Fiscal decentralization and public spending: Evidence from heteroscedasticity-based identification

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Abstract

We analyse the instantaneous relation between public spending and expenditure decentralization by means of a novel identification scheme suggested in Lewbel (2012). Our cointegration, error-correction approach indicates that expenditure decentralization impacts negatively on total public spending and most of its subcategories.

JEL classification: H41, H50, H72, H77.

Key words: Fiscal decentralization, Public spending, Government ideology, Endogeneity, Heteroscedasticity-based identification.

Highlights:

- We address endogeneity among public spending and expenditure decentralization.
- We employ error-correction models and a new approach proposed by Lewbel (2012).
- We find that expenditure decentralization mutes the growth of total public spending.

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1 Introduction

While establishing modern welfare states has been seen as positive for economic development, many economists have started to ask whether, nowadays, the public sector in many developed economies is not oversized. Accordingly, recent tendencies of expenditure decentralization are seen critically, as it is commonly expected that decentralization contributes to an increase of public spending (e.g., Rodden, 2003).

Economic theory currently agrees that some government functions are better centrally provided, e.g., because of economies of scale, while decentralizing others might better match the citizens' preferences (Tiebout, 1956; Oates, 2005). For most functions, however, the appropriateness of centralized versus decentralized provision depends on the tradeoffs between economies of scale or coordination advantages, and information or accountability disadvantages of central provision (Oates, 1985; Seabright, 1996). Against this background, the effects of increasingly decentralized service provision on public expenditure are, lastly, a matter of empirical analysis. Apart from measurement issues, intrinsic endogeneity linking decentralization and public expenditure complicates the assessment of causal effects which has not yet been convincingly resolved (Martinez-Vazquez et al., 2015).

We employ a new approach proposed by Lewbel (2012) to handle the endogeneity problem, and analyze the influence of expenditure decentralization on total public spending and six of its main subcategories. Furthermore, we address the endogeneity of government ideology which is often seen as an important determinant of public expenditure and decentralization (Baskaran, 2011). Finally, taking account of the non-stationarity of our data, we use error-correction models (ECMs) to distinguish between long-run and short-run determinants of public expenditure.

2 Data and empirical model

2.1 Data and variables

The data set comprises annual data from 1995 to 2013 for 23 OECD economies.[1] Our dependent variable is public expenditure on spending category c, $pe^{(c)}$, measured as per capita expenditure in logarithms of quotes in US dollar and US purchasing power parity implied prices with 2010 as the base year. As spending categories we distinguish: general public services ($c = 1$), public order and safety ($c = 2$), economic affairs ($c = 3$), health ($c = 4$), education ($c = 5$), social protection ($c = 6$).[2] We also consider 'non-social' spending ($c = \textit{non-social}$) which comprises the first three categories, and 'social' spending ($c = \textit{social}$) which includes the last three categories. Finally, total public expenditure is $pe^{(total)} = pe^{(non-social)} + pe^{(social)}$.

Public expenditure is explained by the following economic explanatory variables: a decentralization index for each spending category ($dec^{(c)}$) indicating the share of subna-

[1] Details on measurement, data sources, descriptive statistics and panel unit root diagnostics are in the supplementary material to this note.

[2] Because spending is completely centralized or relatively low we do not consider the categories: defence; environment protection; housing and community amenities; recreation, culture and religion.

tional spending (local and state), per capita gross domestic product in logarithms (*gdp*), population ageing ratios (*p*15, *p*65), the unemployment rate (*ue*), and, as shares of GDP, the volume of trade (*trade*), the current account balance (*nx*), general government surplus (*surp*), and general government debt (*debt*).

As political explanatory variables we use government ideology (*ideo*) as the unweighted mean of the ideological position of parties in government on a -5 (rightist) to 5 (leftist) scale, a dummy variable for election years (*elec*), an indicator for the polarization of the party system (*pola*) as proposed by Esteban and Ray (1994), and the number of coalition partners in government (*ncp*).

