: Luxembourg Income Survey (LIS), 2007.

Notes: authors' calculation based on LIS.

Table 3

Simple progressive tax results Germany 2010

2010	Germany		Tax rate	
Quantile	**Income in thousand €**	**x**	**Formula I**	**Formula II**
1	4.3	0.10	2.90	
5	8.8	0.20	5.89	
10	11.3	0.25	7.60	
25	18.0	0.40	12.17	
50	31.9	0.71	21.43	
75	54.1	1.21	36.42	
Cut for (4)	74.3	1.67	50.00	
90	81.3	1.82	54.72	50.16
95	101.4	2.27	68.24	50.61
99	161.5	3.62	108.64	51.95

Source: Luxembourg Income Survey (LIS), 2007.

Notes: authors' calculation based on LIS.

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TABLE 4

Simple progressive tax results Estonia 2007

2007	Estonia		Tax rate	
Quantile	**Income in thousand €**	**x**	**Formula I**	**Formula II**
1	0.7	0.05	1.60	
5	2.4	0.18	5.51	
10	2.7	0.22	6.45	
25	4.6	0.35	10.71	
50	9.2	0.71	21.43	
75	16.3	1.26	37.87	
Cut for (4)	21.5	1.67	50.00	
90	24.5	1.90	56.86	50.22
95	30.8	2.38	71.53	50.72
99	46.6	3.60	108.03	51.93

Source: Luxembourg Income Survey (LIS), 2007.

Notes: authors' calculation based on LIS.

TABLE 5

Simple progressive tax results Estonia 2010

2010	Estonia		Tax rate	
Quantile	**Income in thousand €**	**x**	**Formula I**	**Formula II**
1	0.7	0.06	1.79	
5	2.4	0.19	5.68	
10	3.4	0.27	8.02	
25	4.6	0.37	11.09	
50	8.9	0.71	21.43	
75	16.9	1.34	40.32	
Cut for (4)	20.9	1.67	50.00	
90	25.3	2.02	60.51	50.35
95	33.3	2.65	79.50	50.98
99	49.99	3.98	119.52	52.31

Source: Luxembourg Income Survey (LIS), 2007.

Notes: authors' calculation based on LIS.

The tables show that the maximum level of 55 per cent is not reached until the top 1 per cent of income. They also show that the system produces a progression, as mentioned in the descriptive part above. The people with low income pay very low taxes while the tax rates increase substantially over the spectrum of incomes. Even though these numbers are not too detailed, they are able to show the general tendencies within a society and the general results of the formulas.

The results of formula (4) show that the richest one per cent of Estonians got slightly richer between the year 2007 and 2010, while the "Cut for (4)" moved down, which indicates that more taxpayers lost income in the same period.

However, regardless of such possible interpretations the tables show that the SPT would indeed provide a completely different taxation level for most taxpayers, while keeping the administrative costs low. The richest 25 to 30 per cent of the taxpayers would feel an increase in their tax volume, while the poorest 20 to 25 per cent would feel a significant tax relief. The middle-income group of the society would only observe a rather small change in their tax rate.

The objective of these tables is also to enable an easy and obvious comparison to the tax code in place in the particular country. The Estonian flat tax makes such a comparison simple, as the tax rate for every taxpayer in 2010 was 21 per cent and 22 per cent in 2007. The rate dropped to 20 percent in 2015 and remains, at least, until 2018 on that level (Estonian Tax and Customs Board, 2019).

The comparison with the German data is a little bit more complex, and therefore table 6 summarizes it for the year 2011. Table 7 represents the same calculation for Estonian data for 2012. These comparison tables shall help to understand the differences in the tax volumes and tax systems and the different rules. The examples are calculated as first insights and representations of the inner workings of the SPT. A deeper empirical analysis will be needed in follow-up research.

For the sample presented in table 6, we adapted the indicators of the SPT. The adaptations made here have the objective of making the comparison more realistic and bringing the two progressive systems closer together. We changed the secondary indicator to 15, which means the indicator of the second step of formula (1) and the "Cut of line for (4)" was changed to $3.3\overline{3}$. The impact factor for formula (4) is hence now $3.3\overline{3}$. This impact factor and thus the $3.3\overline{3}$ are rather simple to calculate, as they represent only the value of x when the tax rate is 50 per cent. It is easy to adapt the formula further if the progression is too steep or the average tax level too high for the taste of somebody.

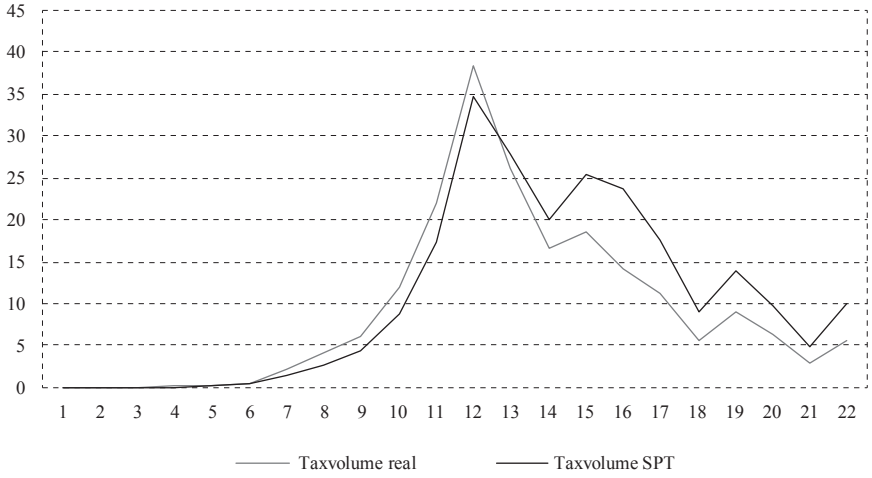
Formula (4) came only into use for taxpayers in the groups above an income of 175,000€ a year. The richest four groups penetrated the maximum restriction, and even though their tax rates would be mathematically higher, they were limited to 55 per cent. The importance of this limit can be seen with the help of the fact that the highest earning group of Germans, which is about 0.01 per cent of the population, would have had an index of 258.98. This incredibly high index is even more impressive considering the slow progressivity of formula (4).

Table 6 shows what was expected. Most of the lower-income groups are paying less under the SPT than with the current system, while the higher-income groups would pay more. What is interesting is the group of taxpayers with an income per year between 10,000 and 12,500€. These citizens would pay slightly more under the SPT, which shows that the exceptions and specialized solutions of the German tax code have their effects. Such special needs cannot be respected in a universal system, such as the SPT.

The public income of one group and hence their tax burden under the SPT only surpasses the current system's income in the population group with an income of 75,000-100,000€, which means that the SPT only leads to a heavier burden for the well earning sections of the population. The group from 75 to 100 thousand euros income per year is already among the 15 per cent top earners in Germany. Graph 1 shows these results clearly.

Graph 1

Taxation volume per income group in billion €



Source: DeStatis dataset (2015).

Table 6

SPT in comparison with the German tax code in 2011

Income group in thousand €	Average income per group in thousand €	Nr. of taxpayers in thousand	SPT (1) result	Tax rate SPT in %	Total group tax volume real in million €	Total group tax volume under SPT in million €
0-2.5	0.8	25.8	0.01	0.21	60.4	0.045
2.5-5.0	3.8	47.2	0.06	0.93	35.4	1.6
5.0-7.5	6.3	71.8	0.10	1.55	44.2	7.0
7.5-10	8.8	160.1	0.15	2.18	78.2	30.7
10.-12.5	11.3	665.1	0.19	2.78	204.4	208.6
12.5-15	13.7	863.7	0.23	3.39	495.2	402.6
15-20	17.5	1,789.2	0.29	4.32	2,220.2	1,352
20-25	22.5	2,134.1	0.37	5.56	4,013.5	2,667.3
25-30	27.5	2,333.1	0.45	6.79	6,093	4,355.6
30-37.5	33.6	3,148.9	0.55	8.30	11,898.9	8,783.9
37.5-50	43.3	3,737	0.71	10.69	21,890.6	17,291.6
50-75	60.6	3,818	0.99	14.97	38,271.8	34,625
75-100	85.7	1,531	1.41	21.17	26,260.2	27,776.1
100-125	110.9	657	1.83	27.39	16,703.8	19,952.9

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Income group in thousand €	Average income per group in thousand €	Nr. of taxpayers in thousand	SPT (1) result	Tax rate SPT in %	Total group tax volume real in million €	Total group tax volume under SPT in million €
125-175	145.1	486.2	2.39	35.86	18,583.7	25,306
175-250	205.5	230.3	3.38	50.05	14,160.7	23,677.8
250-375	299.3	114.4	4.93	51.60	11,147.5	17,668.1
375-500	428.8	38.7	7.06	53.73	5,685.9	8,923.9
500-1,000	668.2	37.7	11.01	55.00	8,977.1	13,870
1,000-2,500	1,463.4	12.2	24.11	55.00	6,339.8	9,829.8
2,500-5,000	3,408.8	2.6	56.16	55.00	2,924.7	4,788.4
5,000-	12,887.6	1.4	212.31	55.00	5,459.8	9,888
					201,549.1	231,407

Sources: based on DeStatis dataset (2015).

Notes: authors' own calculation, under the exclusion of donations; tax rate multiplier of 15 and a societal tax multiplier of 3.33̄ – in order to reflect a reasonably similar total tax volume.

Table 7

SPT in comparison with the Estonian tax code in 2012

Income group in thousand €	Average income per group in thousand €*	Nr. of taxpayers in thousand	SPT formula result**	Tax rate SPT**	Total group tax volume real in million € **	Total group tax volume under SPT in million €**
0-1.7	0.6	68.8	0.04	0.53	0	0.2
1.7-3.2	2.5	47.0	0.14	2.11	473.0	245.7
3.2-6.4	4.7	128.0	0.26	3.96	1,289.2	2,364.3
6.4-12.8	9.3	176,925	0.53	7.90	1,782.2	12,967.2
12.8-19.2	15.5	79,832	0.88	13.17	804.3	16,269.1
19.2-25.6	21.9	31,954	1.24	18.64	322.2	13,055.3
25.6-32	28.4	14,092	1.61	24.13	141.7	9,647.8
32-63.9	41.7	15,556	2.36	35.44	156.5	22,960.5
63.9-127.8	82.4	2,359	4.67	53.00	23.9	10,298.2
127.8-191.7	151.7	282	8.61	55.00	2.8	2,353.,6
191.7-255.7	222.3	61	12.61	55.00	0.569	745.9
255.7-320	286.5	30	16.25	55.00	0.569	472.7
320-383.5	350.5	22	19.88	55.00	1.6	424.1
383.5-639.1	480.8	31	27.27	55.00	0.569	819.7
639.1-3,195.6	952.6	21	54.03	55.00	4.200	1.100
Above 3,195.6	4,534.4	2	257.19	55.00	1.9	498.8
Total					569.2	48.8

Sources: based on Estonian Tax and Customs Board (2013).

** Estimation based on standard distribution.*

*** Estimation – if applicable: based on the same parameters as table 6.*

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6 DISCUSSION

The tables show that the SPT keeps in the promise of the descriptive part of the paper. There is not much to say, as the data speak for themselves. These examples were only able to show that the system actually works. A more detailed analysis about the long-term results and societal consequences of the SPT will follow in future research. One thing that can be said is that the SPT, under the applications used in this first example, would shift the tax burden more intensely towards the citizens with more income. Decreasing income inequality would be achieved not only by progression, but also by an aspect that was not represented in the data, because the SPT would observe capital income as well as income and would not grant special conditions for those incomes. The SPT would also decrease administrative expenditures in Germany and would keep the level to the same extent in Estonia.

The weakest and most complicated point of the SPT is the transition from formula (1) to formula (4). In the example of table 6 this point is only of interest for about two per cent of the population (DeStatis, 2015). If we had calculated the example with the values we used for the other examples (30; $1.6\overline{6}$) the transition would have affected about 13 per cent of the society. In that case, the total tax revenue would have been about 360 billion euros and hence 130 billion euros more than under the design above and the actual system in place. The example also shows that only the top earners are impacted by the transition at all. The example also emphasises that the indicators were adapted correctly. The transition is smooth, and the impact on the taxpayers is minimized in any case.

What is positive is that the examples were also able to show another weakness of the SPT or all simple tax systems in general. One group of low-income taxpayers in Germany has to pay more under the SPT than under the current system. The payment difference between the two systems is marginal for the individual, about 6.25€, but it shows the advantage of a complex taxation system. The needs of one particular group can be respected, which simple systems cannot provide. The simplicity of tax systems is sometimes associated with an increase in injustice, as there are fewer exceptions and thus less individuality is representable. One contradicting issue for this statement is that there is no perfect information and hence that complexity has a decreasing marginal utility when the numerous exceptions have led to a complex system of loopholes. More loopholes mean less tax payment, while increasing the administrative costs that all taxpayers have to bear. A taxpayer can hence profit from the system as long as the necessary information is available for that particular taxpayer. A simple system like the SPT cannot respect any individual problems or aspects – which could only be generated by a complex algorithm. The SPT and simple systems like flat taxes can ensure that everybody is shouldering her or his share of the tax burden without exceptions as the possibility of finding a loophole is eliminated by its simplicity.

The obligation to pay the highest taxation rate, the rate of 55 per cent, affects only the richest 0.2 per cent of the society. Hence the slow progression within formula

(4) continues until rather high incomes. The most positive and important aspect of formula (4) is that it makes it possible to ease the rather strong progression of formula (1) in the higher income groups.

Another advantage of the SPT is that the formula inherently adapts to the level of income inequality within a society. The larger the income inequality is, the larger is the spread between the lowest and the highest tax rate. The limit of the tax rate is only determined by politics, as formula (4) allows for a spread of the progression across the entire spectrum of all incomes of a society, hence a spread from 0.0 per cent to 100 per cent. On the other hand, if a hypothetical society were perfectly egalitarian and all incomes were equally high, all incomes would be taxed with the same tax rate. The same mechanism, the average-based calculation, provides the fact that the system adapts automatically to inflation and increases in price levels, as the number remains the same for all and is automatically updated each year. Only an episode of hyperinflation would be problematic for the efficiency of this design, as the much higher incomes in the current year would lead to maximum tax rates for all incomes, which cannot be the target at any point in time, but particularly not in times of a hyperinflation.

It is also clear that a progressive taxation system would trigger negative externalities and spill-over effects if the rest of the tax code were not adapted. A flow towards corporate funds needs to be prevented with a similar tax rate for a company, which could be provided with a slightly more complicated version of this formula or another progressive system.

To validate these results and to investigate the results in more depth, especially the long-term results of an introduction of the SPT, further research with solid empirical data is needed. Future research should also include an analysis of inheritance tax, value-added tax and cooperate tax based on the SPT. This paper was able to give an empirical and theoretical demonstration of the concept. Nevertheless, questions that cannot be answered with the methods and the data used for this paper remain.

The concept or an adaptation of it might be interesting for countries with a tax code that is already rather simple, as the adaptation too would be rather simple. For countries with a more complex system this concept might be more of an inspiration, as the simplification of the tax code goes along with many controversial discussions. The population and special interest groups would work hard to prevent the loss of particular benefits so that the process is rather complex and long-lasting, but countries with an already simplified tax code could rather easily adapt such a system in order to fight increasing income inequality or in order to follow a different approach towards simplicity than a flat tax.

