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The Welfare State and Economic Growth – Econometric Evidence from Germany

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This paper attempts to analyze the growth effects of social security expenditures in Germany from a time series perspective. Therefore, a regression model based on standard determinants of growth is specified and estimated as a vector error correction model. Results show that there is a bidirectional relationship between growth and social security expenditures. In the short run, social security expenditures and growth rates are inversely related. Lower or even negative growth rates cause higher expenditures of the welfare state. In the long run, there is also an inverse relationship, but the direction of causality changes. Higher social security spending triggers lower growth rates. Robustness tests confirm the stability of the results.

Keywords: Economic Growth, Welfare State, Social Security

JEL Classifications: O40, O52, H52, H55

1 Introduction

The growth effects of an expanding Welfare State have been discussed extensively in the literature, theoretically as well as empirically. There is, however, no clear-cut evidence whether expanding social security expenditures impede economic growth or may even be conducive to growth. Atkinson (1995) and Lindert (2016) provide a comprehensive discussion of the economic effects. From a theoretical viewpoint some of the arguments in favour of the welfare state are:

1. Social spending and the associated transfer payments contribute to social peace and therefore make long term investment projects more predictable and more profitable.
2. Social security systems act as automatic stabilizers and thus dampen short-term fluctuations of the growth path. Less volatility may increase growth rates.
3. Parts of social spending may preserve human capital, e. g. in the case of unemployment when off-the-job training is supported.

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4. Early retirement programs may increase overall labor productivity because they take the less productive workers out of the production process.

A negative impact of social security spending on growth can be justified as follows.

1. The tax burden associated with welfare spending will drive people out of the market economy. This may cause inefficient allocation of resources and a lower GDP.
2. Social security expenditures directly reallocate parts of the current income from investment and increase current consumption. Lower investment may lead to lower growth in the future.
3. The existence of social insurance systems may contribute to a less flexible labor market.

From a theoretical perspective it is quite difficult to draw firm conclusions regarding the net effect (Simoes et al. 2014, 8). Lindert, who generally argues in favor of the Welfare State stresses the view that the Welfare State may even be “a free lunch” (Lindert 2003), i. e. has no negative growth effects. Negative work incentives are extensively discussed in Tanner and Hughes (2015). There are other criticisms of the Welfare State (Habermann 2013; Balcerowicz and Radzikowski 2018) but these are only indirectly related to growth and not discussed here.

2 Growth effects of the Welfare State: Literature review

The spectrum of contradicting arguments is reflected in the empirical literature. An overview of the earlier empirical studies is given by Atkinson (1995). In these studies, the dependent variable is the GDP growth rate or the GDP per capita growth rate. The measure of the Welfare State mostly is the government’s social security expenditures to GDP. All the papers reviewed are pooled time series/cross section studies of a sample of OECD countries. In most cases control variables (per capita GDP as a catch-up variable, investment rate) have been included. The results of these studies differ dramatically. Whereas Korpi (1985) finds that a five percent point reduction in the Welfare State expenditure rate causes a 0.9 percentage point reduction in the annual GDP growth rate, Weede (1986) finds the opposite of a one percentage point increase. The most recent study cited by Atkinson (Persson and Tabellini 1994) reveals only a 0.3 percentage point increase, but the coefficient of their transfer variable is barely significant. Atkinson (1995: 178) tries to resolve this empirical puzzle, but a convincing explanation is still missing. Nevertheless, he points out two important points. First, he raises the question of causality, which is seldom addressed. Second is the dynamic specification in the pooled models, which may be incomplete.

With respect to the causality question, Atkinson writes:

> "It may be poor economic performance that leads to high Welfare State spending, rather than vice versa. Slow growth, or output below trend, may cause reduced employment and hence higher spending on unemployment benefit and other transfers. Alternatively, it may be successful countries, with high income per head, that can afford a more generous social security system. Or it may be that industrialization of the economy leads both to higher living standards and to the need for social security. The modern employment relationship, with its risk of catastrophic income loss, creates the role for social insurance. We might therefore expect more advanced countries to have larger Welfare States. This would predict a positive relation between Y (income) and WS (Welfare State spending), although again the causation would run in the reverse direction."
>
> "The same applies to the growth rate version of the relationship. Suppose that the growth rate is fastest during the industrialization period, approaching its steady-state value from above (as predicted by a number of growth models), and that state spending grows as the social insurance scheme matures. The higher level of Welfare State spending is then associated with a slowing of aggregate growth, again without there being any causal connection."

These questions will be addressed in section 4.

