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# The effects of private social security accounts on economic growth in Eastern Europe

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### Abstract

Eastern European countries have been transitioning out of communism and some have followed the Latin American and European countries' path of changing from a public social security system, toward a system that includes private accounts. They have chosen mixed systems with private as well as government funded parts to also sustain the previous pay-as-you-go system where workers paid for those retired. This research uses panel data and regression analysis for the Eastern European countries to estimate the impact of using some form of private accounts, or the percentage of income paid toward private accounts, on economic growth of GDP per capita. The impact on economic growth is statistically highly significant throughout all regressions with a large positive impact on the percentage of economic growth of GDP per capita from allocating higher percentages of income toward private accounts.

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# 1. Introduction

After 1989, when Eastern European countries started to transition out of communism and into capitalist economic systems, they were looking especially to Western Europe for how to develop their new economic systems. The first Eastern European countries to implement private social security accounts were Hungary and Poland in the late 1990s. These countries were among those Eastern European transition economies trying to change their economic systems rapidly, and they adopted many capitalist practices that were common in Europe and elsewhere. Other countries followed, until eight countries out of 20 Eastern European countries in this sample had adopted private social security accounts to be used in conjunction with their public social security systems that were in budgetary crises.

Many countries, both capitalist and communist, developed and developing, decided in the early 20<sup>th</sup> century to institute a social security system where workers pay a certain percentage of their income to the government and then can collect social security when they retire. However, when instituted, the then retired workers would not have been able to collect social security, unless the government would have utilized a pay-as-you-go system, where current workers' social security taxes finance the retirement of current retirees. Families had many children then, so this system would not pose a problem, as the amount of workers paying into the system would keep increasing compared to current retirees. Two developments fundamentally changed the preconditions that had prevailed when the pay-as-you-go systems were instituted. During and after World War II, a large baby-boom generation was born that eventually also would retire. In the mean time, families have had fewer children partially because they no longer need to depend on children financially in old age (PRB 2009). Thus, this has led to fewer workers paying into the social security system, until in some Eastern European countries there were less than one worker per retiree in the 1990s!

Many social security systems have become unsustainable. However, it is difficult to change the program, as those retired or near retirement are likely to vote for keeping the public social security program in place. The social security taxes they paid into the system never went into private accounts but into a general government fund and have already been paid out to those retiring earlier. Chile's social security system became unsustainable, and in 1981, they made a full change from public social security to private accounts, even though the set-up of private accounts at the time were made on paper, before the wide-spread use of computers. The Eastern European countries' social security systems were in crises after the transition from communism. Taking away price ceilings and subsidies led to rapid inflation and the rising prices were especially difficult to afford for retirees on fixed incomes. Privatizing, downsizing and closing of former state-owned factories and stores led to rising unemployment rates of 20-30 percent and increased the number of people who were able to claim disability or take early retirement. This led to fewer workers paying into social security while expanded social security payments made some countries' social security systems reach insolvency quicker. As a result, in the 1990s, the Eastern European countries were in desperate need of social security reform. Some countries had fewer contributors than pensioners, like Albania, Georgia, and Armenia (Müller 2005). Based upon pressure from the population, the governments implemented mixed systems with a new private social security part where pensions would be based upon the size of the contribution, not just the number of years worked. No Eastern European country opted for the more expensive

Chilean-style reform toward private accounts alone (Kritzer 2000/2001). These countries aspired to eventually be accepted as members of the EU, and then would not be able to incur too much more government debt. However, as pointed out by Müller (2005), most Eastern European governments still follow some non-contributory practices of covering those in need, and ultimately governments bare the risks inherent in any system with ineffective government, private or public.

The Swedish model has been considered a role model for social security reform within the EU and Eastern Europe. Latvia and Italy have adopted the system developed by Swedish experts of notional defined contributions (NDC), where each worker has a notional account of their social security contributions. The Swedish reformed system contains partly a public pay-as-you-go social security system, as well as since 1999 a newer part with individual accounts. In Sweden, political parties reached a compromise that a needed social security tax increase of 2.5 percent would consist of private accounts (for a total of 18.5 percent). Thus, this has been considered an add-on as well as a carve-out private social security contribution. The system's introduction was implemented in an incremental fashion (in increments of 16), where workers near retirement would keep getting all their retirement payments from the old pay-as-you-go government system, and young high school or college graduates starting to work would fully pay into the new part of social security going toward private accounts. Someone in the middle would get half of the new private account system, etc. Workers can change the government investment choices in their private accounts.