7 CONCLUSION

Simplifying the tax code while employing a flexible progressive tax system is rather unusual, but the literature review has shown that it is the design of working with the adaptations of only one formula and using the yearly societal average income as a tax basis that makes the Simple Progressive Tax unique in comparison to the existing progressive taxation systems.

The tax rate can increase slowly or rapidly, depending on the chosen indicators. The tax rate can be limited to any level and even further simplified when stopped at the over-progressive tax rates of formula (1), as no secondary formula is needed in such a case. The SPT or a similar system can be adapted easily to multiple taxes. Such a system would enable welfare gains, not only because the citizens and the administration would save enormous amounts of time and money, but they would also gain confidence in their state, as an understandable taxation system should be able to increase the confidence in the government and its administration.

This first introductory paper about the concept of the SPT has established that it produces a slow progression for the tax rate, while providing the organisational benefits of a flat tax. Future research will have to show if the results of the concept can hold up in the long-term and if the concept can actually make life easier for the economically weaker members of the society and simplify its administration.

Disclosure statement

No potential conflict of interest was reported by the authors.

APPENDIX

Table A1

Descriptive statistics for Germany

Variable	**Gross household income in thousand €**		
Years			
2007		2010	
Percentiles		Percentiles	
1	4.5	1	4.3
5	8.4	5	8.7
10	10.9	10	11.3
25	18.0	25	18.0
50	31.5	50	31.9
75	51.9	75	54.1
90	76.8	90	81.3
95	99.0	95	101.4
99	165.8	99	161.5
N. obs.	10.9	N. obs.	12.1
Mean	40.6	Mean	41.3
S.D.	44.3	S.D.	39.3

Source: Luxembourg Income Survey (LIS) for years 2007 and 2010.

Table A2

Descriptive statistics for Estonia

Variable	**Gross household income in thousand €**		
Years			
2007		2010	
Percentiles		Percentiles	
1	0.7	1	0.7
5	2.4	5	2.4
10	2.8	10	3.4
25	4.6	25	4.6
50	9.2	50	9.0
75	16.3	75	16.9
90	24.5	90	25.3
95	30.8	95	33.3
99	46.6	99	49.9
N. obs.	4.7	N. obs.	4.9
Mean	12.0	Mean	12.3
S.D.	10.2	S.D.	10.4

Source: Luxembourg Income Survey (LIS) for years 2007 and 2010.

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Social welfare dynamics in post-socialist countries: unveiling the secrets of success

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Abstract

Since the global collapse of the socialist command economy, a significant differentiation in social and economic development within the former socialist world has been observed. Economists have pointed out a number of factors which could explain this disparity. One of the most important is market reform of the economy freeing Smith's "invisible hand" that with the support of inclusive political and economical institutions makes it possible for the national economy to thrive and thus achieve higher welfare for the nation. In this article, the influence of various factors on social well-being in the post-socialist countries of Central and Eastern Europe is analyzed. Our analysis has revealed that such factors as the level of economic freedom, intensity of economic reform, fostering of human capital, and level of national economy output play a significant role in creating a positive social welfare dynamics in transitional nations. It appears that the importance of these factors may vary within the cross-section of selected countries; thus, different policy patterns with regard to social welfare could be applied depending on factor combinations existing in some specific countries.

Keywords: market transformation, social welfare, the Sen Social Welfare Index, post-socialist countries

1 INTRODUCTION

Social welfare is characterized by the quality of life and standard of living in a given country and is a product of economic, social, environmental, cultural and institutional factors that are on the one hand predetermined by historical development and on the other hand are subject to a nation's public choice. Its estimation allows us to lay down a desired trajectory of social development. It is the commonly perceived wisdom that any society should be striving for higher social welfare, i.e. the nation-wide human community aims to reach higher well-being for society as a whole. From a theoretical point of view it is fascinating to investigate why different countries, despite comparable initial conditions, reach different levels of social welfare. This issue is even more important in practical terms.

At the end of the 20th century major modifications were initiated in the countries of Central and Eastern Europe (further referred to as CEE). These modifications brought about fundamental transformations of their socio-economic systems. The demise of socialism in these countries is quite a persuasive historical fact that reveals the advantages of a market over a state-controlled socialist economy. Nowadays, after almost 30 years of political, social and economic transformations, significant differentiations of socio-economic development in separate CEE countries and in their achieved level of social welfare can be seen. That is why this group of countries provides important empirical material for studying the influence of the building of a market economy on economic growth and social well-being.

Having in mind that an increase in social welfare itself is the ultimate goal of the socio-economic development of the country, the objectives of our research were,

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firstly, to assess the scale of variation in social welfare characteristic of CEE countries. Secondly, to find out which economic and political factors determine the success in achieving this goal; this will give an opportunity for a researcher to find an explanation of why some of the countries have made considerable socio-economic progress while others have not.

The material of the study is structured in the following way: (i) firstly, we provide a short review of economic literature on the factors affecting social welfare; (ii) we present data on dynamics and divergences of CEE countries with regard to social welfare; (iii) we divide countries into clusters and perform a regression analysis that explains the social welfare dynamics in these countries; (iv) finally, we outline the policy patterns that may be implemented in separate countries in order to ensure sufficient dynamics in their economic and social development.

2 THE THEORETICAL BASICS OF RESEARCH

Numbers of modern economists mentioned the existence of a direct link between economic growth, social welfare and economic freedom on the empirical level. The methodological foundations for these conclusions are laid in the writings of classical writers, Adam Smith, David Ricardo, John Stuart Mill, and by later writers like Friedrich August von Hayek (Hayek, 1960), Milton Friedman (Friedman, 1962), James McGill Buchanan (Buchanan, 1975) and a number of other modern economists. The core argumentation in favor of an idea that expansion of economic freedom promotes social welfare growth is the acknowledgement of the fact that greater economic freedom provides more powerful incentives for effective interaction among economic actors; this, in turn, contributes to increasing the level of social welfare. In contrast, restrictions on economic freedom have a negative impact on socio-economic development.

Some economists suggest that "regardless of the sample of countries, level of economic liberty and aggregation level, there are sustainable positive interactions between economic liberty (the development level of market relations) and economic growth. Meanwhile, economic liberty has considerably greater impact on economic growth, than political liberty" (Doucouliagos, 2006:75).

It has been concluded that with a high level of economic freedom in a society all strata of the population benefit more or less equally. If the level of economic freedom is low, only specific population strata may benefit (Berggren, 2003). At the same time, a positive correlation between the level of economic freedom and average income has been revealed (Grubel, 1998). These conclusions have found support in studies made by many other authors (Hanke, 1997; Leschke, 2000).

Empirical proof that economic freedom has a positive impact on economic development was found: countries that have advanced market institutions and have shaped open policies in the area of trade and investment tend to be more successful in economic development; on the contrary, countries that slide towards internal

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markets in conjunction with a high level of state control demonstrate slow growth rates (Bhagwati, 1999).

However, studies that did not show a statistically significant correlation between economic liberty and the increase of social welfare should be also mentioned. For instance, it was found that economic and social development could not be forecast accurately according to the expansion of economic freedom (Gwartney, Lawson and Holcombe, 1998); there exists an ambiguity of the linkage between an increase in economic freedom and the specific socio-economic results achieved (Geiets, 2010).

The ambiguity mentioned above could be explained by the large number of interrelated variables that affect the economic and social development of any country. This fact may explain the inconsistency of the results obtained by the economists in their empirical studies – depending on the set of variables in a model, the time horizon and the size of a sample, the impact assessment of a separate variable will noticeably vary.

In particular, Babetskii and Campos (2007) presented in their paper the results of a meta-regression analysis where 43 empirical studies on countries with economies in transition were analyzed with a view to identifying the link between market reforms and economic growth. They found that out of 321 coefficients characterizing the influence of reforms on socio-economic growth approximately one third turned out to be positive and statistically significant, the second third – negative and statistically significant, the rest – negative and statistically insignificant. Among the reasons that have affected results the authors mentioned model specification, choice of simulation method, etc.

While referring to the studies on evolution of the post-socialist economy, we could distinguish in modern economic literature three directions in socio-economic development research that are dedicated to different stages of its evolution in the transformation process: (i) the transformation recession; (ii) recovery; and (iii) growth.

The main principles of the first direction were formulated by Kornai (1990), Fischer and Gelb (1991), Blanchard (1997), Kremer and Chamon (2009). Kornai distinguished two types of the necessary changes that had to happen during the period of the transformational recession: firstly, a shift from the seller's market to the buyer's market (in the course of price liberalization) and, secondly, the imposition of hard budget constraints for entrepreneurs (with the help of privatization and eradication of budget support mechanisms, such as budget subsidies, soft loans and tax benefits). Such changes kick-start the market mechanism start and launch the primary economic incentives for all economic agents.

Blanchard (1997), Kremer and Chamon (2009), while explaining the process of transformational recession, emphasized the disorganization caused by the demise of the command economy. Disorganization causes the following structural modifications: redeployment of resources from obsolete economic activities to new

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ones (through closure and bankruptcy of ineffective enterprises and the simultaneous emergence of new ones), and the restructuring of the enterprises which "survived" under these conditions.

Studies of the second direction are focused on the phase of the economic recovery that follows a transformational recession (Fisher and Gelb, 1991; Havrylyshyn, 2001, among others). Here, special attention has been paid to the creation of an effective institutional environment for future socio-economic development.

Studies of the third direction lay emphasis on a phase of transformational economic growth, and find reflections in the documents of international organizations (IMF, EBRD, the World Bank). In particular, they aim to formulate recommendations concerning specific steps for securing economic growth.

The studies mentioned above applied different methodologies, but got similar results concerning factors which affect the efficacy of economic transformation. Actually, they have all outlined the three main blocks of variables which explain socio-economic development during the transformational change: initial conditions, macroeconomic policy, and structural policy (Havrylyshyn, 2001).

It should be mentioned that many empirical studies offered by modern economists suffer from the methodological flaw of improper identification of economic growth and social welfare. We assume that economic growth is only one of the components of social well-being, so studies aiming to uncover the influence of market restructuring on social welfare must take into account a range of other factors.

3 RESEARCH METHODOLOGY

3.1 SOCIAL WELFARE INDEX

The main problem with the indexes of social welfare used in most empirical studies is that they mostly have been calculated on the basis of mean values, for example, per capita GDP. Namely, per capita GDP was considered a social welfare index by Arthur Pigou (1932) and many other economists (Nordhaus and Tobin, 1973; Beckerman, 1994; Dodds, 1997, among others). As a result, one gets a correlation that does not correspond to reality, for we cannot measure welfare by GDP or another similar index because it really does not capture the social component of social welfare. That is why we have chosen the Sen Social Welfare Index (further referred as SSWI) elaborated by Amartya Sen (Sen, 1974) as an output indicator for our models. The advantages of Sen's approach to evaluating social welfare is that it takes into consideration not only the economic component that is measured by average income, but also the social one – the grade of equitable distribution within the nation measured by the Gini index (Atkinson, 1999).

SSWI is calculated according to the formula (Sen, 1974, 1976, 1997):

$$SSWI = E(1 - G), \tag{1}$$

where E is per capita national income, G is the Gini index.

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Equation (1) means: the smaller the disparities in incomes achieved, the higher social welfare can be reached at an existing level of per capita income.

Table A1 demonstrates the SSWI values for CEE countries for year 2016.

3.2 SOCIAL WELFARE FACTORS AND DATA SOURCES

As a result of synthesizing the foregoing approaches regarding social welfare determinants with regard to transition economy, we selected the following factors that probably influence the social welfare dynamics:

- freedom concerning economic decision making;
- development of market economy institutions;
- state policy concerning development of human capital;
- the country's economic dynamics.

The index of economic freedom was chosen as a factor that reflects the level of liberty in economic decision making; it has been calculated by the Heritage Foundation (HF). This index is generally used in economists' academic writings for describing the level of economic freedom. Annual publication of this index allows for the way the recent transformations in the governmental policy affect economic freedom. The main indicators on which the index is built include (HF, 2017):

- corruption in the judiciary, customs and government bureaucracies;
- fiscal burden which covers personal income tax rate, corporate income tax and government expenses as a percentage of GDP;
- the rule of law, efficiency of the judiciary and the possibility of contract execution;
- responsibility of business in relation to health care, industrial safety provision and environment protection;
- limitations for banks relating to financial services (sale of securities and insurance);
- regulation of the labor market;
- "black market" activity.

It is worth mentioning that tracking the progress in the development of market institutions is a very tricky thing, as it is rather difficult to choose adequate indexes for its statistical assessment. Thus, such evaluation is often subjective. One should have the numerical characteristics of these processes for comparing the countries that have different levels of socio-economic development, but similar development vectors. Thus, the European Bank for Reconstruction and Development (EBRD) annually publishes the Report on the progress in post-socialist transformation (Transition Report) that encompasses data for 25 countries of CEE and the former USSR (EBRD, 2017).

In the Transition Report, the evaluation of success in reforms that must be initiated on the early stage of transformation is performed by the use of such indicators as: market and trade liberalization, small-scale privatization, price and trade liberalization, free access to foreign currency, the rate at which the economic costs of

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utilities are covered by the population. The second set of the reform indicators includes: privatization of large enterprises and the institutional reforms which are necessary for development of the competitive markets and for providing an environment for their effective functioning. The scale of the indicators ranges from 1 to 4+, where 1 means few changes in comparison with the administrative command economy or their absence, and 4+ is a standard for the developed market economy.

The mean value of the six market reform indexes in the transition economy which are presented in the Transition Report was chosen as a combined market reform success factor for our model specification.

Two indicators (government spending on education and healthcare as a percentage of GDP) were chosen as indicators of the degree to which the state promotes human capital development. These indicators could be considered a good proxy for public investment into the society's human capital and have been published on an annual basis by the World Bank.

Per capita GDP at PPP was chosen as an indicator for a country's economic dynamics. This indicator depicts not only economic output, but also average income and price levels in the country, and thus is better suited for international comparison than per capita GDP in USD at current exchange rates due to its being less volatile (Schreyer and Koechlin, 2002). This leads us to assume that it is among the best for comparing and gauging irregularities in national economic development. World Bank economic data bank served as the data source for this indicator (World Bank, 2017).

Generalized cluster-wide statistics of social welfare factors are presented in table A2.

3.3 BASIC HYPOTHESES CONCERNING FACTOR IMPACT ON SOCIAL WELFARE

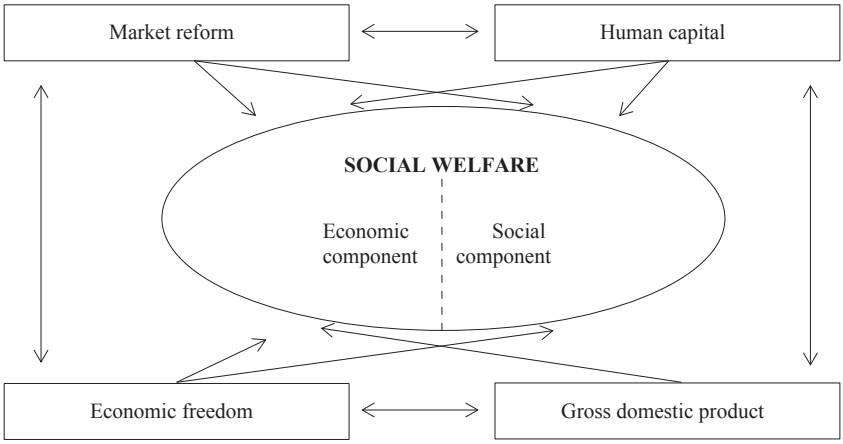
According to theoretical and empirical studies, the following hypotheses about the impact of the above mentioned factors on social welfare were articulated (see graph 1).