More recent empirical evidence also reveals positive and negative growth effects. Herce et al. (2001) apply cointegration and Granger-causality tests for a sample of twelve European (EU) countries. The results are mixed. First, they do not find any cointegration between per capita income and per capita social protection benefits. Granger-causality tests of the differenced variables reveal Granger-causality in seven countries. From a positive correlation (but no cointegration) between the level variables and the Granger-causality found, the authors conclude, that the Welfare State promotes growth. Contradicting evidence is presented by Fic and Gathe (2005). The authors use time series data from 19 OECD countries and find nonlinear simultaneous relationships between welfare spending and growth. Basically, the long-term relationship is negative. As a second order effect, slower growth leads to lower welfare spending. The sample sizes are much larger, compared to the Herce et al. study (50 versus 25). Afonso and Alegre (2008) study the growth effects of various fiscal variables within a panel of 27 EU countries in the period 1971—2006. With respect to the impact of social spending on growth they find a negative effect. This is confirmed by Im et al. (2011). The authors apply a pooled cross section/time series (1990 – 2007) model and test for the effect of social spending on growth in developing (29), semi-developed (30) and developed countries (29). They find a positive association only in developing countries, whereas in the other country groups the impact of welfare spending on growth is negative. The authors conclude that the positive effects of social spending may dominate only in poor countries whereas in rich counties the welfare state retards growth. Differences between country groups are also found by Izák (2011). His sample includes EU member states and finds a negative association between social spending and growth in general. It is particularly strong for post-socialist EU countries. An expanded version of the Afonso and Alegre study has been presented by Afonso and Jalles (2013). They confirm the negative growth effects of social and welfare spending in developed countries. Public expenditures on education and health, however, reveal positive effects. These effects are replicated by Ding (2014) who finds a strong negative effect of public pension spending in particular, besides a general negative effect. Ding conducts a panel analysis for the OECD member states.

On the other hand, Khan and Bashar (2014) find positive effects of overall social spending on growth in Australia and New Zealand using cointegration and vector error correction techniques. However, the sample size is relatively small (n=32) albeit larger than in the Herce et al. study (n=25). For the estimation of VECMs such short time series are at least questionable. Unfortunately, standard growth control variables (catch-up, investment) have not been included and the cointegrating vector does not include growth and spending rates, but income and spending in absolute terms. Dar and Amirkhalkhali (2017) use a disaggregated approach to explain the sluggish growth in OECD countries after the "great recession" in 2009 combining cross-section and time series data. They indirectly identify the increase of transfer payments as the main factor of the growth retardation.

All in all, the majority of papers conclude that the growth effect of social spending is negative for GDP growth. There is, however, contradicting evidence regarding the (rare) time series studies and the panel estimates. Therefore, this paper follows a pure time series approach and tries to improve the following over the existing literature. First, a much longer time series is used covering a period of 60 years for Germany. This is particularly needed to reliably estimate long-run relationships. No existing time series study is based on such a long series. Second, a vector error correction model (VECM) including control variables is specified that also captures the potential role of catch-up and investment rate effects on growth, determinants that have been neglected in previous time series studies. Additionally, the exports-to-GDP ratio is included, as Germany traditionally has a large export sector. Third, long-run and short-run causality directions are examined in order to answer at least some questions posed by Atkinson. Finally, we supplement our analysis by the Toda-Yamamoto causality test procedure and conduct a few robustness checks.