2.2 Empirical model

Having stochastically trending variables we model dynamics of public expenditure in category c, country i and year t denoted $pe_{it}^{(c)}$, $c \in \{1, \ldots, 6, \textit{non-social}, \textit{social}, \textit{total}\}$ in two steps (for a similar approach see, e.g., Gemmell et al. 2013; Herwartz and Theilen, 2014). First, we employ a fixed effect model to extract deviations from the long-run 'fundamental' level, i.e.,

$$pe_{it}^{(c)} = \mu_i + \delta_t + \boldsymbol{\beta}'\mathbf{s}_{it} + ec_{it}^{(c)}, \tag{1}$$

where μ_i and δ_t indicate country and time effects, respectively, and $\boldsymbol{\beta}'\mathbf{s}_{it}$ is a scalar index obtained from the stochastically trending variables in $\mathbf{s}_{it}$.

Adopting an ECM framework, adjustments of $pe_{it}^{(c)}$ are conditionally quantified as

$$\begin{aligned} \Delta pe_{it}^{(c)} &= m_i + d_t + \gamma_1 \Delta dec_{it}^{(c)} + \gamma_2 ideo_{it} \\ &\quad + \alpha_{total} ec_{i,t-1}^{(total)} + \alpha_c ec_{i,t-1}^{(c)} I(c \neq \textit{total}) + \boldsymbol{\rho}'\mathbf{w}_{i,t-1} + \boldsymbol{\phi}'\mathbf{z}_{it} + e_{it}, \end{aligned} \tag{2}$$

where Δ is the first difference operator, e.g., $\Delta pe_{it}^{(c)} = pe_{it}^{(c)} - pe_{it-1}^{(c)}$, and $I(\cdot)$ is an indicator function. In addition to unrestricted individual (m_i) and restricted time effects (d_t), the right-hand side variables in (2) comprise: (i) current government ideology ($ideo_{it}$) and adjustments of decentralization in spending category c ($\Delta dec_{it}^{(c)}$) which are both considered as jointly determined with $\Delta pe_{it}^{(c)}$; (ii) lagged macroeconomic and fiscal indicators including $\Delta pe_{i,t-1}^{(c)}$ (denoted $\mathbf{w}_{i,t-1}$); (iii) contemporaneous political covariates ($\mathbf{z}_{it}$); and (iv) EC dynamics responding to both lagged deviations between total public spending and its fundamental counterpart ($ec_{i,t-1}^{(total)}$), and respective deviations at the sectoral level ($ec_{i,t-1}^{(c)}$, $c \neq \textit{total}$). The augmentation of common ECMs with $ec_{i,t-1}^{(total)}$ allows sectoral spending to respect global public over- or underspending.

As indicated by LM diagnostics (Kleibergen and Paap 2006) standard panel instrumental variable (IV) estimators applied to the ECM in (2) suffer from underidentification. In contrast, presuming specific patterns of heteroskedasticity as suggested in Lewbel (2012) obtains model specifications for within transformed data which pass both tests on instrument validity and diagnostics against underidentification. Heteroskedasticy-based identification, e.g., applies for unobserved factor models. In our case, error terms e_{it} might share common unobserved factors with residuals inherent in conditioning schemes for $ideo_{it}$ or $dec_{it}^{(c)}$. Let $\mathbf{x}_{it} = (\mathbf{w}_{it}', \mathbf{z}_{it}')'$, and denote idiosyncratic innovations to $ideo_{it}$ and $dec_{it}^{(c)}$ as u_{it} and v_{it}, respectively. The structural model parameters in (2) are identified if exogenous or predetermined variables $\mathbf{x}_{it}$ are available, such that $\text{Cov}[\mathbf{x}_{it}, e_{it}^2] \neq 0, \text{Cov}[\mathbf{x}_{it}, u_{it}^2] \neq 0, \text{Cov}[\mathbf{x}_{it}, v_{it}^2] \neq 0$, and $\text{Cov}[\mathbf{x}_{it}, e_{it}u_{it}] = \text{Cov}[\mathbf{x}_{it}, e_{it}v_{it}] = \text{Cov}[\mathbf{x}_{it}, u_{it}v_{it}] = 0$. In summary, these assumptions allow to use generated instruments $(\mathbf{x}_{it} - E[\mathbf{x}_i])u_{it}$ and $(\mathbf{x}_{it} - E[\mathbf{x}_i])v_{it}$ as (additional) instruments to evaluate the ECM in (2) by means of efficient GMM estimation (see Lewbel (2012) for a detailed discussion of identification via heteroskedasticity). We use the STATA module 'ivreg2h ' (with options 'gmm2s' and 'robust') for IV estimation (Baum et al. 2012). Apart from the generated instruments, the endogenous right-hand side variables are further instrumented with $\Delta dec_{i,t-1}^{(c)}$ and $\Delta ideo_{i,t-1}$.