1) Soaring economic freedom positively affects social welfare through its economic component (Barro, 1991; Hanke, 1997; Leschke, 2000; Scully, 1988, 1992);
2) Development of effective market institutions promotes social welfare: market reforming positively influences both its economic and social components (Buchanan, 1975; Friedman, 1962; Hayek, 1960);
3) An increase in governmental spending on human capital has a positive impact on social welfare (Schultz, 1961; Stiglitz, 1999);
4) An increase in per capita GDP supports social welfare growth as it means an increase in personal income (Fisher and Gelb, 1991; Havrylyshyn, 2001).

The impact of chosen factors on social welfare and their interconnection is schematically presented in graph 1.

Graph 1

The interaction of social welfare factors



Source: designed by the authors.

Creation of effective market institutions has a positive impact both on the economic component of social welfare (due to increased productivity), and its social component (increase in the level of education, health improvement of the population, unemployment reduction, higher equality in income distribution). Economic freedom stimulates economic development within a country because it reveals opportunities for development of its economic capacity and may contribute to a reduction of social disparities. As some authors pointed out (Leitner and Holzner, 2008; Milanovic, 1999), an expanding private sector triggers growing income inequality during the first phases of post-socialist transformation. GDP dynamics is an economic growth indicator, but as far as equality is concerned, its influence is negligible, at least among CEE countries (Szeles, 2013). All these factors, in turn, are interrelated.

3.4 CLUSTERING AND MODELING

The CEE region was chosen as the object of this study. We are convinced that the transition to the market economy that started and still continues in these countries provides a good opportunity for empirically verifying the hypothesis that economic development must contribute to the welfare.

For assessing factors influencing social welfare dynamics, balanced panel data of 20 CEE countries for the time period 1995-2016 (the Human Development Report database, Index of Economic Freedom database, EBRD and The World Bank statistical databases were the data sources) was analyzed.

The biggest advantage of panel data is the large number of observations, which increases the number of the degrees of freedom and decreases the interdependence among the explanatory variables and, accordingly, the standard errors of estimate.

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In our study, we used a method of cluster analysis that allows for multi-dimensional (in our case two-dimensional) classification of data containing sample information; as a result, objects have been grouped into relatively homogeneous cohorts. In this way, the issue of data classification with the application of a specific mathematic apparatus could be solved. We have chosen a hierarchical approach to clustering since in our case the number of clusters is a priori unknown.

According to an approach suggested by Okun (1975), the sample of 20 CEE countries has been split into four clusters (this categorization is valid for 2016) basing on economic efficiency (per capita income) and social fairness (Gini index) criteria and analyzed with regard to the influence of separate factors on social welfare. The distance between the objects (countries) was calculated according to the formula of the Euclidian distance:

$$d_{ij} = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}, \quad (2)$$

where x_i, y_i represent the value of the i-variable of the first and the second observations; n – the number of variables. The clustering was committed by single linkage (nearest-neighbor linkage).

For each cluster, a fixed effects regression model was built in order to estimate the impact of selected factors on social welfare. It should be mentioned that the relations within a correlation model could be very complex. To define them all and the functional relations among them is a highly problematic task because functions of higher complexity involve a higher number of predictors, which diminishes the accuracy of estimation and makes result interpretation difficult. That is why while choosing a model type we stand by multiple fixed effects regression; its verification for specification errors with a Ramsey RESET test was successful: no specification errors were present.

4 SOCIAL WELFARE DYNAMICS IN CEE COUNTRIES

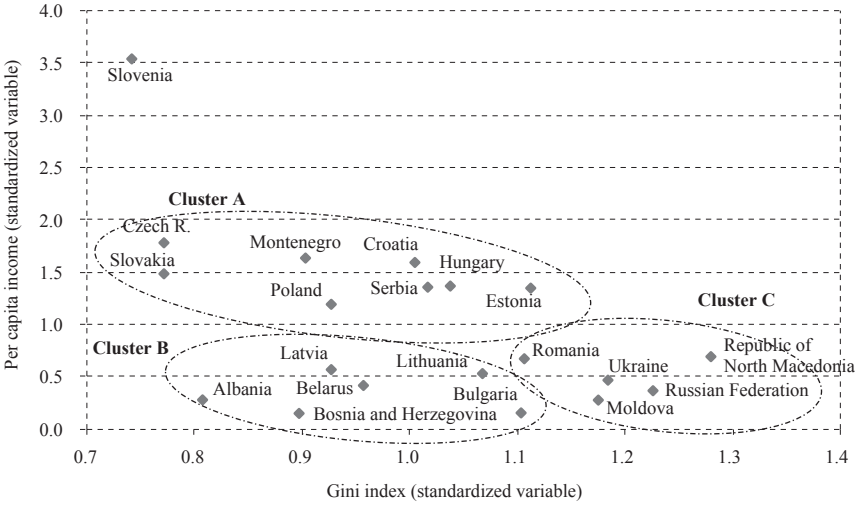
To enhance the reliability of the results, the dynamics of some countries were analyzed with regard to standardized per capita income and Gini index values. Our graphs 2 and 3 support the finding that there is no correlation between economic growth and equality in income distribution for CEE countries (Szeles, 2013); however, the division of countries by these two measures gives us the possibility to split them into clusters. The initial division of countries into clusters that was carried out according to the data of 1995 is presented in graph 2.

According to graph 2, there were grounds for distinguishing three country clusters in 1995: (a) countries with considerably higher per capita income and relatively low level of disparities in income distribution; (b) countries with low per capita income and at the same time low disparities in income distribution; (c) countries with low per capita income and high disparities in income distribution. As for the year 1995, Slovenia was not included in any cluster because this country differed

significantly by indicators from the other countries sampled. According to graph 2, at the initial stage of economic transformation, the clusters included fairly dissimilar countries.

Graph 2

Division of CEE countries by clusters, 1995



Source: calculated by the authors basing on World Bank (2017).

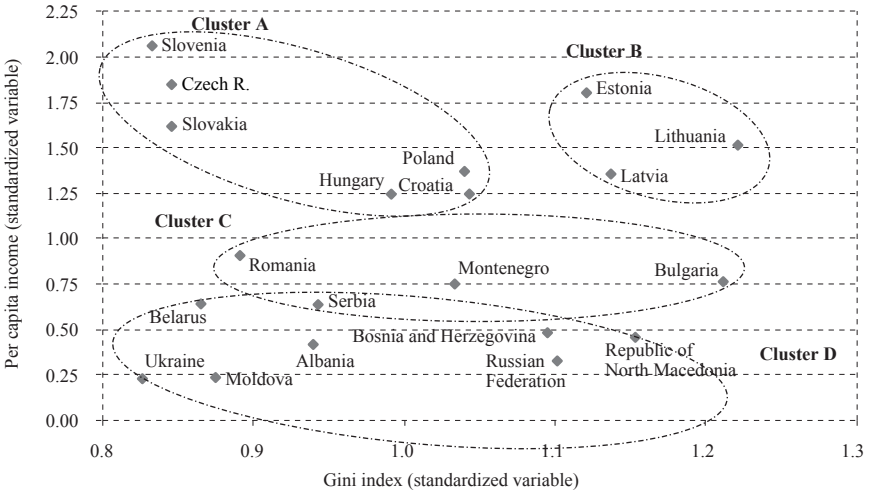
The countries' division by clusters as of 2016 is presented in graph 3. As one can see from it, after more than 20 years of post-socialist economic transformations the differentiation among clusters deepened and, simultaneously, the clusters themselves became more endogenous (in 1995, the Euclidian distance for cluster A was 2,564, 2,120 for cluster B, and 2,611 for cluster C; in 2016, it was respectively 2,531 for A, 1,654 for B, 1,433 for C, and 2,160 for D cluster). As of 2016, four clusters in the CEE region could be distinguished instead of three in 1995.

The soaring differentiation among the clusters can be explained by the fact that some countries appeared to stick to different phases of post-socialist socio-economic transformation, as seen in Brzezinski (1995), see table A3. By the year 2016, cluster A and B countries were starting or finalizing the third phase, cluster C countries appeared to be at a certain stage of the second phase, cluster D countries were still in the first phase. In order to validate our observations, we review the social welfare dynamics of the countries in each cluster for the period 1995-2016.

The clusters' SSWI averages are depicted in graph 4. It appeared that the average SSWI value for the cluster cross-section differs significantly with no trend towards convergence. In addition, a clear upward trend could be observed for A and B clusters, whereas both C and D clusters have almost flat trend lines.

Graph 3

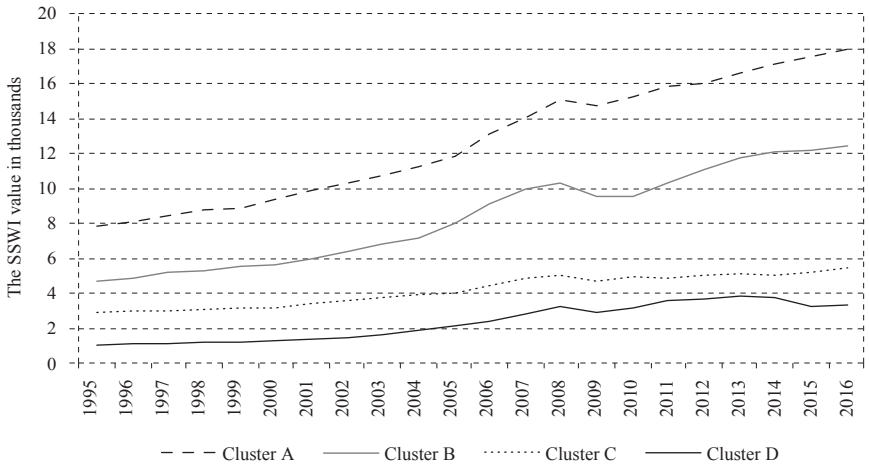
Division of CEE countries by clusters, 2016



Source: calculated by the authors basing on World Bank (2017).

Graph 4

Social welfare dynamics by clusters, 1995-2016



Source: calculated by the authors on the basis of information UNDP (2017); World Bank (2017).

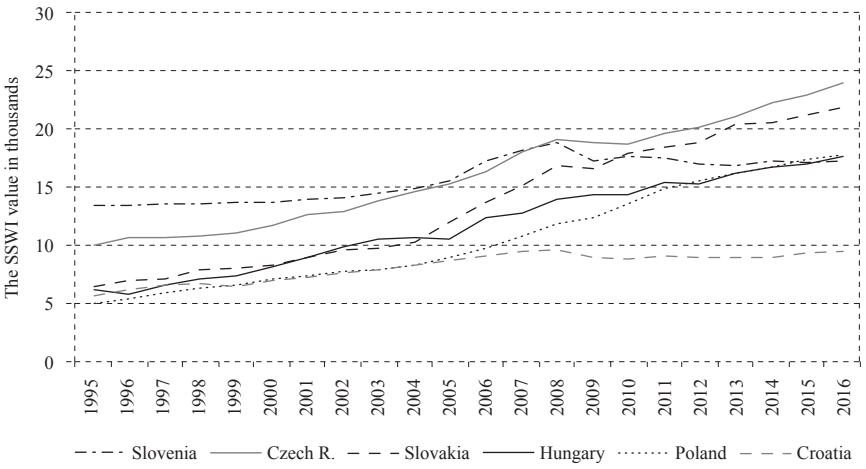
Cluster A is represented by Croatia, the Czech Republic, Hungary, Poland, Slovakia, and Slovenia. A short (by historical standards) period of existence of the command economy – approximately 40 years, in its less rigorous version – is typical for this group of CEE countries. Starting opportunities for this group of countries were very favorable. The elements of private property and private initiative, relatively well-balanced national economy, high willingness of the population to appreciate the market economy remained. Transition towards the market economy

occurred relatively fast and successfully due to close economic and historical proximity with Western Europe. The reforms were carried out in both evolutionary and radical versions. A mainly evolutionary character of the reforms is characteristic for Hungary, Slovakia, and Slovenia. A quite radical approach was implemented in Poland and, somewhat less radically – in the Czech Republic.

What could the reason be for the relatively successful development of these countries? It is appropriate to mention here the last findings on the role of institutional factors of economic development in separate countries: extractive and inclusive political and economic institutions play the key role in achieving economic and social development of a nation (Acemoglu and Robinson, 2013:79-81). Inclusive economic institutions encourage economic activity, contribute to an increase in productivity and social well-being. If such institutions exist, the economic environment facilitates competition, entrepreneurship and innovativeness. On the contrary, extractive economic institutions have the opposite nature: they aim mainly to redistribute income and wealth from some groups of people to others. And the dominance of redistributive social coalitions would hamper the economic and social progress of a nation (Olson, 1982). For cluster A countries, the existence of inclusive political and economic institutions which contribute to a rapid exit from the transformational recession and achievement of relatively high social prosperity is very typical. Graph 5 shows the SSWI dynamics for cluster A countries.

Graph 5

Social welfare dynamics for cluster A countries, 1995-2016



Source: calculated by the authors basing on UNDP (2017); World Bank (2017).

The cluster A countries are characterized by a smooth social welfare dynamics that was slightly broken due to the financial crisis of 2008-2009. There is a certain differentiation of countries in this cluster observed; however, it is not critical. The highest SSWI dynamics was shown by the countries which had previously been

practicing a radical approach to reforming – Czech Republic, Poland, and Slovakia; in general, a convergence of the social welfare levels is typical (Croatia is somewhat isolated in this regard, lagging behind the pace of social welfare growth of other cluster A countries).

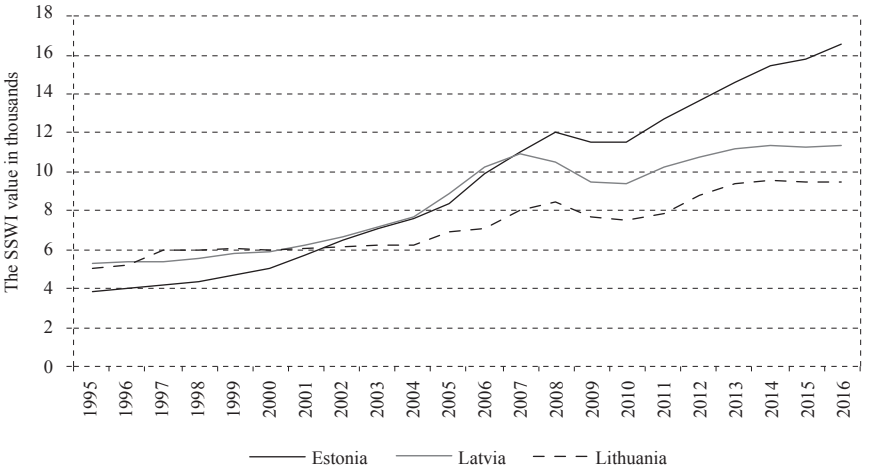
The Baltic states – Estonia, Latvia, and Lithuania – comprise cluster B. After all, they were the last ones annexed by the USSR and were the first ones to leave it. Immediately after gaining their independence, these countries very clearly identified their priorities: building up democratic states, integrating into European structures. An important fact is that these priorities were chosen by all of them at the same time. This became possible due to the effective external support rendered by the Western world and the internal political and social consensus concerning directions in reforming.