Completely changing from public pay-as-you-go to only private accounts like Chile's, makes it difficult to pay for current retirees who never paid into private accounts. Due to the higher returns to private accounts, a lower amount of 2.1 percent of payroll can be paid, while still achieving the same outcome as the current 12.4 percent social security tax in the United States (Feldstein and Samwick 1996). Hence, with a small add-on (or a carve-out) tax going into private accounts, e.g. 2.5 percent like in Sweden, one can then keep funding current retirees in the public system, as well as fund a new private social security system. Even keeping a pay-as-you-go system afloat is expected to require a raise in social security taxes, together with raises in the retirement age and decreases in benefits. There is a one-time cost of creating the private accounts. Some articles suggest this is enabled by a one-time deficit (Razin and Sadka 2004), however, many nations already have high debt-to-GDP ratios. Others suggest adding a temporary surcharge of less than 1.5 percent during the early part of the transition period (Feldstein and Samwick 1996). If 2.5 percent is paid out of payroll and if this would eventually prove to have covered the initial set-up costs, then the rest would accrue to the individual to protect against fluctuations in returns, alternatively, costs or needs during retirement years. Based upon estimates by Garrett (2005), more than 95 percent would receive higher benefits with private accounts than with public accounts. Hence, care needs to be taken and possibly measures put in place to protect the remaining five percent, so they will not be worse off than with a fully public system. If the 2.5 percent are added onto current contributions, this would not be the case.

In Eastern Europe, workers can generally choose social security funds as well as change funds, although sometimes with incentives to stay in a fund, or penalties if they leave. The Polish pension funds net rate of return were negative in the first years seemingly because of their low threshold to be a sales manager of a \$25 registration fee and no criminal record, albeit with little training and not being subject to normal business standards (Kritzer 2000/2001).

Little previous literature has focused on the effects of private social security accounts on economic growth like this paper. The impact of countries having introduced private accounts, alternatively the percentage of income paid into private accounts, is estimated in panel regressions for Eastern Europe. This research assesses the influence of privatizing parts of social security on countries' economic growth of real GDP per capita. The rest of the paper is organized as follows. Section 2 provides a literature review of studies on private social security affecting economic growth. In section 3, the econometric model and data are described. The regression results are discussed in section 4. Section 5 concludes.

## 2. Literature Review

Using an endogenous growth model, Holzmann (1997) shows that private pensions raise steady state economic growth. Private pensions are expected to improve economic growth through developing financial markets and making funds available to borrow for capital formation. His econometric estimations for Chile in a time series regression and 41 countries in a cross-section for the 1976-93 time period demonstrates that the financial market developments have improved total factor productivity (TFP), capital formation and growth of Real GDP for Chile. Financial market developments were measured as assets and liabilities, an average of three stock market indicators, and asset mispricing between actual and pricing implied by reference models.

Private social security has in a regression been found to positively effect private investment, average productivity of capital, and TFP growth and then the coefficients of these parameters have in simulations been found to increase economic growth for Chile by 1-2.9 percent (Schmidt-Hebbel 1999). Simulations for the United States (Kotlikoff et al. 1999; Kotlikoff 2000), as well as in a representative economy (Corsetti and Schmidt-Hebbel 1995) yield positive effects on economic growth as well.

Total pension assets as a percent of GDP are estimated to have a positive effect on log output per head among most OECD and select emerging economies (Davis and Hu 2008). The growth of the total amount of pension assets as a share of GDP, and the rate of return of the pension sector, are found to have a highly statistically positive effect on long-term growth of GDP per capita for OECD and non-OECD countries, but for short-term growth only the latter variable shows high statistical significance (Zandberg and Spierdijk 2013). One study finds poor fits and no statistically significant positive effects for the share of carve-out private pensions out of wages on GDP per capita growth in emerging countries of Latin America, Eastern European and Central Asian countries, with a dummy for Eastern Europe (Altiparmakov and Nedeljkovic, 2018).

Increases in economic growth due to countries having private social security accounts could result from the labor force participation expanding as noticed in Latin America 1980-1999 (Packard 2002). The incentive has shifted from informal to formal markets in order to pay into and later thus benefit from the private social security accounts.

The effect of privatizing social security on economic growth could also possibly be attributed to positive effects on savings, which are found for Chile (Schmidt-Hebbel 1999) and the fully public pay-as-you-go-system has been considered to contribute to the low savings in the

U.S. (Meguire 1998; Saunders and Ghosh 2006). However, others have found no evidence of increases in savings from privatization of social security (Holzmann 1997; Samwick 2000).

### 3. Methodology

#### 2.1 Model Specification

The methodology in the empirical regressions used in this paper adheres to the endogenous growth theory that finds the rate of investment in physical and human capital, given technology, to augment economic growth rates (Lucas 1988).