3 Social Security Expenditures in Germany

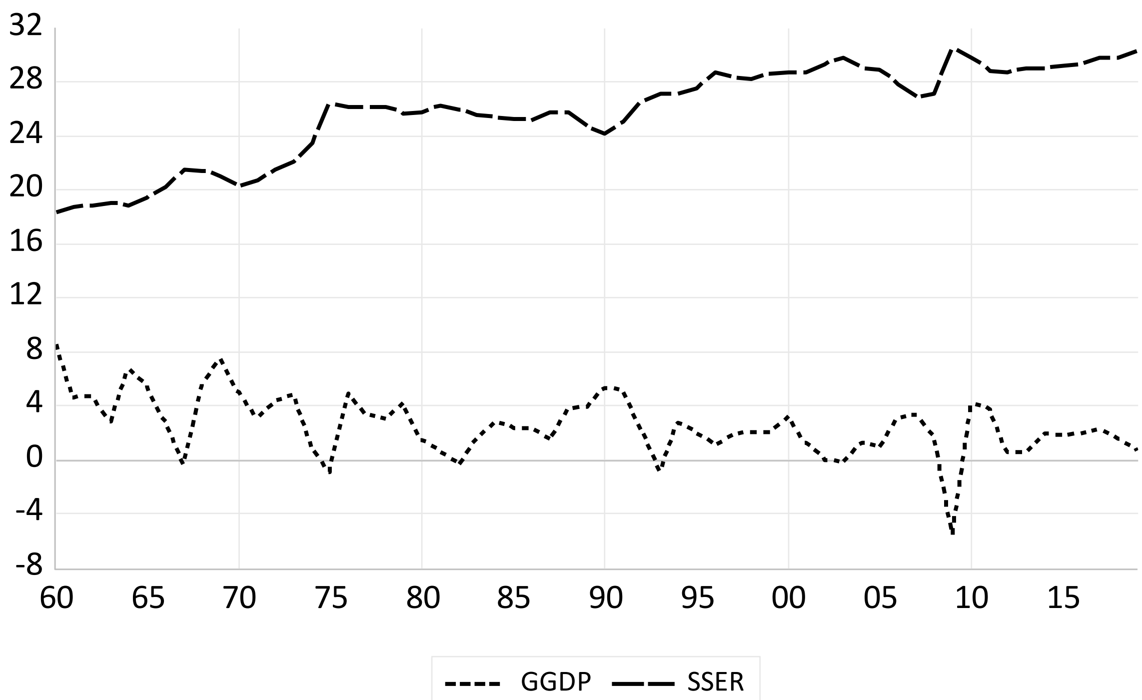
For Germany, comprehensive data on social spending are available since 1960. The "Sozialbericht 2017" reports expenditures in the following sectors to name only the most relevant:

a) Pension payments
b) Health and care expenditures
c) Unemployment benefits
d) Child and family benefits
e) Social welfare benefits

In 2017, total expenditures amounted to 962 billion €, nearly 30 percent of GDP. In 1960, the social security expenditure ratio, henceforth SSER stood at 18.3 percent (Bundesministerium für Arbeit und Soziales, 2017, Table I/II). In 2019, the SSER increased to more than 30 percent.

The SSER and the growth rate of real GDP (GGDP) are displayed in figure 1.

Figure 1:Total welfare expenditures (SSER; percent of GDP) and (percent) GDP growth (GGDP), 1960—2019



Source: Sozialbericht 2017, Federal Statistical Office: National Accounts.

A negative relationship between the two series is evident. With the rising share of welfare expenditures, growth rates drop. The simple correlation coefficient is -0.62. Three distinct periods can be identified. The first growth phase of the welfare state was the period from the mid-1960s to the mid-1970s. This was a period when the welfare state was made "more generous" after the demise of chancellor Ludwig Erhard, the former economics minister and "father of the German Wirtschaftswunder" (Leisering 2000: 9). Erhard always opposed spending increases. In his well-known book *Wohlstand für Alle* (*Prosperity through Competition*, Chapter 12) Erhard (1957) warns:

> "The result of this dangerous road toward the welfare state must be the increasing socialization of incomes, the growing centralization of planning, and the extensive tutelage of the individual with increasing dependence on the state or the group — together with the deterioration of a free and well-functioning capital market as an important prerequisite for an expansion of the market economy. In the end we shall find the subject and a guarantee of social security by an all-powerful state, but we shall also have a paralysis of the economy."

From 1975 to the end of the 1980s, SSER slightly declined due to spending cuts. In 1990 Germany reunified, leading to a massive increase of social spending. The main forces behind this increase were the unification burden (high unemployment, convergence of old-age pensions) and the population aging. In 2003, the so-called Hartz reforms were implemented, a series of policy reforms intended to make the labor market more flexible (less job protection, lower unemployment benefits). This resulted in a temporary reduction of the SSER until the outbreak of the financial crisis in 2008. Currently, the German Welfare State is further expanded by introducing new child benefits and a more generous pension scheme.

4 Empirical Analysis

Vector Error Correction Model

Following Atkinson, it is the purpose of this paper to determine the growth effects of the Welfare State in Germany as well as the causality directions in the long-run and the short-run. As the variables GGDP and SSER appear to be non-stationary, a vector error correction model (VECM) will be specified, after testing for the order of integration. The VECM is based on a standard growth model that relates the growth rate of real GDP to the per capita income level (as a proxy for the catch-up potential) and the investment rate (gross investment as a fraction of GDP). These variables have proven significant and stable in the empirical literature. In our case, Welfare State expenditures (SSER) and the exports-to-GDP ratio (XR) are added to the model. The latter is motivated by the importance of the export-led growth model for Germany's economy (Jones, 2021).