Here the economic transformations of the 1990s were conducted more actively than in the other post-socialist countries. They embraced total liberalization of the economy, rapid institutional transformations (in particular, privatization and land reform), introduction of national currencies (later replaced by the euro), a comprehensive integration into the global economic space and joining the EU. The effective implementation of reforms contributed to the fast development of the human-centered market economy and to an increase in social welfare; all this allowed these countries to outpace some other CEE countries which began their economic transitions earlier.

The SSWI dynamics for countries of this cluster is depicted in graph 6.

Graph 6

Social welfare dynamics for cluster B countries, 1995-2016



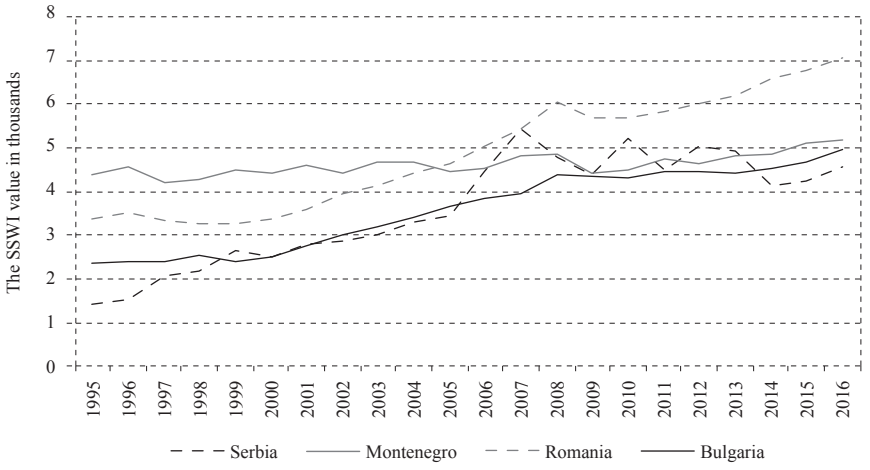
Source: calculated by the authors basing on UNDP (2017); World Bank (2017).

A high and positive social welfare dynamics (with some fluctuations caused by the recession of 2008-2009) is typical for cluster B countries. Nevertheless, an increasing differentiation of these countries is also obvious: while there was almost no difference among them in 1995, by 2016 the difference between the highest (Estonia) and the lowest (Lithuania) indicators of social welfare was nearly twofold, which demonstrates the differing effectiveness in market transformation in these countries. For example, a new Estonian government took on the responsibility for implementing market reforms, which laid the foundations of the successful transition from the command to a market economy, from the very first days of Estonian independence. The primary reforming activities included monetary reform, the establishment of free trade zones, balancing the public budget, privatization of state-owned companies and introducing favorable profit taxation (like abolishing corporate income tax on retained and reinvested profits). As a result, Estonia joined the club of the lead countries with regard to economic freedom.

Cluster C includes Bulgaria, Montenegro, Romania, and Serbia. These countries are characterized by incompleteness of structural reforms and the sharp economic downturn in the 1990s, which remains partly unresolved even now. Bulgaria and Romania are the least integrated members of the EU, and Serbia and Montenegro are candidates for entry. The countries of this group are characterized by an upward trend with regard to social welfare (see graph 7). However, they also demonstrate quite significant SSWI value fluctuations (Serbia in particular); a convergence in social welfare indicator generally is not observed.

Graph 7

Social welfare dynamics in the cluster C countries, 1995-2016



Source: calculated by the authors on the basis of information UNDP (2017); World Bank (2017).

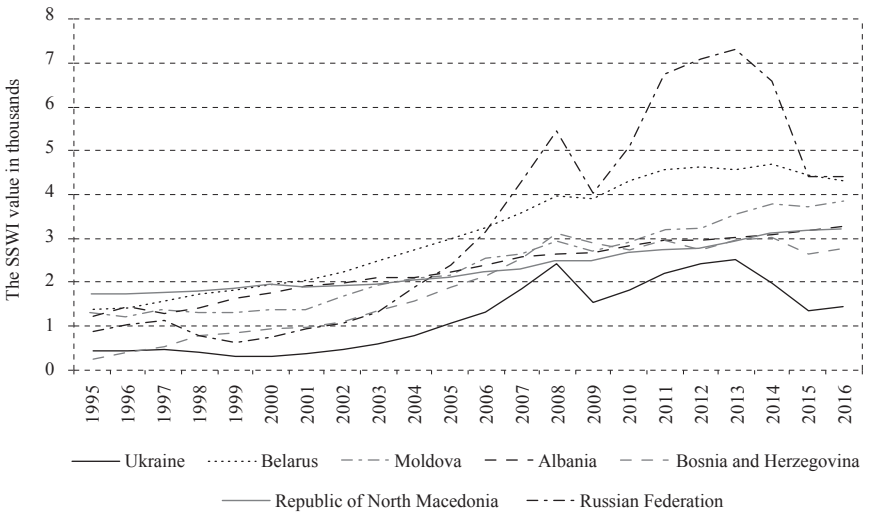
Cluster D includes some of the Balkan countries and most of the post-Soviet countries from the CEE region (except for the Baltic states that shaped cluster B): Albania, Bosnia and Herzegovina, Belarus, Republic of North Macedonia,

Moldova, the Russian Federation, Ukraine. Most of these countries endured a significantly longer dominance of the command economy (for more than 70 years) than the countries of the A, B, and C clusters.

The reform launching period was characterized here by more or less homogeneous level of social welfare within the cluster and its positive dynamics in all the countries (graph 8). Then, in particular, since the mid 2000s, an increase in turbulence started and their SSWIs have demonstrated a diverging trend with high fluctuations. The most remarkable fluctuations happened in indicators for Ukraine and the Russian Federation (with a negative dynamics since 2014). Concerning Ukraine, this fact could be explained by economic losses due to contraction of economic activities caused by the Russian military aggression and illegal annexation of part of its territory (the Crimean Peninsula and parts of Donetsk and Luhansk regions); with respect to Russia, it was a result of numerous economic sanctions that were introduced by most Western countries due to the many-fold violation of international law by this country, economic wars with Ukraine and other countries; and by the economic burden of supporting the temporarily occupied territories of Ukraine (Åslund, 2018; Slukhai, 2018). The SSWI value generally is quite low for all cluster D countries in comparison with the other clusters, which testifies to the low rate and inefficiency in reforming the economy and other spheres of social life.

Graph 8

Social welfare dynamics in cluster D countries, 1995-2016



Source: calculated by the authors on the basis of information UNDP (2017); World Bank (2017).

A common feature for the countries of C and D clusters is the preservation of the extractive political and economic institutions that were inherited from the socialist past or established in the course of ill-designed post-socialist transformations.

These institutions prepared the ground for the significant deformations occurring during socio-economic transformations in these countries, and have a negative impact on both economic development of these countries and the dynamics of their social welfare.

Thus, our analysis testifies that a considerable diversity in the social welfare dynamics among the clusters as well as among the countries in each separate cluster is present; the differentiation among them soaring over time is very typical for the CEE countries. This fact justifies the question: what are the reasons behind such developments? An approach to answering it with help of the econometric techniques is presented in the next chapter.

5 ESTIMATION RESULTS AND DISCUSSION

Having applied the least squares method, multiple linear regressions were built with individual and time fixed effects on the basis of panel data for each separate cluster and the CEE countries in total.

A dependent variable of the model (y) is the SSWI value; the independent variables include:

x_1 – index of economic freedom (one year lagged);
x_2 – EBRD transition indicator (one year lagged);
x_3 – public expenditures on education (per cent to GDP);
x_4 – public expenditures on healthcare (per cent to GDP);
x_5 – per capita GDP at PPP.

With regard to the high probability of heteroscedasticity and autocorrelation of residuals, a fixed effects multiple linear regression model was chosen to estimate the impact of factors on social welfare. A logarithmic regression equation has the following form:

$$\log y^t = c_1 * \log x_1^{t-1} + c_2 * \log x_2^{t-1} + c_3 * \log x_3^t + c_4 * \log x_4^t + c_5 * \log x_5^t + c_6 + \left[CX = F, PER = F\right] \quad (3)$$

In order to validate the inclusion of both individual and time-fixed effects, the Redundant Fixed Effects – Likelihood Ratio Test was applied. Its results permit the conclusion that all the effects have to be included into the model (respective p-values are less than 0.05). To account for heteroscedasticity in the model, the robust White cross-section method of evaluating the co-variance matrix was applied. The validation of applying the fixed effects model was carried out with the Hausman test. The zero hypothesis in this test prioritizes a model with random effects. In our models the zero hypothesis is rejected (p-value is less than 0.05), so the application of the fixed effects model is justified.

The determinants "The Index of Economic Freedom" and "EBRD transition indicator" were included into the model (3) with a one-year lag, so their values are

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calculated on the basis of the previous year's data; the reason is that these factors may have an impact on social welfare in the subsequent time periods, but not in the immediate one. The results of regression analysis are presented in table 1. In table 1 the values of coefficients characterizing the effect of each separate factor are presented; the brackets contain p-values that show whether the factor's effect is significant.

Table 1

Results of regression analysis

	x_1^{t-1}	x_2^{t-1}	x_3^t	x_4^t	x_5^t	c_6	R^2
The whole sample (N=440)	0.4993 (0.5990)	0.0753 (0.3502)	0.8381* (0.0760)	0.0414** (0.0165)	0.0354 (0.4220)	3.5573 (0.0000)	0.483
Cluster A (N=132)	0.1615** (0.0392)	0.0475*** (0.0036)	1.2538** (0.0195)	0.0648** (0.0299)	0.1411*** (0.0004)	7.667 (0.0001)	0.836
Cluster B (N=66)	1.8375*** (0.0051)	2.9436*** (0.0000)	0.8009** (0.0344)	0.5018** (0.0154)	0.1370** (0.0381)	16.07 (0.0000)	0.869
Cluster C (N=88)	0.3662 (0.1117)	0.0411** (0.0311)	0.7958*** (0.0000)	0.0120*** (0.0022)	0.0499** (0.0428)	2.8553 (0.0000)	0.879
Cluster D (N=154)	-0.026 (0.8461)	0.4096*** (0.0004)	0.7749*** (0,0000)	0.0662* (0.0614)	-0.3553*** (0.0000)	1.3923 (0.1072)	0.683

Source: calculated by the authors basing on EBRD (2017); HF (2017); UNDP (2017); World Bank (2017).

The regression model for the CEE country cross-section (table A4) did not give us adequate results. The influence of factors appeared to be insignificant and the determination coefficient too low. However, it is important to stress that all the regression coefficients proved to be positive; this means that these factors have a positive effect on social welfare, which supports our theoretical hypotheses as formulated in chapter 3.

Cluster A and B countries are characterized by a high degree of influence of the considered factors on social welfare (tables A5 and A6). All the coefficients have a positive correlation.

Cluster C countries' figures are similar to those for A and B clusters (see table A7). However, a coefficient by x_1 (the index of economic freedom) appeared insignificant. This could be explained by a generally insufficient level of economic freedom in the countries included in this cluster and by missing a certain tendency in its dynamics. This also could mean that particularly this factor could become a significant trigger of positive changes in the cluster C countries in the future. All other factors have a strong positive correlation with the social welfare value.

While estimating the social welfare factors for cluster D countries (table A8), it turned out that the impact of determinants x_1 (index of economic freedom) and x_2 (EBRD transition indicator) is quite low. This could be explained by a low level

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of economic freedom in countries that experienced no significant positive changes (or even a down-sloping trend) and issues in the market reform of the economy, such as serious political and economic influence of the oligarchic structures ("redistribution coalitions", according to Olson) that impede reforms in economy and the reallocation of funds for the sake of fostering human capital. As mentioned earlier, dominance of exclusive institutes in policy and economy that is typical for these countries hampers social development in general. We also found a negative correlation between the value of social welfare and per capita GDP which could be explained by the significant depreciation of the national currency experienced by these countries that finally led to the GDP drop in terms of US dollars (especially in Ukraine and the Russian Federation). Besides, there is no sustainability in GDP dynamics in the countries of this cluster; this fact could be explained by instability of their economic institutions.

6 CONCLUSIONS

Our analysis has shown that the progress in social welfare that the CEE countries demonstrate differs widely in specific countries and in their clusters. It appeared that social welfare in the CEE countries as measured by the Sen Social Welfare Index depends on several factors. Monitoring the patterns in the correlation of social welfare with economic freedom, the intensity of market reforms, the fostering of human capital and economic output has made it possible to identify the potential sources of social welfare growth for separate countries and their clusters. These sources should be taken into account in the course of policy making on the national level. As these factors are of a varying nature, balancing state intervention in the economy with market self-regulation still seems to be a burning issue for the majority of CEE countries.

We have aimed to involve into our analysis factors that are most relevant for CEE countries. However, we assume that not all of them have been captured in our study. For example, the national mentality and cultural peculiarities, as well as the historical background, a country's innovation capacity and its realization, the level of support from international organizations and governments of other countries could also be important for the estimation of the development of social welfare. Besides, certain other social welfare indexes could be tested as well. Within these limitations we assume that our study results could be considered as relevant for most CEE countries with regard to their specific features.

The study showed a significant and positive correlation between social welfare and such factors as market reform, expenditure on human capital development, national economic output in those CEE countries which have already reached a considerably high level of social welfare (clusters A and B). As the institutions for further sustainable development in these countries are present, policies aiming to strengthening them are likely to enhance the nation's well-being. Further improvement of inclusive economic and political institutions and the implementation of active policies to develop human capital would maintain and enhance social welfare in these countries.

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In the less fortunate countries (clusters C and D), the impact of the above-mentioned factors on social welfare seems to be less significant. This finding could be explained by poor levels of economic freedom, incompleteness in implementing market reforms, deformations observed in policy making and implementation. All these problems persist because of a weak institution-building capacity that does not create a springboard for the driving forces of social welfare.

Focusing on improving the governmental policy in a certain nation belonging to clusters C and D would enhance their social welfare. The following policy measures could be considered as beneficial: (i) increasing the level of economic freedom (through better protection of property rights, minimizing corruption at all governmental levels and sectors of the economy, increasing the efficiency of government spending, securing economic freedom by reducing governmental interventions and so on); (ii) raising the efficiency of market institutions (dismissing those inherited from the command economy as they hamper normal economic development; and making concerted efforts in planting those that have proved to enhance markets); (iii) rearranging the public spending policy: instead of securing social benefits, paying more attention to increasing expenditures enhancing human capital.