Panel data are used for the Eastern European countries in analyzing any potential influence of implementing private social security accounts on per capita growth rates of Gross Domestic Product (GDP). The panel data are calculated as averages over ten-year periods. The dependent variable is 10-year average real GDP per capita growth rates by decade 1971-2010. The new variables for private social security accounts is either a dummy for each decade in which a country had private accounts implemented ( $D_{PA}$ , created from Kritzer 2005), or alternatively the percentage paid into private social security accounts (PS, from James 2005), calculated as a 10-year average in the same decade as the dependent variable economic growth.

Control variables are included similarly to Barro (1997, 2000) and McMahon (2000). The use of lags compares to McMahon's (2000) dynamic framework, while Barro's (1997, 2000) neoclassical static model examines steady state growth. Entering or dropping control variables incrementally emphasizes their individual influence on the private social security account variables. World Bank data are utilized, except when stated otherwise. The natural logarithm of GDP per capita ( $ly$ ) is lagged by 10 years prior to the growth rate thereof. The natural log of the fertility rate,  $\ln(f)$ , the growth rate of the consumer price index (inflation), political rights (PR, from Freedom House), and as shares of GDP: investment in physical capital ( $I/Y$ ), and openness ( $T/Y$ ,  $T = \text{exports} + \text{imports of goods and services}$ ), enter contemporarily to per capita growth.<sup>1</sup>

Enrollment rates ( $e_i$ ) in primary, secondary and higher education ( $i=1,2,3$ ) are averages lagged by a decade, starting from 1960-1970 to account for the dynamics of the length of time for human capital formation to impact GDP per capita growth. Enrollment rates include public and private enrollment.<sup>2</sup> Investments in education are of higher statistical significance when longer lags are employed, and education variables have influential externalities through indirect effects of other development goals statistically significant to economic growth (Appiah and McMahon 2002; McMahon 2000).

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<sup>1</sup> Real GDP per capita, and its growth rate, are in constant \$U.S. Inflation is based upon the CPI, when available, otherwise the GDP deflator. The data are from the WDI, except Political Rights are from the Freedom House. Political Rights are converted to 0-1 scales, with 1 being the highest attainable ranking, similar to Barro (1997).

<sup>2</sup> UNESCO education data are criticized by, e.g., Behrman and Rosenzweig (1994). Enrollment often measures beginning-of-the-year enrollments, not attendance, and thus overstates especially LDC enrollment rates. McMahon (2003) assesses the overstated enrollment to counteract almost fully the ability bias, which under- and overestimates respectively the effects of schooling on its returns. Thus, UNESCO data should not be severely misleading.

## 2.2 The Econometric Model

The pooled least square (PLS) assumption of a common constant might be too restrictive for the group of 20 Eastern European countries used in this sample, so the existence of fixed effects is tested, which would imply that the unrestricted (fixed effect) model would be more fitting. The hypothesis that the constant terms are equal for all Eastern European countries is tested with an F-test. The test results reject a common intercept for the Eastern European countries. The unrestricted model is a consistent estimator for all regressions and most regressions show the presence of fixed effects. Thus, the unrestricted model, with individual country effects, provides unbiased, consistent and efficient estimators for most regression results. This is also considered the within-groups estimator.

Using the unrestricted model regression equations for the two measures of private social security accounts, the dummy variable, alternatively the percentage contribution from payroll, become:

$$\mathbf{g}_{it} = \mathbf{i}\alpha_i + \beta_1(\mathbf{ly})_{i(t-10)} + \beta_2\mathbf{DPA}_{it} + \mathbf{X} + \varepsilon_i \quad (1)$$

$$\mathbf{g}_{it} = \mathbf{i}\alpha_i + \beta_1(\mathbf{ly})_{i(t-10)} + \beta_2\mathbf{PS}_{it} + \mathbf{X} + \varepsilon_i \quad (2)$$

where  $\mathbf{X} = \beta_3(\mathbf{I/Y})_{it} + \beta_4\mathbf{ln(f)}_{it} + \beta_5\mathbf{e}_{i(t-10)} + \beta_6(\mathbf{T/Y})_{it} + \beta_7\mathbf{PR}_{it} + \beta_8\mathbf{Inflation}_{it}$

The notation  $\mathbf{i}\alpha_i$  is a matrix of individual dummies for each model (the bold font indicating vectors). This provides an individual constant (not reported) for each country in each regression, catching enduring country-specific features otherwise not included in the regressions, e.g., history, culture, social, ethnic and linguistic mixture. These are nonmarket effects that are unaccounted, by including GDP per capita (here changing over time). If country-specific constants capture differences influenced by education, education's direct impact would be lessened. The degrees of freedom are reduced with fixed effects, however, the results are seldom of lesser statistical significance than with a common constant for all Eastern European countries over time.