The VECM allows a test for a reverse causation in the sense that social security expenditures are triggered by (slower) growth. VECMs do not ex ante fix the causality directions or, in other words, exogenous variables. A VECM treats all variables as endogenous; causality is determined within the estimation. In our case, the VECM consists of the following five equations:

$$\Delta GGDP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta PCI_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta INV_{t-i} + \sum_{i=1}^{n} \beta_{3i} \Delta SSER_{t-i} + \sum_{i=1}^{n} \beta_{4i} \Delta XR_{t-i} + \delta_1 ECT_{t-1} + \phi_{1t}$$

$$\Delta PCI_t = \beta_5 + \sum_{i=1}^{n} \beta_{6i} \Delta GGDP_{t-i} + \sum_{i=1}^{n} \beta_{7i} \Delta INV_{t-i} + \sum_{i-1}^{n} \beta_{8i} \Delta SSER_{t-i} + \sum_{i=1}^{n} \beta_{9i} \Delta XR_{t-i} + \delta_2 ECT_{t-1} + \phi_{2t}$$

$$\Delta INV_t = \beta_{10} + \sum_{i=1}^{n} \beta_{11i} \Delta GGDP_{t-i} + \sum_{i=1}^{n} \beta_{12i} \Delta PCI_{t-i} + \sum_{i=1}^{n} \beta_{13i} \Delta SSER_{t-i} + \sum_{i=1}^{n} \beta_{14i} \Delta XR_{t-i} + \delta_3 ECT_{t-1} + \phi_{3t}$$

$$\Delta SSER_t = \beta_{15} + \sum_{i=1}^{n} \beta_{16i} \Delta GGDP_{t-i} + \sum_{i=1}^{n} \beta_{17i} \Delta INV_{t-i} + \sum_{i=1}^{n} \beta_{18i} \Delta PCI_{t-i} + \sum_{i=1}^{n} \beta_{19i} \Delta XR_{t-i} + \delta_4 ECT_{t-1} + \phi_{4t}$$

$$\Delta XR_t = \beta_{20} + \sum_{i=1}^{n} \beta_{21i} \Delta GGDP_{t-i} + \sum_{i=1}^{n} \beta_{22i} \Delta INV_{t-i} + \sum_{i=1}^{n} \beta_{23i} \Delta PCI_{t-i} + \sum_{i=1}^{n} \beta_{24i} \Delta SSER_{t-i} + \delta_5 ECT_{t-1} + \phi_{5t}$$

The Δ operator indicates first differences in the first section of the short-run VAR. If these exist, a cointegration vector and the error correction term ECT is negative and significant in the respective VAR equation ($\delta < 0$), there is long-run causality in the sense of Granger. Short-run causality can be determined by examining the coefficients of the differenced variables. Prior to estimation of the VECM all variables will be tested for the order of integration.

Our tests are based on German annual data covering the period from 1960 to 2019 (pre-pandemic), thus giving a sample size of 60. Data for SSER are taken from the Sozialbericht (Social Security Report) 2017 and updated government statistics; GDP growth, exports-to-GDP, and investment figures were retrieved from the time series database of the Deutsche Bundesbank; and per capita income figures are from the Maddison Project Database 2018, and the most recent years were updated using official data from the Federal Statistical Office.

Unit Root Tests

Prior to cointegration and causality testing, we check whether our four endogenous variables (GGDP, SSER, INV, XR, and PCI) are stationary. Therefore, unit root tests are conducted. Since it is well-known that these tests have limited power depending on the first order autoregressive parameter of the time series and the sample size (Arltová and Fedorová, 2016), three tests are performed in order to cross-check the results. These are the Elliott-Rothenberg-Stock (ERS) test, the standard ADF test, and the Kwiatkowsky-Phillips-Schmidt-Shin (KPSS) test. The Null of the first two tests is that the variable is non-stationary, whereas the KPSS test's Null assumes stationarity. All tests were performed with a constant only and a constant plus trend specification. The appropriate lag length was automatically selected according to the Schwarz Criterion. Table 1 summarizes the test results.