3 Results and conclusions

Estimating the long-run parameters from short time series obtains heterogeneous results for total public expenditure and its subcategories. Panel DOLS estimators (Saikkonen 1991) of the long-run relation describing $\widehat{pe}_{it}^{(total)}$ suggest that expenditure decentralization does not contribute fundamentally to the total public expenditure level, i.e.,

$$\begin{aligned}\widehat{pe}_{it}^{(total)} &= \hat{\mu}_i + \hat{\delta}_t - \underset{(-0.50)}{0.082}\, dec_{it}^{(total)} + \underset{(12.83)}{0.831}\, gdp_{it} - \underset{(-3.36)}{0.007}\, ue_{it} + \underset{(2.07)}{1.491}\; p15_{it} \\ &\quad + \underset{(5.15)}{3.097}\; p65_{it} + \underset{(4.11)}{0.153}\, debt_{it} + \underset{(5.40)}{0.699}\, nx_{it} - \underset{(-1.46)}{0.044}\, trade_{it}, \end{aligned} \tag{3}$$

with t-ratios in parentheses. Similarly weak effects of $dec_{it}^{(c)}$ on $pe_{it}^{(c)}$ are also found for spending categories and omitted for space considerations.

As displayed in Table 1, (category specific) public expenditure growth responds throughout significantly negative to lagged deviations from the equilibrium level, thereby supporting the cointegration assumption that underlies the ECM. Comparing fixed effect (FE) and IV estimation of public expenditure growth obtains that IV estimates of potentially endogenous effects are either not covered by 95% confidence regions constructed in the FE model (*ideo*) or close to the lower interval bound ($dec^{(c)}$). Therefore, the evaluation of the influence of decentralization and government ideology on public expenditure deserves robust IV methods.[3]

Robust estimates describing the effects of decentralization on public expenditure (categories) are mostly significantly negative with exceptions observed for the categories social spending and health (insignificant), and education (significantly positive). Hence, except for the education category, our results are at odds with the view that decentralization enhances public spending.

Similar to recent literature, the model does not unravel an impact of government ideology on total public spending during the last two decades (Herwartz and Theilen, 2014). Distinguishing main categories, however, it turns out that with 5% (10%) significance left-wing (right-wing) governments put more weight on social (non-social) expenditure

[3]Documented estimates are the result of general to specific modelling. Subsequently, variables with least significance were removed until all $t-$ratios become larger than one in absolute value such that, at conventional levels, joint insignificance of imposed restrictions is likely. Core explanatory variables, i.e. $\Delta dec_{it}^{(c)}, ideo_{it}, \Delta pe_{i,t-1}^{(c)}, ec_{i,t-1}^{(total)}, ec_{i,t-1}^{(c)} I(c \neq total)$, have not been subjected to variable selection.

growth in comparison with their right-wing (left-wing) counterparts, a result, that is in line with economic theory (Cameron, 1978; Alesina, 1987).

Lagged macroeconomic indicators show plausible effects on growth of total public expenditures, e.g., GDP growth, budget surplus and positive changes of public debt impact positively on future public expenditure growth. Regarding political indicators we find that growth rates of public spending are higher in election years and in more polarized political systems. Since total public expenditures comprise heterogeneous categories, as expected, the marginal effects of both groups of indicators lack homogeneity across categories.

To conclude, instead of spurring the growth of public spending, recent tendencies of expenditure decentralization in developed economies, rather, have turned out to mute expenditure growth.