Generally, the majority of CEE countries managed to achieve significant progress on the way to building a market economy and ensuring a high level of social welfare. On the other hand, there still are problematic areas in developing a high-quality and competitive business environment, corporate governance and a reliable legal system. The main reason for the majority of post-Soviet countries, including Ukraine, lies in the poor performance of market institutions, which reforms that have a partial and inconsistent nature are incapable of establishing.

In light of the above-mentioned, further research to identify the ways to improve the country-specific institutional environment becomes particularly relevant.

Disclosure statement

No potential conflict of interest was reported by the authors.

ANNEX

Table A1

SSWI crosscut for CEE countries, 2016 (in descending order)

Country	SSWI
Cluster A	
Slovenia	11,854
Czech Republic	10,574
Slovakia	9,260
Poland	7,209
Hungary	6,697
Croatia	6,547
Cluster A average	8,690
Cluster B	
Estonia	9,128
Lithuania	7,310
Latvia	6,818
Cluster B average	7,752
Cluster C	
Romania	5,104
Montenegro	3,971
Bulgaria	3,712
Serbia	2,944
Cluster C average	3,933
Cluster D	
Belarus	3,654
Bosnia and Herzegovina	2,620
Albania	2,456
Republic of North Macedonia	2,295
Russian Federation	2,262
Moldova	1,354
Ukraine	1,344
Cluster D average	2,284
Whole sample average	5,665

Source: calculated by the authors basing on World Bank (2017).

Table A2

Generalized cluster-wide statistics on social welfare factors, 2016

		Index of economic freedom	EBRD transition indicator	Public expenditures on education (per cent to GDP)	Public healthcare expenditures (per cent to GDP)	Per capita GDP at PPP, $
Cluster A	Average value	62.17	3.55	4.57	5.18	19,464
	Standard deviation	5.85	0.56	0.63	0.72	7,034
Cluster B	Average value	64.10	3.60	5.35	4.24	16,174
	Standard deviation	7.62	0.47	0.63	0.64	7,687
Cluster C	Average value	55.77	3.04	3.77	4.32	11,039
	Standard deviation	8.77	0.66	0.65	0.89	5,092
Cluster D	Average value	53.86	2.92	3.85	4.21	7,222
	Standard deviation	8.77	.56	1.48	1.02	4,226

Source: calculated by the authors basing on EBRD (2017); HF (2017); UNDP (2017); World Bank (2017).

TABLE A3

Phases of postcommunist transformations according to Z. Brzezinski

Political	Legal/regulatory	Economic	Western aid
Phase one: 1-5 years Political goal: transformation Economic goal: stabilization			
Basic democracy; free press; end of one-party state & police system; initial democratic coalition for change	Elimination of arbitrary state controls	Elimination of price controls and subsides; end of collectivization; haphazard privatization	Currency stabilization; emergency credits & aid
Phase two: 3-10 years Political goal: from transformation to stabilization Economic goal: from stabilization to transformation			
New constitution & electoral law; elections; decentralized regional self-government; stable democratic coalition – new political elite	Legal/regulatory framework for property & business	Banking system; small & middle scale privatization; demonopolization; new economic class appears	Infrastructural credits; technical & managerial assistance; trade preferences & access; initial foreign investment
Phase three: 5-15 (+) years Political goal: consolidation Economic goal: sustained take-off			
Formation of stable democratic parties; democratic political culture takes	Independent judiciary & legal culture emerges	Large-scale privatization; capitalist lobbies; entrepreneurial culture emerges	Major foreign investment; inclusion in key western organs (e.g. EC, NATO, etc.)

Source: Brzezinski, 1995.

TABLE A4

Model for the total sample

variable	Coefficient	Std. error	t-statistic	Prob.
log x_1^{t-1}	0.4993	0.1045	4.7766	0.5990
log x_2^{t-1}	0.0753	0.0805	0.9353	0.3502
log x_3^t	0.8381	0.0259	32.287	0.0760
log x_4^t	0.0414	0.0171	2.4072	0.0165
log x_5^t	0.0354	0.0440	0.8037	0.4220
c_6	3.5573	0.5634	6.3135	0.0000
Effects specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.4831	Mean dependent var		8.7481
Adjusted R-squared	0.4812	S.D. dependent var		0.7089
S.E. of regression	0.0971	Akaike info criterion		-1.7276
Sum squared resid	3.8706	Schwarz criterion		-1.3034
Log likelihood	441.7758	Hannan-Quinn criter.		-1.5605
F-statistic	518.7867	Durbin-Watson stat		0.1808
Prob(F-statistic)	0.0799			

TABLE A5

Model for the cluster A countries

Variable	Coefficient	Std. error	t-statistic	Prob.
log x_1^{t-1}	0.1615	0.3432	0.4703	0.0392
log x_2^{t-1}	0.0475	0.1203	0.3951	0.0036
log x_3^t	0.2538	0.1067	2.3762	0.0195
log x_4^t	0.0648	0.0423	1.5279	0.0299
log x_5^t	0.1411	0.1646	0.8573	0.0004
c_6	7.6670	1.8886	4.0596	0.0001
Effects specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.8369	Mean dependent var		9.1685
Adjusted R-squared	0.8170	S.D. dependent var		0.4053
S.E. of regression	0.1167	Akaike info criterion		-1.2486
Sum squared resid	1.2940	Schwarz criterion		-0.5507
Log likelihood	109.6620	Hannan-Quinn criter.		-0.9651
F-statistic	47.0890	Durbin-Watson stat		0.1364
Prob(F-statistic)	0.0000			

Table A6

Model for the cluster B countries

Variable	Coefficient	Std. error	t-statistic	Prob.
$\log x_1^{t-1}$	1.8375	0.6143	2.9907	0.0051
$\log x_2^{t-1}$	2.9436	0.5273	5.5821	0.0000
$\log x_3^{t}$	0.8009	0.3638	2.2013	0.0344
$\log x_4^{t}$	0.5018	0.1970	2.5463	0.0154
$\log x_5^{t}$	0.1370	0.1601	0.8554	0.0381
c_6	16.078	1.9041	8.4439	0.0000
Effects specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.8697	Mean dependent var		8.9936
Adjusted R-squared	0.8464	S.D. dependent var		0.3472
S.E. of regression	0.0803	Akaike info criterion		-1.9032
Sum squared resid	0.2260	Schwarz criterion		-0.9506
Log likelihood	87.9509	Hannan-Quinn criter.		-1.5285
F-statistic	41.5770	Durbin-Watson stat		1.1599
Prob(F-statistic)	0.0000			

Table A7

Model for the cluster C countries

Variable	Coefficient	Std. error	t-statistic	Prob.
$\log x_1^{t-1}$	0.3662	0.2261	1.6192	0.1117
$\log x_2^{t-1}$	0.0411	0.0267	1.5347	0.0311
$\log x_3^{t}$	0.7958	0.0849	9.3647	0.0000
$\log x_4^{t}$	0.0120	0.0222	0.5391	0.0022
$\log x_5^{t}$	0.0499	0.1138	0.4386	0.0428
c_6	2.8553	0.5266	5.4215	0.0000
Effects specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.8977	Mean dependent var		8.7190
Adjusted R-squared	0.8965	S.D. dependent var		0.9681
S.E. of regression	0.0578	Akaike info criterion		-2.6130
Log likelihood	85.1509	Hannan-Quinn criter.		-1.5285
F-statistic	41.5770	Durbin-Watson stat		1.1599
Prob(F-statistic)	0.0000			

TABLE A8

Model for the cluster D countries

Variable	Coefficient	Std. error	t-statistic	Prob.
$\log x_1^{t-1}$	-0.0260	0.1337	-0.1947	0.8461
$\log x_2^{t-1}$	0.4096	0.1099	3.7254	0.0004
$\log x_3^{t}$	0.7749	0.0693	11.1711	0.0000
$\log x_4^{t}$	0.0662	0.0348	1.8990	0.0614
$\log x_5^{t}$	-0.3553	0.0606	-5.8575	0.0000
c_6	1.3923	0.8540	1.6302	0.1072
Effects specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.6830	Mean dependent var		7.9037
Adjusted R-squared	0.6764	S.D. dependent var		0.4253
S.E. of regression	0.0653	Akaike info criterion		-2.3843
Sum squared resid	0.3199	Schwarz criterion		-1.6261
Log likelihood	155.1799	Hannan-Quinn criter.		-2.0771
F-statistic	149.5601	Durbin-Watson stat		0.4974
Prob(F-statistic)	0.0000			

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State ownership and performance of firm: evidence from India

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Abstract

In this paper, an analysis of the performance of public and private sector firms operating in five different industries over the period 2011 to 2015 has been made. Using data envelopment analysis (DEA), the performance has been measured in respect of technical efficiency. To compare the performance of public and private sector firms, two distinct methodologies have been used: independent samples t-test and the Tobit regression model. The results of t-test indicate that the private sector has significantly higher technical efficiency in two industries but in one industry is outperformed by the public sector. In the remaining two industries, both sectors are equally efficient or inefficient. While the results of the Tobit model show that even after controlling for the firm- and industry-specific characteristics as well as the scale effect, in three industries the public sector has a managerial efficiency significantly higher than the private sector, which is found to be more efficient only in one industry.

Keywords: state ownership, performance, data envelopment analysis

1 INTRODUCTION

From the Second Five Year Plan (1956-1961) to the economic reforms of 1991 the public sector played a dominant role in the Indian economy and was often regarded as the engine of economic growth. However, despite its enormous contribution to the economic development of the country, the public sector had to face severe criticism due to its low profitability and under-utilization of capacity. In order to improve the performance of public sector enterprises (PSEs) by introducing competition, the Government of India (GOI) adopted the policy of de-reservation and disinvestment as a part of the economic reforms initiated in 1991. Since then, the GOI has been following the policy of privatization to increase the efficiency of PSEs, according to the belief that private ownership establishes the market for corporate control by allowing the tradability of property rights and therefore improves the quality of management. In this sequence, the GOI introduced the Competition Act in 2002 which replaced the Monopolies and Restrictive Trade Practices Act, 1969 (MRTP Act) in order to promote and sustain competition in Indian markets. The Competition Act provides enough freedom to the private sector firms to expand on a level playing field. Moreover, the doors are also opened to competition from foreign firms by extending the limits of foreign direct investment (FDI) up to 100 percent in many sectors. Opening up the economy to foreign competition has also forced a considerable restructuring of the private corporate sector via consolidation, mergers, and acquisitions as many domestic firms are now concentrating on their core competencies and exiting from unrelated and diversified fields (Dasani, 2011). It induced the free inflow of FDI along with modern cutting edge technology, which considerably increased the importance of the private sector in the Indian economy. This further fuelled competition amongst same-industry players and even in government firms.

The aim of this paper is to compare the performance of public and private sector firms in five different industrial sectors for the period from 2011 to 2015, when

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enough competition had been infused into the Indian economy. The underlying hypothesis of the present study is that (public or private) ownership does not have any significant impact on the performance (measured in terms of technical efficiency) of a firm.

The rest of the paper is structured into six sections. Section 2 presents a brief overview of the theoretical debate on the ownership and performance issue. Section 3 reviews the existing empirical literature on this issue available at national and international levels. Section 4 presents a brief outline of the methodological aspects of this study. The empirical findings are discussed in section 5 and finally, section 6 concludes.

2 OVERVIEW OF THEORETICAL DEBATE

Despite the existence of a large volume of theoretical and empirical literature, the question regarding the ownership and performance issue has still not been settled. The theoretical debate on this issue is based on property rights hypothesis, public choice theory, and principal-agent problem. The property rights hypothesis as propounded by Alchian (1965) and de Alessi (1980) postulates that firms in the private sector should operate with more efficiency and profitability than those in public sector. Manne (1965) and Fama (1980) argued that in the case of an efficient capital market, poor managerial performance is reflected in falling share prices, which make these firms highly vulnerable to takeover raids. Therefore, the threat of replacing the current management through takeovers serves as an effective mechanism in disciplining the current management as well as the aligning of shareholders in private firms. Since the shares of government owned firms are not tradable in the capital market, this mechanism does not work for PSEs (Sarkar, Sarkar and Bhaumik, 1998). Against this, Grossman and Hart (1980) emphasized that market failure associated with a large number of shareholders can make the functioning of the market for corporate control ineffective. For example, an individual shareholder can ignore the effect of his/her decision regarding the selling/holding of shares on the outcome of takeover raid. If there are more chances of success of a takeover bid, he/she will prefer to hold so that he/she can participate in the profit gains resulting from the replacement of the current management with the new one (Yarrow et al., 1986).

The public choice theorists like Niskanen (1975) and Levy (1987) support the argument of the property rights hypothesis. Regardless of the market conditions, state ownership gives rise to a particular type of X-inefficiency associated with the utility maximizing behaviour of bureaucrats. They argued that the bureaucrats (the agents) are more intent on maximizing their own utility or the utility of pressure groups than on the welfare of the public (the principal). Moreover, Estrin and Perotin (1991) pointed that government attempts at accommodating the interest of various pressure groups coupled with multiple and frequently changing objectives of PSEs exacerbate the above principal-agent problem by making it more difficult to measure and monitor the outcomes of managerial efforts (Sarkar, Sarkar and Bhaumik, 1998).

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The principal-agent problem may arise in the case of privately owned big corporations due to the divorce between ownership and control. This gives rise to the problem of asymmetric information since the agents (managers) possess more information regarding the true performance of firm than the principals (the shareholders). Therefore, the agents act in their own interests rather than pursuing the interests of the principals. The principals can overcome this problem by motivating the agents through some appropriate incentives based on the outcome of managerial efforts. However, there are two major problems with this incentive-based monitoring: first, monitoring by some shareholders generates spill over benefits for others, which may lead the sub-optimal levels of monitoring (Yarrow et al., 1986). Second, if there is a risk associated with the outcome of managerial decisions and the agent is risk averse, this outcome based incentive mechanism breaks down (Shavell, 1979).

Due to the non-tradability of shares, no market for corporate control exists for PSEs. However, it does not necessarily imply the absence of managerial incentives for these enterprises. Williamson (1975) has proved that, in appropriate situations, efficient monitoring might come into effect through hierarchical arrangements in a state-owned enterprise. Moreover, government can offer profit-based incentives to efficient officials and/or fire personnel responsible for poor performance. Against the market alternative, government monitoring has two possible merits: it does not face the free-rider problem arising from the dispersed shareholdings, and it can immediately take into account the deviations between social and private returns in the goods market as well as in the factor market (Yarrow et al., 1986).

Another argument often given in favour of privatization stresses that nationalization increases the power of labour unions to extract higher wages from the government, since government officials and supervising ministries have less incentive to minimize the unit cost of labour than their private counterparts (Yarrow et al., 1986). Against this, however, it may be argued that government has more incentive to have a tough negotiating stand than its private counterparts for at least two reasons. First, government has greater resources at its disposal, which enhances its ability to face the union's pressure and resulting losses. Second, a generous settlement by the government in one area can be considered a sign of weakness by the public negotiators in other areas. If government does not take into account this demonstration effect, it may lead to more generous settlements to labour in these areas. Therefore as compared to employers in private sector, the government has a relatively high motivation to attain a reputation for toughness (Kreps and Wilson, 1982; Yarrow et al., 1986).