Table 1: Unit Root Tests

	ERS			
Variable	Level Intercept	with Trend	1. Difference Intercept	with Trend
GGDP	5.316	5.177	0.755***	1.653***
SSER	66.057	7.697	0.478***	1.694***
INV	4.008	7.202	1.332***	3.567***
PCI	1,693.8	66.15	0.175***	0.014***
XR	42,507	17.07	1.056***	3.288***
	ADF			
Variable	Level Intercept	with Trend	1. Difference Intercept	with Trend
GGDP	-5.899***	-6.849***	-9.376	-9.301
SSER	-1.685	-2.709	-6.311***	-6.361***
INV	-1.906	-2.874	-6.618***	-6.572***
PCI	1.984	-0.860	-4.349***	-5.010***
XR	-0.232	-1.774	-6.966***	-6.928***
	KPSS			
Variable	Level Intercept	with Trend	1. Difference Intercept	with Trend
GGDP	0.968***	0.116	0.267	0.170**
SSER	0.871***	0.168**	0.158	0.066
INV	0.685**	0.078	0.078	0.075
PCI	0.949***	0.233***	0.346	0.049
XR	0.787***	0.135**	0.119	0.067

(*), (**), (***) indicate significance at the 10 percent, 5 percent, 1 percent level
Source: Author's Calculations

The tests consistently reveal, that SSER, INV, PCI, and XR are stationary in first differences, thus I(1). GGDP is likely to be I(1) according to the KPSS and ERS test, but not in the case of the ADF test. Therefore, we perform a supplementary Ng-Perron test. The estimated values for the four sub statistics clearly show, that GGDP is an I(1) series. Therefore, we treat all variables as non-stationary. With respect to the GDP growth rate, non-stationarity at first sight seems to be implausible since one would expect that GDP levels are I(1) yet because of their mostly increasing means. This is, however, not generally the case. In the case of increasing or decreasing growth rates the mean of a growth rate series may grow (or decline) thus identifying an I(1) series if a unit root test is applied. As Germany's growth rate gradually declined since the 1950s, this could easily be the case. If GDP growth rates are roughly constant (like in the US), then GDP levels are likely to be I(1) whereas the growth rate series would be I(0). Our test result above (GDP growth rates are I(1)) represents the continuing reduction of growth rates.

Cointegration and Granger Causality

According to economic theory, all five variables could be endogenous, but special attention is paid to relationship between the GDP growth rate (GGDP) and the ratio of social security expenditures to GDP (SSER). Therefore, we conduct a systems cointegration test following the Johansen/Juselius (JJ) method. Prior to cointegration tests we determine the optimal lag length using an unrestricted VAR model. Each of the five selection criteria indicates that the optimal lag length is one.

Next the Johansen-Juselius cointegration (JJ) test is performed using the following alternative specifications:

a) Intercept in cointegrating equation and VAR
b) Intercept and trend in cointegrating equation, intercept in VAR

As estimation of the corresponding vector error correction models reveal that model b) is not appropriate as the trend in the cointegrating equation is insignificant. This is consistent with a missing plausible justification for a trend in the cointegrating equation.

These results indicate that per capita income does not play a role as a long-term growth determinant. Germany's growth did not drop because the country had become too wealthy. The results indicate that the post-war reconstruction era must have ended at least in the early 1960s. The exports-to-GDP ratio has the expected sign but surprisingly fails to pass even the 10 percent significance level. SSER is marginally significant, leaving the investment share the only significant variable. These results however, may be at least partly attributed to multicollinearity, a problem that is rarely assessed in cointegration analysis. We therefore first drop the (least significant) variable PCI which gives the following reduced cointegration vector.

The following table shows the results of the JJ cointegration test, model a).

Table 2: Johansen Juselius Cointegration Test

Unrestricted Cointegration Rank Test

Hypo. No. of CE(s)	Trace Stat	0.05 CV	Prob.	Max-Eigen Stat.	0.05 CV	Prob.
None*	86.981	69.819	0.0012	49.461	33.877	0.0003
At most 1	37.519	47.856	0.3234	21.998	27.584	0.2205
At most 2	15.522	29.797	0.7453	9.2125	21.132	0.8149
At most 2	6.3098	15.495	0.6589	5.3012	14.264	0.7034
At most 4	1.0086	3.8415	0.3152	1.0086	3.8415	0.3152

Both test statistics (Trace, Max-eigenvalue) clearly indicate a single cointegrating relationship. The cointegrating vector normalized to GGDP is

GGDP	INV	SSER	PCI	XR
1.0000	-0.2908	0.1590	5.79E-05	-0.0678
Standard error	0.1162	0.1009	4.90E-05	0.0514
t-stat	2.5026	1.5758	1.1816	1.3191

GGDP	INV	SSER	XR
1.0000	-0.1517	0.2609	-0.0092
Standard error	0.0899	0.0539	0.0237
t-stat	1.6854	4.8404	0.3882

Surprisingly, the variable XR is far from passing any significance level whereas SSER is highly significant and INV still marginally significant. If the long-term relation is further restricted by deleting XR, the following cointegrating vector emerges.