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	tot.	*tot.*	*n-soc.*	*soc.*	$c = 1$	$c = 2$	$c = 3$	$c = 4$	$c = 5$	$c = 6$
$\Delta dec_{it}^{(c)}$	$-.909^{**}$	$-.721^{**}$	-1.55^{**}	$-.130$	$-.746^{**}$	$-.228^{**}$	-2.13^{**}	$.024$	$.552^{**}$	$-.480^{**}$
	(-8.70)	(-3.73)	(-5.52)	(-1.59)	(-2.37)	(-3.21)	(-10.6)	(0.87)	(3.46)	(-3.12)
$ideo_{it}$	$-.003^{**}$	$-.001$	$.004^{*}$	$-.004^{**}$	$-.005$	$.004$	$.016^{**}$	$-.002$	$-.002$	$-.012^{**}$
	(-3.18)	(-0.60)	(1.69)	(-1.98)	(-1.20)	(1.30)	(2.56)	(-0.68)	(-0.76)	(-2.67)
$ec_{i,t-1}^{(total)}$	$-.421^{**}$	$-.352^{**}$	$-.042$	$.045$	$-.192^{*}$	$-.004$	$.159$	$-.016$	$-.062$	$.088^{*}$
	(-4.49)	(-6.56)	(-0.83)	(1.11)	(-1.88)	(-0.05)	(1.10)	(-0.25)	(-1.18)	(1.75)
$ec_{i,t-1}^{(c)}$	-	-	$-.318^{**}$	$-.402^{**}$	$-.334^{**}$	$-.337^{**}$	$-.302^{**}$	$-.252^{**}$	$-.350^{**}$	$-.215^{**}$
			(-6.65)	(-5.74)	(-6.11)	(-5.40)	(-5.90)	(-5.75)	(-7.69)	(-4.38)
$\Delta pe_{i,t-1}^{(c)}$	$.101^{**}$	$.117^{**}$	$-.033$	$-.088^{**}$	$-.017$	$.020$	$-.053^{*}$	$-.129^{**}$	$-.052$	$-.091$
	(2.40)	(2.69)	(-0.66)	(-2.09)	(-0.32)	(0.34)	(-1.72)	(-1.99)	(-0.98)	(-1.33)
$\Delta gdp_{i,t-1}$	-	$.230^{**}$	$.223^{**}$	-	-	$.576^{**}$	$.397^{**}$	$.178^{*}$	$.172^{*}$	$-.224^{**}$
		(3.91)	(2.62)			(3.69)	(2.13)	(1.68)	(1.73)	(-2.58)
$\Delta ue_{i,t-1}$	-	-	-	-	-	$.008^{**}$	-	$-.004^{*}$	-	$.004$
						(2.23)		(-1.69)		(1.51)
$\Delta p15_{i,t-1}$	-1.78^{*}	-1.72	-	-	6.81^{**}	-	-	-3.06^{**}	-1.53	-
	(-1.88)	(-1.48)			(2.80)			(-2.10)	(-1.13)	
$\Delta p65_{i,t-1}$	-4.21^{*}	-2.18	-	-1.15	2.70	-	4.90	-	-2.20	-
	(-1.67)	(-1.50)		(-1.12)	(1.03)		(1.46)		(-1.34)	
$\Delta nx_{i,t-1}$	-	-	$.128$	$-.159^{*}$	-	-	$.440^{**}$	-	-	$-.242^{**}$
			(1.24)	(-1.90)			(1.98)			(-2.43)
$\Delta trade_{i,t-1}$	-	-	$-.065^{**}$	-	-	$-.076^{*}$	$-.089$	-	$-.038$	-
			(-2.59)			(-1.80)	(-1.58)		(-1.10)	
$\Delta deb_{i,t-1}$	$.065$	$.073^{**}$	-	-	$-.156^{**}$	-	-	$-.072$	$-.045$	-
	(1.10)	(2.21)			(-2.20)			(-1.50)	(-1.10)	
$surp_{i,t-1}$	$.004^{**}$	$.004^{**}$	$.002^{**}$	-	$-.006^{**}$	-	$.007^{**}$	$-.002^{**}$	$-.002^{*}$	-
	(4.75)	(3.41)	(2.16)		(-4.18)		(3.46)	(-2.04)	(-1.73)	
$pola_{it}$	$.045^{*}$	$.038^{*}$	$-.006$	$.017$	$-.056$	$.043$	$.035$	$.041^{*}$	$-.042$	$.021$
	(1.96)	(1.78)	(-0.25)	(1.12)	(-1.32)	(1.28)	(0.63)	(1.76)	(-1.61)	(0.97)
$elec_{it}$	$.014^{**}$	$.019^{**}$	$.001$	$.004$	$-.009$	$-.000$	$.013$	$.016^{**}$	$.004$	$-.005$
	(2.18)	(3.78)	(0.24)	(1.04)	(-0.90)	(-0.03)	(0.96)	(2.14)	(0.66)	(-0.73)
ncp_{it}	$.002$	$-.001$	$.002$	$-.000$	$.002$	$.003$	$-.002$	$.003$	$.004^{*}$	$.003$
	(0.57)	(-0.89)	(1.12)	(-0.10)	(0.42)	(0.89)	(-0.50)	(1.06)	(1.75)	(1.44)
$cons^{(\dagger)}$	$.004^{(\pm)}$	$-.001^{(\pm)}$	$-.001$	$-.002$	$-.001$	$.008^{(-)}$	$.007^{(-)}$	$.002^{(-)}$	$.008^{(-)}$	$-.004^{(+)}$
	(0.25)	(-0.94)	(-0.30)	(-1.60)	(-0.40)	(2.35)	(1.75)	(0.69)	(3.60)	(-2.00)
KP test		52.6	55.7	53.3	32.3	45.1	55.7	48.9	49.6	21.8
		(.001)	(.000)	(.000)	(.054)	(.002)	(.000)	(.003)	(.005)	(.293)
Hansen J		17.9	17.7	20.1	17.1	19.7	17.1	25.6	27.6	16.7
		(.806)	(.605)	(.218)	(.649)	(.476)	(.843)	(.375)	(.378)	(.541)
d		24	20	16	20	20	24	24	26	18