Utilizing control variables that would affect growth as well as country-specific constants reduce potential problems of omitted variables. Panel data control for time-persistent omitted variables (Temple 1999). Incorporating many countries diminishes self-selection problems. However, in order to include more countries, while some have missing observations for different variables, an unbalanced data set is used where an observation may be missing for a period. To ensure outliers are not driving the results, outliers were checked for using z-scores, and they were not found in this data set used. Using a regional sample of somewhat more similar countries, alleviates Grossman and Helpman's (1994) concern that the results might arise from contrasts between developed and developing countries (Temple 1999). It might resolve any potential nonlinearities in the development process (Krueger and Lindahl 2001).

## 4. Private Social Security Accounts on Per capita Growth

### 3.1 Social Security Accounts on Economic Growth in Eastern Europe

Both variables for private social security accounts are positive and generally highly statistically significant at the 1- or 5-percent level to economic growth of GDP per capita throughout the regressions for these 20 Eastern European countries (Tables 1-4). The coefficient for the percentage contribution to private accounts is large throughout the regressions, so higher

contributions toward private accounts are associated with large gains in real GDP per capita growth rates in Eastern European countries for the time period 1990-2010. The countries were privatizing social security to a larger extent during the later 2000-2010 timer period and were growing more rapidly. A 2.5 percent additional contribution out of payroll income is associated with gains in growth rates of GDP per capita in the range of 4.6 to a 10.5 percentage points when more variables are added as to avoid an omitted variables bias. In the regressions where the variation in explanatory variables explain more, from about 85 and up to 92 percent of the variation in the dependent variable, the range is 7.6 to 9.2 percentage points improvements in the growth rate. In the regression with the highest 92 percent fit of the regression, if an additional 2.5 percent of income is contributed to private social security accounts, a 9.16 percentage point increase in growth rates would be estimated. However, as economies mature, they usually slow their economic growth, so the size of this coefficient would be expected to decrease in the future. Thus, when standard variables explaining economic growth are added (similar to Keller 2006a&b), these regressions for Eastern Europe explain up to 92 percent of the variations in their growth rates of GDP per capita. These regressions exhibit high explanatory powers for cross-country regressions, here also over time in a panel-data model.

TABLE I  
Private Social Security Accounts (dummy vs. % of income paid) on Per Capita Growth in Eastern Europe

Dependent Variable: GDP per capita growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(y)	-0.095 [2.168]**	-0.109 [2.000]*	-0.148 [5.264]***	-0.136 [5.229]***	-0.106 [2.311]**	-0.119 [2.100]*	-0.202 [12.787]***	-0.190 [12.746]***
D(PrivAcct)	0.097 [4.660]***	0.106 [3.382]***	0.201 [3.973]***	0.190 [3.805]***				
PrivAcct%					1.692 [3.453]***	1.811 [2.883]**	3.213 [5.493]***	3.046 [4.859]***
<u>ln(Invest)</u> GDP		-0.084 [0.763]	-0.200 [2.722]**	-0.181 [2.074]*		-0.075 [0.700]	-0.164 [2.675]**	-0.150 [1.979]*
ln(fertility)			-0.200 [1.979]*	-0.172 [1.548]			-0.157 [1.745]	-0.136 [1.318]
enrollment <sub>t</sub>			0.233 [0.900]	0.285 [1.525]			0.042 [0.234]	0.088 [0.617]
<u>Intl. Trade</u> GDP			0.355 [3.098]**	0.318 [3.347]**			0.415 [5.059]***	0.383 [5.692]***
Pol.Rights			-0.500 [6.297]***	-0.438 [3.716]***			-0.454 [6.687]***	-0.404 [3.794]***
Inflation				-0.007 [1.487]				-0.006 [1.302]
R <sup>2</sup> adj.	-0.272	-0.316	0.828	0.827	-0.281	-0.333	0.853	0.847
F-statistics	0.623	0.596	7.26***	6.970**	0.613	0.580	8.56***	7.894***
Obs.	38	38	31	31	38	38	31	31
Countries	20	20	17	17	20	20	17	17

Notes: Each regression is estimated with individual coefficients for each country (not reported). For each variable are stated the estimated coefficient and the absolute value of the t-statistic in brackets. White's heteroskedasticity-consistent covariance matrix is used. Statistical significance is indicated by \*\*\*, \*\* and \* for the 1-, 5- and 10-percent levels respectively.