GGDP	INV	SSER
1.0000	-0.1146	0.2611
Standard Error	0.0702	0.0503
t-stat	1.6320	5.1963

The impact of the investment rate is not large and only weakly significant. On the other hand, the coefficient of SSER is quite large and highly significant. The higher the welfare expenditure rate, the lower the growth rate.

The strong impact of the SSER variable is further confirmed if SSER is excluded from the list of endogenous variables and replaced by XR. The estimated cointegrating vector is

GGDP	INV	XR
1.0000	-0.2591	0.0422
Standard Error	0.1264	0.0341
t-stat	-2.0498	1.2375

In this case, the XR has even the wrong sign. Rising export-to GDP ratios imply lower growth rates. Given these results, we thus proceed with the estimation of the vector error correction model using only GGDP, INV, and SSER as endogenous variables. In order to properly account for the specific effects of the financial crisis, the VECM is augmented by two dummy variables (DUMMY2009, DUMMY2010). Additionally, we tested for potential effects of the Hartz reforms by including dummy variables for each of the years 2003 to 2015. However, all of the dummies except those for 2009 and 2010 proved insignificant (t-stats ranging from 0.00 to 0.95).

The cointegrating equation reveals a highly significant effect of SSER on the growth rate. Rewritten, we obtain $GGDP_{t-1} = 8.2261 - 0.2774 SSER_{t-1} + 0.0608 INV_{t-1}$. In the long run, an increase in the social security expenditure ratio of 10 percentage points depresses the GDP growth rate by 2.8 percentage points and thus largely accounts for the growth retardation towards the end of the sample. The loading coefficient (-1.3074) is negative and highly significant. Surprisingly, it is less than -1. This indicates a high speed, oscillatory adjustment of disequilibria. However, it confirms the dynamic stability of the system (Loyaza and Ranciere 2005; Narajan and Smyth 2006). The residuals are free from serial correlation, heteroskedastic, and normally distributed.

If the VECM is estimated without the dummies, the following results are obtained:

$$GGDP_{t-1} = 6.6080 - 0.2611 SSER_{t-1} + 0.1146 INV_{t-1}$$

The investment-to GDP ratio is now significant, but the coefficient of determination drops from 0.69 to 0.49.

Given these results, we can conclude that there is a long-run causal relationship in the sense of Granger running from welfare expenditures to growth, but not the reverse. The hypothesis of higher welfare expenditures because of retarded growth can thus be falsified.

Table 3: VECM Estimates

Sample (adjusted): 1962 2019
Included observations: 58 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
GGDP(-1)	1.000000		
SSER(-1)	0.277381 (0.04797) [5.78251]		
INV(-1)	-0.060784 (0.06985) [-0.87027]		
C	-8.226073		
Error Correction:	**D(GGDP)**	**D(SSER)**	**D(INV)**
CointEq1	-1.307364 (0.22569) [-5.79266]	0.206423 (0.09193) [2.24531]	0.063158 (0.19372) [0.32602]
D(GGDP(-1))	0.403764 (0.11301) [3.57280]	-0.142479 (0.04603) [-3.09507]	0.120380 (0.09700) [1.24101]
D(SSER(-1))	0.019608 (0.36296) [0.05402]	0.333609 (0.14785) [2.25640]	-0.081589 (0.31155) [-0.26188]
D(INV(-1))	0.215269 (0.21116) [1.01948]	-0.037712 (0.08601) [-0.43844]	0.040320 (0.18124) [0.22246]
C	0.024289 (0.21165) [0.11476]	0.093079 (0.08621) [1.07964]	-0.048307 (0.18167) [-0.26591]
DUMMY09	-7.079618 (1.53716) [-4.60564]	3.033807 (0.62615) [4.84514]	-2.529902 (1.31942) [-1.91744]

Table 3 continued

DUMMY10	4.746270	-1.752524	3.297287
	(1.87653)	(0.76439)	(1.61071)
	[2.52928]	[-2.29270]	[2.04710]
R-squared	0.687852	0.483141	0.190043
Adj. R-squared	0.651129	0.422335	0.094754
Sum sq. resids	117.3127	19.46561	86.43084
S.E. equation	1.516657	0.617801	1.301815
F-statistic	18.73070	7.945506	1.994379
Log likelihood	-102.7260	-50.63642	-93.86658
Akaike AIC	3.783656	1.987463	3.478158
Schwarz SC	4.032330	2.236137	3.726832
Mean dependent	-0.068966	0.199655	-0.067241
S.D. dependent	2.567763	0.812851	1.368251
Determinant resid covariance (dof adj.)		0.523138	
Determinant resid covariance		0.355667	
Log likelihood		-216.9162	
Akaike information criterion		8.307456	
Schwarz criterion		9.160053	
Number of coefficients		24	