Table 1: Estimation results from fixed effect (FE, 2nd column) and GMM-IV estimation (columns 3-9) for growth of public expenditures and its components. Robust $t-$ratios in parentheses. Significance at 5% and 10% is indicated with '**' and '*', respectively. The number of observations is 368. Diagnostics include the LM statistic of Kleibergen and Paap (2006) testing underidentification, and the J-statistic from Hansen (1982) testing orthogonality of d overidentifying instruments. Degrees of freedom for the KP test are $d + 1$. '*cons*' provides intercept estimates, the † indicates if the model includes restricted time dummy variables with positive or negative sign for selected periods. Period selection relies on significant time effects in FE models.

Supplementary material

Additional information on data

The data set comprises annual data from 1995 to 2013 for 23 OECD economies: Austria (AUT), Belgium (BEL), Czech Republic (CZR), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (GER), Hungary (HUN), Ireland (IRL), Italy (ITA), Japan (JPN), Latvia (LAT), Luxembourg (LUX), the Netherlands (NLD), Norway (NOR), Portugal (PRT), Slovak Republic (SLR), Slovenia (SLO), Spain (ESP), Sweden (SWE), the United Kingdom (UK), and the United States (US).[4]

The election variable is determined as in Franzese (2000) as

$$elec = \frac{(M-1) + d/D}{12}, \tag{4}$$

where M is the month and d is the day of election, and D is the number of days in the month of election. In years without elections $ELEC = 0$. Following Esteban and Ray (1994), the polarization of the party system is measured as

$$pola = \sum_{j=1}^{J} \sum_{l=1}^{J} v_j^2 v_l |ideo_j - ideo_l|, \tag{5}$$

where J is the number of parties, and v_j and v_l are the shares of seats in parliament of parties j and l, respectively. Table 2 provides an overview of variable definitions, measurement, and data sources.

[4]The country and sample period selection are due to data availability. Data on subnational levels and subcategories of public expenditure in OECD (2016a) is available for the period 1995-2013. Due to missing values for JAP (1995-2004), NOR (1995-2001), SLO (1995-1998), and the UK (1995-1996) the panel is unbalanced.