**TABLE II**  
**Private Social Security Accounts (dummy vs. % of income paid) on Per Capita Growth in Eastern Europe**

Dependent Variable: GDP per capita growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(y)	-0.171 [3.370]**	-0.181 [4.208]***	-0.138 [2.569]**	-0.160 [3.213]**	-0.227 [5.241]***	-0.234 [6.741]***	-0.163 [3.394]***	-0.190 [4.436]***
D(PrivAcct)	0.182 [6.286]***	0.193 [6.528]***	0.114 [2.396]**	0.136 [2.679]**				
PrivAcct%					3.347 [7.465]***	3.450 [9.623]***	1.850 [2.300]*	2.199 [2.496]**
ln(Invest)	-0.192 [2.646]**	-0.201 [2.954]**	-0.185 [2.066]*	-0.211 [2.390]**	-0.154 [2.948]**	-0.158 [3.257]**	-0.182 [2.061]*	-0.206 [2.306]**
ln(fertility)	-0.259 [1.790]	-0.292 [2.127]*	-0.113 [0.892]	-0.166 [1.274]	-0.257 [1.953]*	-0.273 [2.410]**	-0.085 [0.717]	-0.131 [1.102]
enrollment <sub>2</sub>	0.225 [0.552]	0.276 [0.755]			0.322 [0.843]	0.350 [1.056]		
enrollment <sub>3</sub>			0.376 [1.240]	0.477 [1.405]			0.518 1.899*	0.645 [2.194]*
Intl. Trade	0.340 [3.363]**	0.352 [3.589]***	0.250 [2.009]*	0.284 [2.313]**	0.372 [4.553]***	0.379 [4.791]***	0.249 [2.136]*	0.284 [2.507]**
Pol. Rights	-0.506 [5.394]***	-0.552 [9.123]***	-0.333 [2.361]**	-0.436 [3.871]***	-0.499 [6.222]***	-0.522 [10.713]***	-0.315 [2.249]*	-0.414 [3.633]***
Inflation	-0.004 [0.991]**		-0.015 [2.116]*		-0.002 [0.603]		-0.015 [2.004]*	
R <sup>2</sup> adj.	0.831	0.848	0.710	0.620	0.884	0.899	0.726	0.635
F-statistics	7.153**	8.269***	4.306**	3.299**	10.505***	12.555***	4.576**	3.454**
Obs.	31	31	32	32	31	31	32	32
Countries	17	17	16	16	17	17	16	16

Notes: Each regression is estimated with individual coefficients for each country (not reported). For each variable are stated the estimated coefficient and the absolute value of the t-statistic in brackets. White's heteroskedasticity-consistent covariance matrix is used. Statistical significance is indicated by \*\*\*, \*\* and \* for the 1-, 5- and 10-percent levels respectively.



**TABLE III**  
**Private Social Security Accounts (dummy vs. % of income paid) on Per Capita Growth in Eastern Europe**

Dependent Variable: GDP per capita growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(y)	-0.143 [2.857]**	-0.159 [4.353]***	-0.148 [3.211]**	-0.047 [3.717]	-0.191 [6.055]***	-0.205 [7.791]***	-0.190 [6.080]***	-0.106 [1.839]
D(PrivAcct)	0.208 [4.056]**	0.223 [4.341]***	0.181 [2.392]**	0.241 [2.993]**				
PrivAcct%					3.491 [7.439]***	3.664 [8.431]***	3.295 [4.095]***	4.203 [3.755]***
ln(Invest)	-0.210 [3.684]**	-0.215 [4.076]***	-0.239 [2.453]**	-0.358 [2.937]**	-0.210 [4.525]**	-0.214 [4.955]***	-0.235 [2.742]**	-0.347 [3.211]**
ln(fertility)	-0.239 [1.479]	-0.291 [1.903]			-0.190 [1.534]	-0.222 [1.920]		
enrollment <sub>1</sub>	0.469 [1.271]	0.448 [1.236]	0.379 [0.794]	1.334 [1.717]	0.393 [1.310]	0.373 [1.340]	0.378 [1.057]	1.260 [1.812]
enrollment <sub>2</sub>	0.178 [0.568]	0.268 [0.931]	-0.095 [0.351]	-0.424 [1.140]	0.135 [0.135]	0.192 [0.848]	-0.073 [0.359]*	-0.392 [1.200]
enrollment <sub>3</sub>	0.213 [0.474]	0.167 [0.419]	0.370 [1.072]	1.135 [3.552]***	0.425 [1.522]	0.405 [1.602]	0.535 [2.270]*	1.320 [4.633]***
Intl. Trade	0.250 [2.023]	0.272 [2.354]*	0.398 [3.142]**		0.275 [3.539]**	0.292 [3.788]**	0.383 [4.230]***	
Pol. Rights	-0.506 [4.906]***	-0.567 [7.279]***	-0.464 [5.014]***	-0.455 [3.517]	-0.491 [6.576]***	-0.531 [9.172]***	-0.462 [5.982]***	-0.448 [4.025]***
Inflation	-0.005 [0.972]				-0.004 [1.108]			
R <sup>2</sup> adj.	0.795	0.818	0.753	0.378	0.910	0.919	0.872	0.510
F-statistics	5.487*	6.413**	4.847**	1.800	12.697**	14.764***	9.573***	2.371**
Obs.	30	30	30	30	30	30	30	30
Countries	16	16	16	16	16	16	16	16