3 REVIEW OF EMPIRICAL LITERATURE

Till now, a large volume of empirical literature has grown on the ownership-performance issue and the impact of privatization. Among the most popular studies, that of Boardman and Vining (1989) examined the relative performance of the public and private sector by taking a sample of 500 non-US multinational firms

and concluded that private sector was a superior performer to the public sector. Dewenter and Malatesta (2001) by using the data reported in Fortune magazine for a heterogeneous group of very large firms doing business around the world, compared the profitability of the public and private sector firms and found the private sector more profitable than the public sector. Further, Goldeng, Grünfeld and Benito (2008) analyzed the profitability of Norwegian firms and concluded that privately owned firms performed significantly better than the state-owned firms. Against it, Caves and Christensen (1980) and Färe, Grosskopf and Logan (1985) documented evidence of high performance by PSEs relative to private firms. By reviewing a number of other international studies, Martin and Parker (1997) found mixed evidence. Further, Thompson and Pederson (1996) analyzed the impact of the ownership structure of the 100 largest firms of several European countries. They found no indication that ownership modes systemically affect the firm's performance in terms of growth and profitability. Among more recent studies, Mijić, Jakšić and Berber (2015) compared the productivity and profitability of public and private firms operating in the Central and Eastern Europe region and found that the private sector has significantly higher profitability and productivity than that of public sector in most of the countries of the region.

As far as privatization is concerned, Megginson, Nash van Randenborgh (1994) analyzed the impact of privatization on the financial and operating performance of 61 firms belonging to 18 countries and 32 industries by comparing their performance in pre- and post-privatization period. They found that privatization significantly improved the performance of firms in terms of various parameters. Boubakri and Cosset (1998) analyzed the performance of 79 firms belonging to 21 developing economies that witnessed full and partial privatization during the period from 1980 to 1992. Their results showed a significant increase in profitability and operating efficiency after privatization. In contrast, Qi, Wu and Zhang (2000) by taking a sample of Chinese state-owned firms, analyzed the relationship between firm performance and tradable shares and found that diffused ownership by individual domestic and foreign investors did not improve a firm's performance. On the other hand, Frydman et al. (1999), taking a sample of 218 firms from the various transition economies, found improvements in the performance of these firms in the post-privatization era, although they emphasized that improvement in performance is contingent on getting the design of privatization right. In this sequence, La Porta and Lopez-De-Silanes (1999) gave similar evidence of improvements in a firm's performance due to privatization in Mexico. Subsequently, Galal et al. (1994), Zhang, Parker and Kirkpatrick (2008), and Estrin et al. (2009) concluded that in developing countries, competition is more important than privatization for improving the performance of PSEs. On the other hand, Bartel and Harrison (2005), Megginson (2005), Tongzon and Heng (2005), and Pina and Torres (2006) concluded that the policy of privatization would be more effective in a competitive environment and therefore, suggested that both privatization and competition should go hand in hand in order to increase the efficiency of PSEs.

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In India, most of the literature on the ownership-performance issue is rather inadequate, especially in relation to the period following the Competition Act, 2002. The majority of the studies in this regard dealt with the banking sector and documented the superior performance of public sector banks as against their private counterparts following deregulation, which helped public sector banks to enhance their performance through the introduction of competition in the banking industry. The banking industry is subject to asymmetric information and moral hazard; therefore, it differs from other industrial sectors, like the manufacturing sector. Moreover, in developing countries like India, the public have a trust in government-owned financial institutions. All of these factors may be responsible for the relatively high efficiency of public sector banks in India. Only a few attempts have been made to analyze the relative performance of public and private sector firms in the non-banking industries in India. Among the earlier studies, Dholakia (1978) and Gupta (1982) investigated the performance of PSEs in the pre-reform period. They found that the performance of PSEs was improving over time. Bhaya (1990) examined the relative performance of public and private sector over the period 1982 to 1986. He measured the performance in terms of partial labour and capital productivities and concluded that public or private ownership did not have any significant impact on performance. However, in terms of returns on investment, the private sector did better than its public counterpart. Ahluwalia (1995), taking a sample of 762 Indian firms, including 221 state owned firms and 541 large private sector companies, compared the performance of public and private sectors in terms of average gross returns on capital employed. He found the sectors do not differ significantly in terms of average gross returns. However, when the PSEs belonging to the petroleum and refinery industry were excluded from the public sector, a significant decline in the returns for public sector was observed. Further, Ramaswamy (2001) observed that PSEs were not performing as well as their private counterparts and the magnitude of private versus public sector performance increased with increasing competitive intensity. Gupta (2005), using data from 1990 to 2002 on Indian PSEs, measured the impact of partial privatization on profitability, productivity, and investment and she concluded that partial privatization has a positive impact on all of these performance indicators. One serious drawback with the above studies is that they measured the performance of the public sector in terms of profitability. It does not seem justifiable to compare public and private sector firms solely on the basis of profitability, since they are operating in different types of environment, have different types of organizational structure and different types of goals. Since both public and private sector use the scarce resources of the country, therefore, the performance must be measured and compared in terms of efficiency or productivity rather than measuring it merely in terms of profitability. Ahuja and Majumdar (1998), Majumdar (1998), and Mohan and Ray (2003) attempted to bridge this gap by measuring and comparing the performance of the public and private sector in respect of technical efficiency using DEA.

Ahuja and Majumdar (1998) assessed the DEA based efficiency of 68 PSEs working in the manufacturing sector during the period 1987 to 1991. They found that the

mean technical efficiency scores of these PSEs range between 0.35 and 0.39. They suggested that privatization can improve efficiency of these PSEs. Majumdar (1999) compared the performance across four categories of firms: central government PSEs, state government PSEs (India is a federation of states), joint sector enterprises, and privately owned enterprises. The results demonstrated that private enterprises were reported highly efficient followed by joint sector enterprises and the enterprises owned by centre or state government. However, in these studies, performance was measured across highly heterogeneous samples of firms belonging to diverse industrial sectors and therefore they clubbed together firms with widely differing technologies. A meaningful comparison of performance and efficiency through DEA requires at least a modest degree of homogeneity among the decision-making units being compared. Keeping in view the problem of lumping together the data of heterogeneous firms, Mohan and Ray (2003) investigated the relative efficiency of the public and the private sector using firm level data for the period 1992 to 1999. They found that in five out of eight industries, handing over public sector firms to private ownership will not make any significant improvements in efficiency.

All of these studies belong to the pre-reform period or the period when economic reforms were just initiated. In the pre-reform period, the public sector was a dominant player in the Indian industrial sector and faced negligible competition from the private sector. The most recent studies on the ownership and performance issue have been conducted by Kaur and Kumar (2010), Gupta, Jain and Yadav (2011) and Jain (2017). Kaur and Kumar (2010) compared the technical efficiency of foreign, private, and public sector pharmaceutical firms in the Indian context. They found that foreign owned firms perform more efficiently than domestic firms and the private sector firms perform more efficiently than PSEs. They regarded the difference in the technologies used by these firms as the main reason for performance differentials. Gupta, Jain and Yadav (2011) analyzed the financial performance of disinvested central PSEs in India on pre and post disinvestment basis over the period, 1986-87 to 2009-10. The authors observed a significant decline in the performance of PSEs measured in terms of profitability and major efficiency ratios after disinvestment and suggested that partial disinvestment was not a successful measure for improving the financial performance of the PSEs across various industrial sectors. By using stochastic frontier analysis, Jain (2017) measured the performance of 238 central PSEs (belonging to various sectors) for the period 1991 to 2010. She found a strong and positive relationship between disinvestment and efficiency of PSEs.

Against this background, the present study differs from the previous studies in two respects. First, it tries to measure the relative performance of the public and private sector in today's competitive environment. Second, unlike the previous studies using firm level data, it avoids the problem of lumping together disparate industrial categories. The efficiency of a firm belonging to a particular industry must be analyzed against an efficient production frontier estimated from the observed input-output data of firms from that industry only. It provides a more

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meaningful measure of technical efficiency by controlling for technological heterogeneity across varied industrial sectors (Mohan and Ray, 2003).

4 METHODOLOGY

4.1 SAMPLE AND DATA

For the purpose of the present study, five industries viz. engineering goods, fertilizers, mining/minerals, refineries, power generation & supply; have been identified, in which both public and private sectors have a massive presence. From each industry, a sample of ten or more firms having at least a 50 percent share (or above) in the total sales of their respective industries, has been selected. The study is based on firm-level data and covers a period of five years from 2011 to 2015. The detailed data on profit-loss accounts and balance sheets have been obtained from *Capitaline database.* Table 1 shows percentage share of selected firms in total sales of their respective industries.

Table 1

Percentage share of selected firms in total sales of industry in 2015

Selected industry	No. of selected firms	Percentage share in industry's sales
Engineering goods	18	81.26
Fertilizers	12	66.21
Mining/minerals	15	88.60
Refineries	10	98.91
Powergeneration & supply	17	64.85

Source: Capitaline database.

4.2 DATA ENVELOPMENT ANALYSIS

This is a linear programming technique, initially developed by Charnes, Cooper and Rhodes (CCR) (1978) and further generalized by Banker, Charnes and Cooper (BCC) (1984), to evaluate the efficiency of a homogeneous set of decision-making units. An input-orientated version of DEA (where the objective is to minimize inputs for a given level of output) with the assumption of constant returns to scale (CRS), proceeds by solving a sequence of linear programming problems:

Minimize E_n, subject to:

$$\sum_{j=1}^{N} w_j y_{ij} - y_{in} \geq 0 i = 1,\ldots,I$$

$$\sum_{j=1}^{N} w_j x_{kj} - E_n x_{kn} \leq 0 k = 1,\ldots,K$$

$$w_j \geq 0 \, j = 1,\ldots,N$$

where there are N organizations in the sample producing i different outputs (y) and using K different inputs (x). The w_j are weights applied across the N organizations. E_n is the ratio of weighted sum of inputs to the weighted sum of outputs of the *nth*

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organization. If we impose an additional constraint that the weights must sum to one (i.e. $\sum_{j=1}^{N} w_j = 1$), the above DEA model becomes a variable returns to scale (VRS) model. It allows for the existence of economies and diseconomies of scale. The estimation of technical efficiency with CRS and VRS assumptions allows the overall technical efficiency (OTE) to be decomposed into two collectively exhaustive components: pure technical efficiency (PTE) and scale efficiency (SE), i.e. $OTE = PT \times SE$ (Singh and Bansal, 2017). PTE is also known as managerial efficiency. Further, an independent samples t-test is used in order to compare the efficiency score of public and private sector firms.

4.3 INPUT-OUTPUT SPECIFICATION

For specifying the input and output variables, the present study follows the approach adopted by Mohan and Ray (2003). Energy, raw material, wages, and capital are used as inputs. Since energy and raw materials are used as inputs, the use of gross output, rather than net value added (NVA), is appropriate. Using NVA as output is suitable only when labour and capital are considered as inputs. Net sales of firms (i.e. sales net of excise duties) adjusted for changes in inventories are used as gross output. Instead of using the gross or fixed assets, the summation of two items, interest and depreciation is used as capital that is based on flows (not on stocks) like other measures for output and inputs. All nominal values have been appropriately deflated.

4.4 TOBIT MODEL

In order to examine the impact of ownership on the technical efficiency of selected firms in our sample, a second stage analysis of the technical efficiency scores obtained in stage one is performed by applying the Tobit regression model. Since the dependent variable efficiency score is bounded between 0 and 1, an appropriate theoretical specification is Tobit model with two side censoring (Sufian and Abdul Majid, 2008):

$$Y_{it} = \alpha_0 + \alpha_1 CL_{it} + \alpha_2 Size_{it} + \alpha_3 H_t + \alpha_4 Pub + \sum_{j=2}^{5} \beta_j Ind_j + \sum_{j=2}^{5} \gamma_j (Ind_j Pub) + \sum_{t=12}^{15} \delta_t T_t + u_{it}$$

where Y_{it} = technical efficiency scores of firm i, in year t, CL_{it} = capital-labour ratio (measured as the ratio of fixed capital to employee cost) of firm i in year t, $Size_{it}$ = share of firm i in industry's total sales in year t, H_t = Herfindahl index in year t, Pub =1 if firm belongs to public sector and zero otherwise, Ind_j = 1 if firm belongs to industries j and zero otherwise (industry code 1 is assigned to the engineering goods industry which is used as the reference industry) and $T = 1$ if observation is from year t and zero otherwise (year 2011 is used as the reference year). It is worth mentioning that the impact of ownership on the technical efficiency of a firm in the engineering goods industry cannot be measured by the above specification of the model. In order to measure the impact of ownership in this sector, the above model is re-estimated assuming the Fertilizers sector as the reference industry. The results for other industries are fairly similar to the findings of the previous models. Therefore, they are not reported in this study.

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5 RESULTS AND DISCUSSION

Table 2 presents the principal characteristics of selected public and private firms. The table shows that two industries (viz. refineries and power generation & supply) are characterized by government monopoly, as state owned firms in these two industries, on average, cover 76.57 and 68.29 percent of industry's total sales respectively over the period of time. In the other three industries (i.e. engineering goods, fertilizers, and mining/minerals) the private sector has the largest part of (approximately 70 percent) of the industry's total sales over the period under consideration. The percentage share of selected firms in industry's total assets and employee cost demonstrates that public sector firms are relatively labour intensive whereas private sector firms are relatively capital intensive. Further, the Herfindahl index and the concentration ratio measure the extent of competition in each of the industries. A relatively low value of these two indices in an industry indicates a high degree of competition in that industry. The degree of competition is highest in the power generation & supply industry followed by engineering goods and fertilizers industries. As far as mining/minerals and refinery industries are concerned, the competition is lowest in these two industries.

TABLE 2

Principal characteristics of selected public and private sector firms, 2011 to 2015

Industry	Percentage share in industry's sales		Percentage share in industry's total assets		Percentage share in industry's employee cost		Herfindahl Index (H)[1]	Concentration Ratio (CR)[2]
	Public	Private	Public	Private	Public	Private		
Engineering	25.31	74.09	21.22	78.46	24.54	75.06	0.12	56.60
Fertilizers	29.76	67.73	19.16	72.73	46.58	49.98	0.10	50.62
Refineries	76.57	23.42	68.33	32.04	78.25	21.74	0.19	83.09
Mining/minerals	22.10	77.89	23.68	76.31	62.73	37.26	0.45	86.99
Power	68.29	31.70	71.87	28.12	74.76	25.23	0.05	33.51

Note: the figures in the table are the averages of the period from 2011 to 2015.

Source: author's calculation.

Table 3 shows the descriptive statistics of the efficiency score of selected public and private sector firms for the period 2011 to 2015. The mean OTE scores of engineering goods, refineries, and power generation & supply industries are increasing over time. This is because in these industries, both public and private sector firms have improved their performance over time, as indicated by the increased value of their mean OTE scores in 2015 compared to that of 2011. However, this improvement is more consistent for the private sector, as revealed by the decreased values of standard deviation in 2015 for each of the three industries. In the fertilizers and mining industries, the average efficiency score is declining over time at the industry level. In the fertilizers industry, the mean OTE scores of both

[1] $H = \sum_i^n S_i^2$ and $\frac{1}{n} \leq H \leq 1$, where S_i is the ratio of firm *ith* sales to that of industry.