Variable	Definition	Measurement	Source
$pe^{(c)}$	Public expenditure on spending category c	Per capita in US dollar and US purchasing power parity in natural logarithms	OECD (2016a)
$dec^{(c)}$	Decentralization indicator for spending category c	Share of subnational public expenditure on categry c over total expenditure.	Own calculations with data from OECD (2016a)
gdp	Gross Domestic Product	Per capita in US dollar and US purchasing power parity in natural logarithms	OECD (2015)
ue	Unemployment rate	Share of unemployed over total labor force	OECD (2015)
$p15$	Young population rate	Ratio of young (< 15) over total population	OECD (2015)
$p65$	Elderly population rate	Ratio of elderly (> 65) over total population	OECD (2015)
nx	Current account balance (net exports)	Percentage of GDP	World Bank (2016)
$trade$	Sum of exports and imports	Percentage of GDP	World Bank (2016)
$surp$	General government surplus (net lending)	Percentage of GDP	OECD (2016b)
$debt$	General government debt (gross financial liabilities)	Percentage of GDP	OECD (2016b)
$ec^{(c)}$	Error correction term (Equilibrium error)	Residual from FE regression with time effects of $pe^{(c)}$ on $\mathbf{s} = (dec^{(c)}, gdp, ue, p15, p65, nx, trade, deb)'$ in (1)	Own calculations
$ideo$	Unweighted mean ideology position of the coalition in government	Between -5 (extreme left) and 5 (extreme right positions)	Döring and Manow (2016)
$elec$	Election date	Date of election (see Eq. (4)), zero in years without elections	Own calculations
$pola$	Party polarization index	See Eq. (5)	Own calculations based on Döring and Manow (2016)
ncp	Number of coalition partners	Integer number	Döring and Manow (2016)

Table 2: Data definitions and sources.

	mean	sd	min	max	mean	sd	min	max	mean	sd	min	max	mean	sd	min	max
	$pe^{(total)}$				$\Delta pe^{(total)}$				$dec^{(total)}$				$\Delta dec^{(total)}$			
ov	9.58	.452	7.94	10.5	.018	.048	-.360	.341	.262	.107	.047	.507	.001	.014	-.137	.072
be		.431	8.54	10.3		.014	-.001	.055		.104	.110	.462		.003	-.008	.006
wi		.150	8.98	10.2		.047	-.369	.332		.026	.141	.362		.013	-.129	.071
	$pe^{(non\text{-}social)}$				$\Delta pe^{(non\text{-}social)}$				$dec^{(non\text{-}social)}$				$\Delta dec^{(non\text{-}social)}$			
ov	8.79	.131	8.53	9.20	-.008	.052	-.346	.459	.276	.105	.048	.645	.002	.021	-.100	.148
be		.116	8.61	8.98		.008	-.022	.018		.104	.132	.568		.004	-.003	.011
wi		.065	8.64	9.20		.052	-.345	.460		.030	.101	.353		.021	-.103	.139
	$pe^{(social)}$				$\Delta pe^{(social)}$				$dec^{(social)}$				$\Delta dec^{(social)}$			
ov	9.35	.080	9.02	9.48	.005	.037	-.348	.286	.254	.134	.045	.615	-.000	.017	-.203	.071
be		.069	9.23	9.45		.006	-.012	.018		.130	.060	.566		.004	-.011	.006
wi		.044	9.04	9.46		.036	-.348	.286		.036	.119	.381		.016	-.192	.069
	$ideo$				$elec$				ncp				$pola$			
ov	5.48	1.55	2.60	8.30	.124	.261	0	.972	2.66	1.50	1.00	9.00	.467	.192	.212	1.21
be		.703	4.54	7.03		.055	.047	.227		1.20	1.00	5.11		.185	.238	1.12
wi		1.39	2.55	9.24		.255	-.103	1.01		.930	.343	7.34		.063	.155	.664
	GDP (in 1000)				Δgdp				ue				Δue			
ov	34.8	13.8	7.89	90.0	.019	.033	-.157	.125	7.93	3.98	1.80	26.3	.026	1.33	-4.40	9.70
be		13.5	14.7	76.6		.013	.001	.053		3.28	3.65	16.3		.168	-.394	.539
wi		4.01	16.1	48.2		.031	-.185	.097		2.35	.009	17.9		1.31	-4.31	9.73
	nx				Δnx				$trade$				$\Delta trade$			
ov	.021	.085	-.209	.352	.001	.023	-.090	.207	.975	.575	.167	3.57	.022	.076	-.454	.287
be		.081	-.073	.282		.003	-.005	.006		.559	.254	2.84		.021	-.001	.096
wi		.030	-.122	.170		.023	-.089	.209		.174	-.010	1.71		.074	-.527	.278
	$p15$				$\Delta p15$				$p65$				$\Delta p65$			
ov	.171	.022	.130	.243	-.002	.002	-.007	.003	.158	.024	.105	.250	.002	.002	-.002	.008
be		.019	.142	.213		.001	-.004	-.000		.021	.109	.194		.001	-.000	.006
wi		.011	.142	.219		.002	-.007	.004		.012	.107	.213		.001	-.000	.007
	deb				Δdeb				$surp$							
ov	.648	.376	.067	2.21	.015	.059	-.146	.305	-2.19	4.80	-32.3	18.7				
be		.344	.099	1.57		.021	-.019	.074		3.63	-6.25	11.0				
wi		.167	-.040	1.38		.056	-.130	.278		3.23	-31.1	6.05				