Notes: Each regression is estimated with individual coefficients for each country (not reported). For each variable are stated the estimated coefficient and the absolute value of the t-statistic in brackets. White's heteroskedasticity-consistent covariance matrix is used. Statistical significance is indicated by \*\*\*, \*\* and \* for the 1-, 5- and 10-percent levels respectively.

TABLE IV  
Private Social Security Accounts (dummy vs. % of income paid) on Per Capita Growth in Eastern Europe

Dependent Variable: GDP per capita growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(y)	-0.111 [1.657]	-0.096 [0.979]	-0.155 [1.716]	-0.136 [1.797]	-0.120 [1.452]	-0.154 [2.177]*	-0.127 [1.296]	-0.169 [2.031]*
D(PrivAcct)	0.196 [3.443]***	0.115 [2.761]**	0.059 [1.703]					
PrivAcct%				4.300 [2.335]**	2.416 [1.867]*	3.633 [8.075]**	2.307 [2.455]**	1.233 [2.413]**
enrollment <sub>1</sub>	1.422 [2.462]**			1.701 [2.286]*	1.286 [1.970]*	1.313 [2.544]**		
enrollment <sub>2</sub>		-0.443 [1.122]		-0.037 [0.105]	-0.356 [0.829]		-0.400 [1.000]	
enrollment <sub>3</sub>			0.488 [1.944]*	0.797 [2.276]*	0.639 [1.886]*			0.517 [2.142]*
Pol. Rights				-0.265 [1.405]				
R <sup>2</sup> adj.	0.089	-0.413	-0.301	0.108	0.130	-0.074	-0.377	-0.243
F-statistics	0.871	0.886	0.602	1.167	0.833	0.891	0.568	0.663
Obs.	31	31	32	30	30	31	31	32
Countries	17	17	16	16	16	17	17	16

Notes: Each regression is estimated with individual coefficients for each country (not reported). For each variable are stated the estimated coefficient and the absolute value of the t-statistic in brackets. White's heteroskedasticity-consistent covariance matrix is used. Statistical significance is indicated by \*\*\*, \*\* and \* for the 1-, 5- and 10-percent levels respectively.

#### 4.2 The Control Variables

As expected, GDP per capita has a negative effect on subsequent per capita growth given the other control variables, indicating conditional convergence. Investment shares of GDP seem inefficiently invested in Eastern Europe when it comes to its influence on economic growth, as apparently several of the Eastern European countries growing faster have had lower shares of their GDP invested in physical capital and a few facing somewhat slower growth have higher investment shares, perhaps to try to improve their economic performance. However, the Eastern European countries have been growing at rapid rates in their transition from communist to capitalist economies, so even those with slower growth have had high growth rates of over 9 percent per year. Fertility rates are insignificant or of low statistical significance in most regressions, except the variable is significant at the 5 percent level in one regression, given enrollment rates in secondary education. According to Keller (2006a), enrollment rates in secondary education statistically significantly reduces fertility rates at the 1-percent level. Eastern European countries generally have low fertility rates that are not an impediment to economic growth.

Enrollment rates in primary education are positive and statistically significant, even at the 5-percent level, when few other control variables are added (Table 4), of even higher significance than tertiary education in equivalent regressions, but then turns insignificant when more control variables are included. This is likely due to multicollinearity, as primary education is beneficial

to many other economic variables (Tables 1&3). However, when the three levels of education are included together, the significance of primary education enrollment decreases due to expected multicollinearity, as primary education is essential for higher levels of education and other variables expected to be important to economic growth for countries. Enrollment rates in secondary education are positive, given fertility rates, but when the latter are not included secondary enrollment rates have a negative albeit usually insignificant sign. According to Keller (2006a), enrollment rates in secondary education highly significantly reduces fertility rates, hence, they are multicollinear. Enrollment rates in higher education indicate stronger benefits to economic growth, with larger coefficients and statistical significance often at the 10 percent level (Tables 2&4). The variable indicates a significance at the 1-percent level once the two lower levels of education are held constant, as well as investment and political rights, but when openness to trade is not included (Table 3).