[2] CR = percentage share of the largest four firms in industry's total sales.

sectors have declined marginally over the period. However, the value of standard deviation for the public sector has increased substantially relative to that of the private sector which implies that the problem of declining efficiency is more serious in the public sector. As far as the mining industry is concerned, the mean OTE score of private sector firms is fairly stable over time, though it is in decline in the case of PSEs. If the standard deviation is considered, it can be seen that its value has decreased considerably for the public sector and increased for the private sector over the period. This implies that the OTE score of an average PSE concentrates to the sectoral mean over the period of time, whereas the opposite is true in case of private sector firms.

Table 3

Descriptive statistics of overall technical efficiency (OTE), 2011 to 2015

Industry	Year	Mean OTE			Standard deviation			Range	
		Public	Private	Industry	Public	Private	Industry	Public	Private
Engineering goods	2011	0.909	0.964	0.937	0.085	0.037	0.071	0.260	0.131
	2015	0.913	0.973	0.943	0.094	0.035	0.077	0.304	0.108
Fertilizers	2011	0.920	0.976	0.995	0.066	0.033	0.055	0.169	0.111
	2015	0.905	0.963	0.941	0.226	0.040	0.142	0.900	0.127
Mining/ minerals	2011	0.759	0.739	0.749	0.296	0.177	0.241	0.839	0.437
	2015	0.719	0.744	0.732	0.165	0.297	0.237	0.848	0.541
Refineries	2011	0.896	0.687	0.792	0.090	0.391	0.280	0.260	0.686
	2015	0.888	0.828	0.858	0.092	0.214	0.166	0.247	0.619
Power generation & supply	2011	0.673	0.713	0.693	0.247	0.357	0.304	0.676	0.657
	2015	0.789	0.823	0.806	0.247	0.170	0.167	0.499	0.588

Source: author's calculation.

5.1 RESULTS OF INDEPENDENT SAMPLES T TEST

Table 4 compares the average technical efficiency of public and private sector firms in five different industries from 2011 to 2015. The table demonstrates that out of five, in two industries (i.e. engineering goods and fertilizers) the OTE of private sector companies is significantly greater than that of PSEs over the period. In the engineering goods sector, the mean OTE score of private firms exceeds the mean OTE score of their public counterparts by as much as 5.8 percentage points, whereas in the case of the fertilizers industry, the mean OTE score of private sector firms is significantly greater than that of the PSEs by 5.7 percentage points. In order to find out the sources of this inefficiency, one must investigate the PTE and SE scores of the decision making units under consideration. In both industries, PSEs have a significantly low PTE score as compared with their private counterparts, which indicates the presence of managerial inefficiency in the operation of PSEs in these two industries. As far as scale efficiency is concerned, both public and private sector firms are reported equally efficient over the period of time in both industries. Therefore the main reason for inefficiency in the operations of PSEs may be attributed to managerial inefficiency rather than to inefficiency caused by scale factors. The PTE relates to the capability of managers to utilize a

firm's given resources, whereas the SE refers to exploiting scale economies by operating at a point where the production frontier exhibits constant returns to scale (Sufian and Habibullah, 2009). It is noteworthy that in both of these two industries (i.e. engineering goods and fertilizers), the degree of competition is relatively high in the context of the industries under consideration. This implies that when the policy of privatization is carried out together with increased competition, privatization will certainly result in improvements in efficiency (Ramaswamy, 2001; Megginson, 2005).

In the case of the mining/minerals sector, no significant difference has been observed in the performance of public and private sector firms as far as OTE is concerned. On an average, both sectors are reported with approximately 25 percent inefficiency. Since efficiency is measured using an input-oriented DEA model, which implies that an average firm in mining/minerals industry if producing its output on the efficient frontier instead of its current location would need only 75 percent of the inputs currently being used; by adopting best practice technology, firms, on average, can reduce their inputs by at least 25 percent. However, sources of inefficiency differ in the two sectors as indicated by their PTE and SE scores in table 4. The mean PTE score (0.852) of private sector firms is significantly lower than that (0.949) of the public sector, by 0.098, for the period under consideration. Therefore, it is evident that with respect to the efficient use of inputs, PSEs outperform their private counterparts. As far as SE is concerned, private sector firms exhibit a significant lead over their public counterparts. This implies that private sector firms are operating closer to the minimum point of their long-run average cost curve than their public counterparts. Therefore, the lead of the PSEs in efficient use of inputs is completely offset by their inefficiency in realizing economies of scale as compared to private sector firms, which, as a result, renders the differences between the performances of these two categories of firms statistically insignificant as far as OTE is concerned. Further, the degree of concentration is very high in the mining/mineral industry (as indicated by the Herfindahl index and concentration ratio in table 2). This lack of competition may be regarded as a potential source of technical inefficiency in the operations of both public and private firms in this industry, which consequently renders the difference between the OTE of these two sectors statistically insignificant. From the Hicksian perspective, the monopolistic structure of the market results in loss of efficiency by enabling firms to charge prices above the marginal cost and to produce less than the optimal level (Dudu and Kilicaslan, 2009).

Table 4

Average technical efficiency of public and private sector firms, 2011 to 2015

Industry		Average sectoral technical efficiency		
		OTE	**PTE**	**SE**
Engineering goods	Private sector	0.969	0.994	0.975
	Public sector	0.911	0.934	0.976
	Mean difference	**0.058****	**0.06****	**-0.001**
Fertilizers	Private sector	0.97	0.989	0.981
	Public sector	0.912	0.964	0.978
	Mean difference	**0.057****	**0.025****	**0.002**
Mining/minerals	Private sector	0.751	0.852	0.889
	Public sector	0.729	0.949	0.777
	Mean difference	**0.022**	**-0.098****	**0.112****
Refineries	Private sector	0.758	0.956	0.799
	Public sector	0.892	0.992	0.899
	Mean difference	**-0.135****	**-0.036****	**-0.1****
Power generation & supply	Private sector	0.768	0.907	0.851
	Public sector	0.731	0.912	0.794
	Mean difference	**0.037**	**-0.005**	**0.057**

****, **, and * significant at 1%, 5% and 10% level, respectively.*

Source: author's calculation.

In refineries, the mean OTE score of PSEs as a group is 0.892 and in the case of private sector firms, it is 0.758, which is significantly lower than that of publicly owned firms. However, as compared to the benchmark, public and private sector firms are observed with 11 and 24 percent inefficiencies over the period of time**.** The superior performance of the public sector is attributable to both managerial and scale factors. The mean PTE score of PSEs is significantly greater than that of private firms by 3.6 percentage point, which indicates a relatively high managerial efficiency of the public sector in the use of available inputs. As far as scale efficiency is concerned, the mean SE score in the public sector significantly exceeds the mean score of their private counterparts by 10 percentage points. This implies that PSEs are operating closer to the optimal level of scale than the privately owned firms in refinery sector. The superior performance of the public sector in this industry may be due to the fact that the public sector has enjoyed a monopoly for a long period of time in this industry. Moreover, in India the refinery industry has been a subject of price control for a long period of time, which constrained the entry of private firms into this industry by making it less profitable for the private sector.

Further, table 4 demonstrates that in the power generation & supply industry, the mean OTE score of private sector firms for the period of study is 0.768, which is slightly greater than that of PSEs by 0.037; however, the difference is statistically insignificant. Another thing which can be observed is that the mean OTE scores of both public and private sector firms are significantly low as compared to the benchmark. In the case of PSEs, on an average, 26.9 percent inefficiency is present over the period of time under consideration. In the case of private sector

firms, the size of inefficiency is approximately 23.2 percent. As indicated by their PTE and SE scores, both managerial and scale factors contribute significantly to the overall inefficiency in the two sectors. The average size of managerial inefficiencies in the operation of public sector firms is 8.8 percent, while in the case of private sector firms it is 9.3 percent. Therefore, with respect to the efficient use of inputs, firms in the two sectors are equally efficient or inefficient. As far as scale inefficiency is concerned, 14.9 percent scale inefficiency exists in the production process of private firms, while in the case of PSEs; the average size of scale inefficiency is 20.6 percent. Therefore, as with managerial efficiency, both sectors are equally scale efficient or inefficient in the power sector. It is important to note that like refineries, in the power industry the market power is concentrated in favour of the public sector. Apart from this, in India the prices of electricity are regulated by the government instead of by market forces. Therefore, both government monopoly and regulation may be regarded as a possible source of the inefficiency present in the power sector as a whole.

5.2 RESULTS OF TOBIT REGRESSION MODEL

In order to corroborate the findings of the previous section, this section tries to investigate the impact of ownership on the various estimates of technical efficiency (viz. OTE, PTE and SE) of firms by using the Tobit regression model. The regression analysis by controlling the firm- and industry-specific characteristics provides a more robust analysis of the relative performance of state owned and privately owned firms. For this purpose, we have run three regressions taking OTE, PTE and SE as dependent variables and dummy variables for ownership, industry, industry interacting with ownership, and time as the independent variables. Apart from this, the size of a firm (which is measured in terms of its share in total sales of industry), capital-labour ratio, and Herfindahl Index (which is used as the proxy of monopoly position of the market) are used as additional control variables. All of these variables reflect firm- and industry-specific characteristics that might affect the efficiency of firms, apart from the ownership structure.

Table 5 demonstrates that all of the coefficients (δ_i) of the time dummies in all of the three regression models are statistically insignificant, which implies that time does not have any significant impact on the overall efficiency or on the managerial and scale efficiency of a firm. The results also show that the capital-labour (CL) ratio has significant and negative impacts on OTE as well as PTE. However, its impact on SE is found to be statistically insignificant. Since PTE and SE are the collectively exhaustive components of OTE, it is evident that the CL ratio is affecting the OTE through PTE. The negative impact of the capital-labour ratio on efficiency implies that either labour is more productive than capital (as in case of labour-augmenting technological progress) or Indian firms are using capital beyond the optimal level (as in the case of the existence of excess capacity). Whatever the case, if these firms substitute labour for capital, i.e. use capital saving techniques of production, it will increase their productive efficiency. Further it is found that the size of a firm has a significant and positive impact on OTE and PTE.

As far as SE is concerned, the impact of size is reported insignificant. Therefore, as with the CL ratio, the size of a firm affects OTE through PTE. From a Schumpeterian perspective, a positive impact of size on efficiency indicates that a large firm has a higher tendency to make product and process innovations which increase its productive efficiency. Further, the monopolistic structure of a market (as measured by the Hefindahl Index) has a significantly negative impact on PTE which implies that the monopolistic structure of the market reduces the managerial incentives to produce at the minimum cost since the firms can charge the prices above the marginal cost and therefore, can survive in the economy in spite of their higher costs.

The interaction coefficients (γ_j) measure the impact of ownership on the performance of firms in a particular industry. Table 5 shows that the interaction coefficient (γ_j) is statistically significant only for the refinery industry if we consider OTE as the dependent variable. This means that even after controlling for the impact of firm and industry specific characteristics, state ownership has a positive impact on the OTE of a firm in the refinery sector while in case of the remaining four industries (viz. engineering goods, fertilizers, mining/minerals, and power), ownership does not matter. Further, table 5 shows that in the case of four industries (viz. engineering goods, mining/minerals, refineries, and power), public ownership has a significant impact on PTE, i.e. the efficiency of management in the utilization of available inputs, as indicated by the highly significant interaction coefficients (γ_j) for these industries. In the case of the engineering goods sector, state ownership has a negative impact on the managerial efficiency of PSEs, i.e. PSEs suffer from managerial underperformance. Thus, privatizing these firms will certainly improve their managerial performance in this industry. However, in the case of mining, refineries, and power, state ownership has a positive impact on managerial performance. This implies that even if we remove the scale effect, transferring the ownership of PSEs to private sector will reduce the managerial efficiency of PSEs in these three industries. Therefore, like those of Mohan and Ray (2003), our results reject the argument that the performance of private sector would be superior to that of public sector once we adjusted for the scale effect. As far as SE is concerned, state ownership has significant effect on SE in only two industries, i.e. refineries and power generation & supply. In the case of refineries, the public sector has advantage of scale, while it is operating with diseconomies of scale in power sector. It is worth mentioning that the results of the Tobit model are somewhat different from the results of the independent samples t-test, in that, as per Tobit model, the public sector is reported as being marginally superior to the private sector in terms of both OTE and PTE. This may happen due to the difference in the nature of two methodologies. Unlike the t-test, regression analysis controls the effect of other explanatory variables by including them in the model as additional control variables.

TABLE 5

Tobit regression estimates

Explanatory variables	Dependent variable		
	OTE	PTE	SE
Const (α_0)	1.04993***	1.40393***	1.06753***
CL (α_1)	−1.194e-05***	−2.476e-05***	3.473e-06
Size (α_2)	0.166651**	0.634850***	−0.117076
H (α_3)	−0.419001	−1.17132**	0.0588547
Pub (α_4)	−0.0545116***	−0.181944***	−0.0290541
Ind_2 (β_2)	−0.0284189	−0.147134**	0.0163939
Ind_3 (β_3)	−0.215366***	−0.300554***	−0.136254***
Ind_4 (β_4)	−0.193480***	−0.0446409	−0.218155***
Ind_5 (β_5)	−0.0914068**	−0.120872	−0.0859020*
Ind_1 Pub (γ_1)	0.0172838	−0.073493**	0.00322398
Ind_2 Pub (γ_2)	−0.00686827	0.0734939	−0.00322398
Ind_3 Pub (γ_3)	0.0343362	0.387319***	−0.0870903
Ind_4 Pub (γ_4)	0.167070***	0.159962**	0.133120**
Ind_5 Pub (γ_5)	−0.0611306	0.195389**	−0.127205**
T_{12} (δ_{12})	−0.0318665	−0.0345488	−0.0138445
T_{13} (δ_{13})	0.0149875	−0.0358358	0.0193831
T_{14} (δ_{14})	0.0275370	−0.0141005	0.0304489
T_{15} (δ_{15})	0.00427809	−0.0198059	0.00490746
Sigma	0.180388***	0.184465**	0.213104**

****, **, and * significant at 1%, 5% and 10% level, respectively.*

Source: authors' calculation.

The relatively high managerial efficiency of state owned firms may be attributed to the fact that most of the PSEs in our sample belongs to the *Maharatna* and *Navratna* categories. As the part of economic reforms initiated in 1991, the GOI gradually closed or sold off sick PSEs to the private sector. Profit-making PSEs were classified as *Maharatna, Navratna* and *Miniratna* PSEs based on their performance. These PSEs have been given substantially enhanced autonomy and operational freedom, which significantly increases their efficiency. Further, continuously increasing competition from both domestic and foreign firms in the post reform period also helped these PSEs in improving their efficiency. Moreover, it may be possible that underlying structural factors, such as poor governance, weak law enforcement and tardy bankruptcy procedures tend to keep the private sector from realizing its fullest potential (Mohan and Ray, 2003).