Table 3: Descriptive statistics (mean, standard deviation (sd), minimum (min) and maximum (max)) for three data dimensions, i.e., 'ov' (overall) 'be' (between) and 'wi' (within).

Var	LLC	BD	HS	Var	LLC	BD	HS
$pe^{(total)}$	0.447 (.673)	0.200 (.579)	0.127 (.551)	$\Delta pe^{(total)}$	−6.117 (.000)	−2.739 (.003)	−1.463 (.072)
$pe^{(non-social)}$	−4.218 (.000)	−1.625 (.052)	−0.877 (.190)	$\Delta pe^{(non-social)}$	−7.941 (.000)	3.316 (.000)	1.504 (.066)
$pe^{(social)}$	−5.322 (.000)	−1.939 (.026)	−0.894 (.186)	$\Delta pe^{(social)}$	−8.467 (.000)	3.244 (.001)	1.448 (.074)
$dec^{(total)}$	1.331 (.908)	0.629 (.735)	0.756 (.775)	$\Delta dec^{(total)}$	−5.766 (.000)	2.802 (.003)	−1.922 (.027)
$dec^{(non-social)}$	−1.616 (.053)	−0.894 (.186)	−0.673 (.251)	$\Delta dec^{(non-social)}$	−7.009 (.000)	3.836 (.000)	2.148 (.016)
$dec^{(social)}$	−0.139 (.445)	−0.064 (.474)	−0.129 (.449)	$\Delta dec^{(social)}$	−7.831 (.000)	3.644 (.000)	−2.306 (.011)
gdp	2.247 (.988)	0.600 (.726)	0.709 (.761)	Δgdp	−4.210 (.000)	1.425 (.077)	0.856 (.196)
ue	−0.634 (.263)	−0.193 (.424)	−0.400 (.345)	Δue	−5.821 (.000)	2.365 (.009)	1.374 (.085)
$p15$	1.715 (.957)	0.777 (.781)	0.866 (.807)	$\Delta p15$	4.374 (1.00)	2.031 (.979)	2.453 (.993)
$p65$	1.751 (.960)	0.873 (.809)	0.936 (.825)	$\Delta p65$	4.798 (1.00)	2.579 (.995)	2.074 (.981)
nx	−0.549 (.292)	−0.181 (.428)	−0.241 (.405)	Δnx	−8.667 (.000)	3.525 (.000)	1.589 (.056)
$trade$	−2.688 (.004)	−0.907 (.182)	−0.890 (.187)	$\Delta trade$	−10.92 (.000)	3.637 (.000)	2.179 (.015)
$surp$	−5.098 (.000)	−2.199 (.014)	−1.246 (.106)	$\Delta surp$	−10.64 (.000)	4.226 (.000)	1.804 (.036)
deb	1.130 (.871)	0.417 (.662)	0.692 (.756)	Δdeb	−2.725 (.003)	1.186 (.118)	1.405 (.080)

Table 4: Panel unit root diagnostics (Levin et al. 2002 (LLC), Breitung and Das 2005 (BD), and Herwartz et al. 2016 (HSW)) for level data (left-hand side) and first differences (right-hand side). p-values in parentheses. BD (HSW) is robust against cross sectional correlations (and heteroskedasticity). Test regressions for level variables (except *surp*) allow for linear trends, all tests for first differences and level *surp* include a constant.

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