Having opened up their borders to international trade here indicates to have boosted per capita growth in Eastern Europe, and this variable is generally highly statistically significant. Political rights are significantly negative to growth for Eastern Europe, so it seems they need to mature further into a more democratic system and develop a system with more politicians who are not from the former communist system and have a better knowledge of democracy to be more favorable to per capita growth rates of the countries they are leading. In Eastern Europe, inflation is negatively related to economic growth, but rarely statistically significant at standard levels, and is only highly statistically significant when enrollment rates in secondary education are held constant. So rising prices have not substantially detracted from economic growth in these transition economies over this time period.

## 5. Conclusion

The economic impact of private social security accounts using panel data with cross-country data over time in regression analysis, like this paper has been little studied. This econometric research uses panel data for Eastern Europe where 40 percent of countries (8 of 20) have changed to a system with private social security accounts and where between 3.5 and 10 percent of pay are contributed to individual accounts. This research analyzes the difference between those countries that have implemented private accounts and those which have not, alternatively the percentage of income paid into private social security accounts on economic growth.

The results here are statistically highly significant and indicate substantial benefits of privatizing parts of social security on countries' economic growth of real GDP per capita. Contributing a larger percent of pay to the private social security accounts advances economic growth additionally. For a country with a pay-as-you-go social security system projected to face difficulties paying for future retirees, between 2.1 and 2.5 percent of additional payroll taxes would be advisable to add on to the current social security system. Alternatively, a carve-out of the current pay-as-you-go contributions can be used (or demonstrated savings accounts by employers or workers like in the United Kingdom), but this might make it more difficult to pay for retirees who did not contribute (enough) into the private accounts system. Prior literature has calculated that with the higher returns in private accounts, if 2.1 percent of payroll taxes are paid into private accounts, this lower percentage would have the same outcome as can be expected

from the current 12.4 percent public system in the United States (Feldstein and Samwick 1996). However, to cover the cost of setting up the accounts, a one time deficit (Razin and Sadka 2004) or a temporary surcharge of less than 1.5 percent has been suggested (Feldstein and Samwick 1996). Thus, it appears reasonable to use the Swedish model of adding 2.5 percent of payroll taxes, at least until the set-up costs are paid. If continued beyond paying for the set-up costs, the additional return from this slightly higher rate would be recovered by the individual. As a result, it would be prudent to maintain this rate to safeguard against possible unanticipated fluctuations in private market returns or in amounts needed or desired by the individual in retirement.

Having implemented private accounts of any percentage has a statistically highly significant effect on economic growth of GDP per capita, generally at the 1-percent level. Additional percentages paid into private accounts are statistically significant also usually at the 1-percent level in raising a country's economic growth rate. For the time period estimated, Eastern European countries contributing 2.5 percent more toward private social security accounts would see high gains in the range of about 9.16 percentage points toward their growth rates, in the regression with the highest fit where the variation in the independent variables explain 92 percent of the variation of the dependent variable. However, these estimates would likely decrease somewhat as growth rates tend to slow down when countries mature economically to higher levels of income per capita.

As implied from Garrett (2005), over 95 percent would be expected to receive higher benefits with a private system. Care needs to be taken then to ensure that the remaining less than five percent who would not see improvements would at least have social security benefits that is on par with the prior pay-as you-go system.

For future research, it would be beneficial to utilize longer time spans to re-estimate Eastern Europe's high benefits for the impact of the share of payroll paid into private accounts, as they would be expected to decrease somewhat over time with growth rates tending to decrease for more mature economies.