In the short run, however, things are different. Looking at the short-run section of the VECM (differenced variables), a change of the GDP growth rate significantly affects changes in the welfare expenditure ratio, which is quite plausible. If an economy enters a recession, GDP growth rates will decline and welfare expenditures will grow above average leading to an increase in the SSER. This effect may work primarily through rising unemployment benefits and pension payments due to premature retirement. In order to test the overall effect, we conduct a Block Exogeneity Wald test which gives the following results:

$$D(SSER) \Rightarrow D(GGDP): \quad \chi^2 = 0.0029\ (p = 0.9569)$$

$$D(GGDP) \Rightarrow D(SSER): \quad \chi^2 = 9.5794\ (p = 0.0020)$$

The short-run Granger causal effect of the GGDP growth rate change is clearly visible in the Wald Chi-square test statistic. A reverse Granger causation from d(SSER) to d(GGDP) does not exist.

Therefore, we can summarize as follows:

1) There is long-run Granger causality from social security expenditures on economic growth. The higher the fraction of welfare expenditures to GDP the lower the growth rate. The magnitude of the effect is quite large.
2) There is short-run causality running from GDP growth to social security expenditures. Declining GDP growth rates Granger-cause social spending increases. This is compatible with increased social spending during economic downturns.

Toda-Yamamoto Granger Causality

An alternative procedure to identify causal relationships in time-series data is the modified Granger Test, as suggested by Toda and Yamamoto (1995). Whereas the original Granger Test is applicable to stationary series only, the Toda-Yamamoto (TY) variant can be applied even if the series under consideration are of mixed (or unclear) integration order. As the unit root tests did not unequivocally prove that the GDP growth rate has a unit root (the ADF test indicated stationarity), we supplement our analysis by performing the TY test in order to check the direction of causality. In a first step, a simple VAR in levels is estimated and the optimal lag length is determined according to various information criteria and the absence of serial correlation. Second, the maximum integration order of the series under consideration is fixed. Third, an expanded VAR is estimated with extra lags to adjust for possible non-stationarity. Finally, block exogeneity tests are conducted to check for causality directions. In our case, the optimal lag length of a VAR consisting of SSER and GGDP is two. The highest integration order (SSER) is one. Thus, a VAR is estimated with a lag of two and the third lag declared exogeneous. This is to make sure that lag three does not enter the Wald test, which tests for causality. Finally, block exogeneity tests are conducted. The results are as follows:

$$SSER \Rightarrow GGDP: \quad \chi^2 = 6.0416\ (p = 0.0488)$$

$$GGDP \Rightarrow SSER: \quad \chi^2 = 7.4115\ (p = 0.0246)$$

The TY procedure reveals that causality runs in two directions. Growth causes social security expenditures and vice versa, confirming the results of the traditional VECM.

Robustness Checks

One can object that our sample may be characterized by a structural break due to the German re-unification in 1990. To assess the stability of the VECM, a separate estimation was carried out for the two sub-samples ranging from 1960 to 1989 (pre-unification Federal Republic of Germany) and 1990 to 2019 (unified Germany). A loss of coefficient significance can be expected even if the coefficients stay roughly constant. This is a consequence of the small sample size, which is rather small for estimating a VECM.

The following results for the long-run coefficient of the SSER in the cointegrating equation (t-stats) were obtained (VECM with dummies):

Full sample:	0.2774 (5.78)	
1960 – 1989:	0.1895 (1.94)	no dummies
1990 – 2019:	0.3602 (3.98)	

The significant impact of the SSER on growth is clearly visible though the coefficients change although there is considerable coefficient divergence. Next, the error correction term in the short-run relation is reported:

Full sample:	-1.3074 (5.79)	
1960 – 1989:	-1.3327 (3.59)	no dummies
1990 – 2019:	-1.3313 (4.53)	

The ECT enters the short-run equation with $\Delta GGDP$ as dependent variable significantly negative irrespective of the sample period. All in all, we can conclude that there is a stable negative long-run causal effect of social security expenditures on growth in both sub samples.

Another question is related to the causes of the SSER increase as the growing SSER primarily reflects the ageing of the German population, at least since the mid-1970s. Temporarily, rising unemployment contributed to the increase. One could argue that the growth retardation was not due to social spending increases but caused by the population aging itself: the rising SSE expenditures necessarily accommodate the demographic process.