6 CONCLUSION

In this paper, an analysis of the performance of public and private sector firms operating in five different industries has been made over the period 2011 to 2015. Using DEA, the performance has been measured in terms of technical efficiency. In order to compare the technical efficiency of public and private sector enterprises, two distinct methodologies, the independent samples t-test and the Tobit regression model, have been used. The main findings of the study may be summarized as

follows. First, the results of t-test indicate that out of five, the private sector has significantly high OTE as well as PTE in two industries, engineering goods and fertilizers, where competition is relatively high. In contrast, in refineries where market power is concentrated to the public sector, PSEs have considerably higher OTE and PTE as well as SE than their private counterparts. Therefore it may be concluded that competition along with privatization plays a positive role in improving the efficiency of firms. Second, the results of the Tobit model reveal that even after controlling for the effect of firm specific characteristics and that of the monopolistic structure of the market, the public sector emerges as a superior performer in respect of OTE in the refinery industry. In rest of the four industries, ownership does not matter. Third, if we consider the argument that PSEs enjoy the advantages of scale and compare their performance with that of their private counterparts only in terms of PTE, the public sector emerges as a superior performer in three industries (mining/minerals, refineries, and power generation & supply). Against this, the private sector has significantly high PTE only in engineering goods industry. This implies that only in one industry out of five, transferring ownership to the private sector would result in efficiency gains, even if we disregarded the scale effect. In three industries, privatization would result in a loss of managerial efficiency. In the case of the remaining two industries, no firm conclusion can be made regarding the impact of public or private ownership.

The effectiveness of privatization is based on the link between the market for corporate control and enterprise performance. Considerable information poverty among shareholders and potential raiders regarding the true performance of a firm coupled with the high transaction costs of takeovers due to the time consuming process of transferring shares between sellers and buyers, and stringent takeover regulations can weaken this link in developing countries like India (Sarkar, Sarkar and Bhaumik, 1998). Thus, the policy of privatization cannot effectively increase the efficiency of private sector firms in these countries. The positive impact of privatization on economic performance can take place only in an appropriate institutional environment with relevant legal standards, i.e. protection of shareholders and creditors, righteous and enforceable contracts, functioning bankruptcy courts, adequate banking system, capital market supervision, and so on (Tichá, 2012).

Disclosure statement

No potential conflict of interest was reported by the author.

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APPENDIX

TABLE A1

List of the selected public and private sector firms

Industry	Firm	Ownership status
Engineering goods	B H E L	Public
	BEML Ltd	Public
	Bharat Dynamics Ltd	Public
	Engineers India Ltd	Public
	Hindustan Aeronautics Ltd	Public
	Larsen & Toubro Ltd	Private
	Siemens Ltd	Private
	Tata Projects Ltd	Private
	CG Power & Industrial Solution Ltd	Private
	Crompton Greaves Ltd	Private
	Thermax Ltd	Private
	BGR Energy Systems Ltd	Private
	Tata Hitachi Construction Machinery Company Pvt Ltd	Private
	IL&FS Transportation Networks Ltd	Private
	L&T Technology Services Ltd	Private
	ISGEC Heavy Engineering Ltd	Private
	Sunil Hitech Engineers Ltd	Private
	Ashoka Buildcon Ltd	Private
Fertilizers	Nation Fertilizers Ltd	Public
	Rashtriya Chemicals & Fertilizers Ltd	Public
	Madras Fertilizers Ltd	Public
	Fertilisers & Chemicals Travancore Ltd	Public
	Coromandel International Ltd	Private
	Chambal Fertilizers & Chemical Ltd	Private
	Gujarat State Fertilizers & Chemical Ltd	Private
	Gujarat Narmada Valley Fertilizers & Chemical Ltd	Private
	Zuari Agro Chemicals Ltd	Private
	Nagarjuna Fertilizers & Chemical Ltd	Private
	Deepak Fertilizers & Petrochemicals Corp. Ltd	Private
	Mangalore Chemicals & Fertilizers Ltd	Private

Industry	Firm	Ownership status
Mining/ minerals	Coal India Ltd	Public
	Gujarat Mineral Development Corp. Ltd	Public
	MOIL Ltd	Public
	NMDC Ltd	Public
	20 Microns Ltd	Private
	Associated Stone Industries Ltd	Private
	Facor Alloys Ltd	Private
	Ferro Alloys Corporation Ltd	Private
	Indian Metals & Ferro Alloys Ltd	Private
	Indsil Hydro Power & Manganese Ltd	Private
	Maithan Alloys Ltd	Private
	Rohit Ferro Tech Ltd	Private
	Sandur Manganese & Iron Ores Ltd	Private
	Shirpur Gold Refinery Ltd	Private
	Vedanta Ltd	Private
Refineries	Bharat Petroleum Corporation Ltd	Public
	Bharat Oman Refinery Ltd	Public
	Chennai Petroleum Corporation Ltd	Public
	Hindustan Petroleum Corporation Ltd	Public
	Indian Oil Corporation Ltd	Public
	Mangalore Refinery & Petrochemicals Ltd	Public
	Numaligarh Refinery Ltd	Public
	Essar Oil Ltd	Private
	HPCL-Mittal Energy Ltd	Private
	Reliance Industries Ltd	Private
Power generation & supply	NTPC Ltd	Public
	Gujarat Industries Power Company Ltd	Public
	NHPC Ltd	Public
	NLC India Ltd	Public
	Power Grid Corp. of India Ltd	Public
	SJVN Ltd	Public
	Adani Power Ltd	Private
	CESC Ltd	Private
	Jaiprakash Power Ventures Ltd	Private
	JSW Energy Ltd	Private
	RattanIndia Power Ltd	Private
	Reliance Infrastructure Ltd	Private
	Reliance Power Ltd	Private
	Schneider Electric Infrastructure Ltd	Private
	Suzlon Energy Ltd	Private
	Tata Power Company Ltd	Private
	Torrent Power Ltd	Private

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Structural reforms for growth and cohesion: lessons and challenges for CESEE countries and a modern Europe

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In order to prevent mistakes or the achievement of lower results in future structural reforms, three members of the Austrian National Bank – Ewald Nowotny, Doris Ritzberger-Gruenwald and Helene Schuberth – have edited a book about the achievements and failures of past structural reform policies. Judging from the book they published together in 2015, *The Challenge of Economic Rebalancing in Europe*, it seems that their collaboration is fruitful. Moreover, the collaboration between Nowotny and Ritzberger-Gruenwald was extremely productive from 2012 onwards with four monographs being published every second year. The newest book is dedicated to structural reforms, one of the three pillars – investments, structural reforms and fiscal responsibility – for promoting economic growth and creating more jobs. Although all the pillars are equally important, structural reforms are a *sine qua non* for all the others. The aim of the book is to answer how to shape a better future by promoting policies beyond liberalization and deregulation. This attempt adds value to the contemporary literature.

The book is structured in five parts with seventeen chapters and twenty-five contributors. The first part is dedicated to a modern understanding of structural reforms, the second to the contribution of technological change and innovation, the third to the distributional effects of reforms, the fourth to past and current reform strategies in Europe, and the fifth to the open question of what should be reformed – EU frameworks or EU countries? This book may be challenging for the reader, particularly one who wishes to cover the ground quickly, for the kind of contribution it makes cannot be presented simply. The main reasons are the diversity of written styles and the different perspective that emerges from each topic and/or authors' affiliation. Authors come from different institutions such as national banks, European Commission, EBRD, World Bank, research institutes and universities. Hence, their institutional knowledge, as well as their career positions, also influence their styles and their standpoints toward structural reforms. Some of these authors are researchers, some are professional analysts and some are members of the senior managements so that chapters range from typical journal papers to typical review papers and simply to professional opinions. The diversity of institutions and different professional perspectives are both an advantage and also an obstacle to correlating and aligning all the observations and opinions. Nevertheless, heterogeneity is more rewarding than homogeneity, particularly when topics like structural reforms are being dealt with.

The first part of the book starts with the editors' introduction of the aim and the description of each chapter. The book is oriented toward the role of structural reforms in the transformation of economic systems into more inclusive growth strategies instead of the usual recommendations for more deregulation, liberalization, and privatization. In addition, this book is more, but not exclusively, focused on the area of Central, Eastern and South-Eastern Europe (CESEE). And here, citizens from Croatia might become frustrated, as it is not given as an example of a country processing structural reforms. The country is mentioned only once, on page 186, in the context of prime ministerial corruption. This is something that

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readers from Croatia have to face when looking at their country's international position and its possibilities of achieving growth that is more inclusive.

The first part of the book also includes an interesting EBRD prospective by its chief economist Sergei Guriev on the pre-crisis and post-crisis slowdown in the process of convergence in CESEE countries. He provocatively suggests that these transition countries are stacked in the so-called middle-income trap, without incentives for building institutions able to promote innovation-based growth. In addition, he wonders how much the lack of demand for reforms is due to loss of confidence in previous reforms, as research proves that inequality due to unfairness causes major obstacles in the way of further reforms. Therefore, the EBRD advocates the redesign of dimensions along with its new transition concept for a sustainable market economy. The focus should be on six qualities, meaning an economy has to be: competitive, well-governed, green, inclusive, resilient and integrated. Politicians may not be aware of these combination goals when raising the topic of the importance of growth at election time because this concept integrates left and right wing orientations. In addition to the topic of economic convergence, Georg Fischer from the Vienna Institute for International Economic Studies requests a stronger social dimension for the influence of the EU on the member states, especially when they are not in a situation to do it alone. He argues for social convergence in parallel with other efforts that are aimed at accelerating economic recovery and convergence in balancing between economic and social objectives. On the other hand, Sonja Puntscher Riekmann from the Salzburg Centre of European Union Studies questions the future of "building a deeper and more genuine EMU" as an engine of growth after the time of crisis, and the role of European Commission based on its so-called 2017 Reflection Paper. She agrees that the EU needs supranational organs, but wonders whether international treaties will be enough or whether the EU needs stronger constitutional settings.

The second part is dedicated to technological change and innovation as opportunities for growth across countries. Helena Schweiger from the EBRD proves that for CESEE, after the global financial crisis, only innovation in the private sector is a potential real contributor to productivity. However, there are many prerequisites for innovation-based growth. From the quality of institutions, macroeconomic stability, labour and financial markets to all the prerequisites that affect firms' abilities to innovate and create. The largest gap between CESEE countries and the advanced economies is in the capacity to create and use knowledge. There is no one-size-fits-all recommendation because in the bottom line innovation-driven growth needs formal and informal institutional changes. An outside view of Europe, through the lens of globalization, is given by Daria Taglioni from World Bank who sees the advantage of the EU single market in the creation of powerful digital ecosystems. Digital platforms need regulation and deeper integration with the rules of the EU. This vision is possible if national policies do not push firms away from global technological frontiers. The chapter about non-tariff measures by Mahdi Ghodsi, Julia Gruebler, Oliver Reiter and Robert Stehrer, from the

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Vienna Institute for International Economic Studies is a research article and thus quite different from the other chapters. They have proved that non-tariff measures are strongly responsible for trade restriction.

The third part is focused on the distributional effects of reforms. Orsetta Causa, from OECD, investigates the distributional implications of pro-growth policies such as the increase in government expenses on education or reduction in regulation. An especially interesting part is how reforms in each country have an impact on household income that spreads across the income distribution. The results show generalizations of structural reforms' impacts on economic growth and changes in inequality are not applicable to all countries. "The winner takes it all" model is possible only if the measures are sensitively designed and tailored in synergy for more inclusive growth. In this part, editors have also decided to include a typical journal article by Paul Ramskogler from the Austrian National Bank, about the labour market changes, unemployment, and wage growth. He argues that the contemporary labour market changes toward an increase in temporary contracts had a significant impact on the wage growth especially visible after the crisis. Research results are put in the context of the economic theory and the Phillips curve.

The third part of the book includes country cases dealing with past and current reform strategies in Slovakia, Hungary, Czech Republic and Poland. Authors from Slovakia, Hungary, and the Czech Republic are the central banks' governors whose reports are more (Hungary and Czech) or much less (Slovakia) subjective. Their reports are very similar to reports they are habitually give to the European Commission or European Central Bank through the lens of their own institutional positions. The chapters have an uneven structure and miss strong messages or recommendations for which the editors and reviewers are responsible. In the same part, a contribution by Pawel Strzelecki from the National Bank of Poland differs in the sense that he gives a very profound overview of one specific structural reform, of the pension system in Poland. He raises some interesting research questions but ultimately in all of them the core issue of any structural reform is "permanent short-run temptations to abandon the commitment to optimal long-term enhancements". Almost all CESEE countries are facing the same problem, which makes a reading of this chapter extremely educational and useful. His main finding is that reforms' sustainability depend on business cycles, political calendars, good advertising and a wide range of social commitments. An essential but not the only condition for the sustainability of pension reforms is a political consensus achieved in a democratic process. He identifies that pressure for reform of the pension system does not depend only on budget constraints but also on pro-cyclical fluctuations in the expected long-run economic outlook.

The third part ends with an overview of the political models to transition by Alina Mungiu-Pippidi from the Hertie School of Governance in Berlin who describes paths taken by transition from its historical first steps at the beginning of the 1990s. She argues that the main policies in the time of post-communism differed

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in the different countries and it is not possible to compare them with the same yardstick. The source of difference is not just a matter of types or sequences of reforms, but "simply in the objectivity and impartiality of those who were directing reforms". Therefore, she is inclined to support national politics in the building of democracy democracies along with Europeanization within the EU framework that "favours only certain tendencies".

The final, fifth part challenges readers by questioning if we need to reform the EU or EU countries. Laszlo Csaba from the Central European University in Budapest argues that it is difficult to find relevant arguments against the euro, especially for a small open economy, even with the rise of political Euroscepticism in the EU. He thinks that the eurozone framework is not a barrier to national adjustment in individual EU countries and that financial vulnerability is higher for those that remain outside of the eurozone. In contrast, Hubert Gabrisch from the Wiesbaden Institute for Law and Economics thinks that the EU framework needs to be reformed or improved by implementing an EU-specific central fiscal risk-sharing capacity as an overlay on the existing system. In addition, he proposes an EU stabilization fund for investment or an European unemployment insurance system. In the last chapter, Lucio Vinhas de Souza, Oliver Dreute, Vladimir Isalia and Jan-Martin Frie from the European Political Strategy Centre of the European Commission present evidence-based opinions in a simple and clear textbook style. Their conclusion is that nominal convergence can bring a country to the euro area, but then later everything depends on the country's ability to produce and implement sound policies for sustainable economic development. In addition, the member states' capacity for building institutions and competitiveness is mainly responsible for achieving real convergence. In that process, countries are financially constrained in the implementation of all the necessary policies and the Structural Reform Support Programme is usually insufficient. They advocate transferring new financial lines under the European Structural Investment Fund. This will be helpful for fostering the process of economic convergence in the EU, and for the resilience of the EMU.

This book contains such a variety of topics that everybody can find something of interest. However, the same level of research quality should not be expected in all chapters. It seems that this was not in fact the intention. Most important is the collection of differing opinions about, experiences of, and solutions for structural reforms aiming at future growth possibilities for individual countries within the EU cohesion framework. It seems that there is a united standpoint that the "best practices fits all" model should be discarded in favour of "country tailored" recommendations. However, different standpoints remain about the proper balance between EU framework reforms and national, country-level reforms.

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