## References

- Altiparmakov, N. and M. Nedeljkovic (2018): “Does Pension Privatization Increase Economic Growth? Evidence from Latin America and Eastern Europe” *Journal of Pension Economics and Finance* **17**, 46-84.
- Appiah, E. N. and McMahon, W. W. (2002). “The Social Outcomes of Education and Feedbacks on Growth in Africa” *Journal of Development Studies* **38**, 27-68.
- Barro, R. J. (1997) *Determinants of Economic Growth; A Cross-Country Empirical Study*, MIT Press, Cambridge, MA.
- \_\_\_\_\_. (2000 “Inequality and Growth in a Panel of Countries” *Journal of Economic Growth* **5**, 5-32.
- Corsetti, G. and K. Schmidt-Hebbel (1995) “Pension Reform and Growth?” Policy Research Paper 1471, The World Bank.
- Davis, E. and Y.-W. Hu (2008) Does funding of pensions stimulate economic growth? *Journal of Pension Economics and Finance* **7**, 221–249.
- Feldstein, M. and Samwick, A. (1996) “The Transition Path in Privatizing Social Security” National Bureau of Economic Research, Inc. NBER Working Paper Series w5761
- Freedom House. “Freedom in the World Comparative and Historical Data: Individual Country Ratings and Status, 1973-2016” Freedom House, Inc. at: <https://freedomhouse.org/report-types/freedom-world>
- Garrett, T. and Rhine, R. (2005) “Social Security versus Private Retirement Accounts: A Historical Analysis” *Federal Reserve Bank of St. Louis Review* **87**, 103-121
- Holzmann, R. (1997) Pension reform, financial market development, and economic growth: preliminary evidence from Chile. *IMF Staff Papers* **44**, 149–178.
- James, E. (1998) “New Systems for Old Age Security: Experiments, Evidence and Unanswered Questions” *World Bank Research Observer* **13**, 271-301.
- \_\_\_\_\_. (2005) “Reforming Social Security: Lessons from Thirty Countries” NCPA Policy Report 277, <http://www.ncpa.org/pub/st/st277>
- Keller, K. (2006a) “Investment in Primary, Secondary and Higher Education and the Effects on Economic Growth” *Contemporary Economic Policy* **24**, 18-34.
- \_\_\_\_\_. (2006b) “Education Expansion, Expenditures per Student and the Effects on Growth in Asia” *Global Economic Review* **35**, 21-42.
- Kotlikoff, L; K. Smetters and J. Walliser (1999) “Privatizing Social Security in the United States – Comparing the Options” *Review of Economic Dynamics* **2**, 532-574.
- Kotlikoff, L. (2000) “Privatizing Social Security the Right Way” *Independent Review* **5**, 55-63.
- Kritzer, B. (2000) “Social Security Privatization in Latin America” *Social Security Bulletin* **63**, 17-37.
- \_\_\_\_\_. (2001/2002) “Social Security Reform in Central and Eastern Europe: Variations on a Latin American Theme” *Social Security Bulletin* **64**, 1-24
- \_\_\_\_\_. (2005) “Individual Accounts in Other Countries” *Social Security Bulletin* **66** <http://www.ssa.gov/policy/docs/ssb/v66n1/v66n1p31>
- Lucas, R. E., Jr. (1988) “On the Mechanics of Economic Development” *Journal of Monetary Economics* **22**, 3-42.

- McMahon, W. W. (2000) *Education and Development: Measuring the Social Benefits*. Oxford and New York, NY: Oxford University Press (paperback 2002).
- \_\_\_\_\_. (2003) "Short and Longer Term Impacts of Education on Economic Development Goals." Paper delivered at the Oxford International Conference on Education and Development, September 9-11, [wcmahon@uiuc.edu](mailto:wcmahon@uiuc.edu)
- Meguire, P. (1998) "Social Security and Private Savings" *National Tax Journal* 51, 339-358.
- Müller, K. (2005) "Post-Socialist Pension Reform: Contributory and Non-Contributory Approaches" *Public Finance and Management* 5, 290-309.
- Packard, T. (2002) "Are There Positive Incentives from Privatizing Social Security? A Panel Analysis of Pension Reform in Latin America" *Journal of Pension Economics and Finance* 1, 89-109
- Population Reference Bureau (PRB 2009) "Today's Research on Aging: Social Security Systems Around the World" *Program and Policy Implications* 15, 1-4.
- Razin, A. and E. Sadka (2004) "Social Security: A Political Economy Approach" *Monetary and Economic Studies* 22, 127-136.
- Samwick, A. (2000) "Is pension reform conducive to higher saving?" *The Review of Economics and Statistics* 82, 264–272.
- Saunders, P. and K. Ghosh (2006) "The Effect of Social Security on Personal and Private Saving in the Short Run and the Long Run: A Time Series Analysis" *Journal of Economics* 32, 91-104.
- Schmidt-Hebbel, K. (1999) "Does Pension Reform Really Spur Productivity, Saving and Growth?" Washington, DC: The World Bank.
- Temple, J. (1999) "The New Growth Evidence." *Journal of Economic Literature* 37, 112-156.
- World Bank. "World Development Indicators" International Bank for Development and Reconstruction, World Bank, Washington D.C. <http://data.worldbank.org/data-catalog/world-development-indicators>
- Zandberg, E. and L. Spierdijk (2013) Funding of pensions and economic growth: are they really related? *Journal of Pension Economics and Finance* 12, 151–167.
- World Bank. "World Development Indicators" [Online] Washington D.C.: International Bank for Development and Reconstruction, World Bank