This hypothesis can be tested by replacing the SSER variable by the mean age of the population in the VECM (dummies included). By doing so, the following results are obtained:

a) There is also a cointegrating relationship between growth and the mean age of the population. However, in the long-term part of the VECM significance of the age variable is considerably weaker than the significance of the SSER variable. The loading coefficient drops to -1.10. Thus, there is long-run causality from age to growth. The VECM´s coefficient of determination drops from 0.69 to 0.65.

b) The short-run effect of decreasing growth on higher SSERs disappears. There are no significant short-run effects.

These results indicate that the explanatory power of the age variable falls behind the SSER. However, the existing cointegration relation reveals that demographic effects may well stand behind the growth effects of social spending. This will happen if old age pension payments are not cut when the population becomes older.

5 Conclusion

This paper has attempted to analyze the growth effects of the welfare state in Germany from a time series perspective. The main findings are:

a) There is a long-run, negative relationship between social expenditures and economic growth. An increase of the social spending rate of about 10 percent reduces growth of GDP by approximately 2.8 percentage points. From a Granger-causality perspective we find, that in the long run, growth is affected by social security spending but not vice versa. The long-run relationship is not a spurious phenomenon.

b) In the short run, we find the reverse causality direction. Growth variations significantly drive social security expenditures. During economic downturns when growth rates decline or become negative, social spending increases.

c) Regarding growth differences, the explanatory power of investment rates, exports-to GDP ratio or per capita income is limited compared to the welfare state variable.

References

Afonso, A.; Alegre, J. G. (2008) Economic Growth and Budgetary Components. European Central Bank Working Paper No. 848.

Afonso, A.; Jalles, J. T. (2013) Fiscal Composition and Long-term Growth. European Central Bank Working Paper No. 1518.

Arltová, M.; Fedorová, D. (2016) Selection of Unit Root Test on the Basis of Length of the Time Series and Value of AR(1) Parameter, *Statistika*, 96(3): 47-63.

Atkinson, A. B. (1995) The Welfare State and Economic Performance, *National Tax Journal* 48(2): 171-198.

Balcerowicz, L.; Radzikowski, M. (2018) The Case for a Targeted Criticism of the Welfare State, *CATO Journal* 38(1): 1-16.

Bundesministerium für Arbeit und Soziales (2017) Sozialbericht 2017. Berlin.

Dar, A.; Amirkhalkhali, S. (2017) Fiscal Policy, Total Factor Productivity and Economic Growth in Advanced Economies, *Applied Econometrics and International Development* 17(2): 5-18.

Deutsche Bundesbank
https://www.bundesbank.de/resource/blob/802910/8693028629db51b40ee17b0d25b1aade/mL/lange-zeitreihen-data.pdf

Ding, H. (2014) Economic Growth and the Welfare State: A Debate of Econometrics, *Journal of Social Sciences for Policy Implications* 2(2): 165-196.

Erhard, L. (1957) Prosperity through Competition (Translation of Wohlstand für Alle) 1st edition published 1957 in German, English translation available through https://mises.org/library/german-miracle-vs-welfare-state

Fic, T.; Ghate, C. (2005) The welfare state, thresholds, and economic growth, *Economic Modelling* 22(3): 571-598.

Habermann, G. (2013) Der Wohlfahrtsstaat 2nd Edition, Munich.

Herce, J, A.; Sosvilla-Riviero, S.; and Lucio, J. J. D. (2001) Growth in the Welfare State in the EU: A Causality Analysis, *Public Choice* 109: 55-68.

Im, T.; Cho, W.; and Porumbescu, G. (2011) An Empirical Analysis of the Relation Between Social Spending and Economic Growth in Developing Countries and OECD Members, *The Asia Pacific Journal of Public Administration* 33(1): 37-55.

Izák, V. (2011) The Welfare State and Economic Growth, *Prague Economic Papers* 4: 291-308.

Johansen, S.; Juselius, K. (1990) Maximum Likelihood Estimation and Inference on Cointegration—with Application to the Demand for Money, *Oxford Bulletin of Economics and Statistics* 52(2): 169-210.

Jones, E. (2021) The Financial Consequences of Export-led Growth in Germany and Italy, *German Politics* 30: 422-440.

Khan, H.; Bashar, O. (2015) Social expenditure and economic growth: Evidence from Australia and New Zealand using cointegration and causality tests, *The Journal of Developing Areas* 49(4): 285-300.

Leisering, L. (2000) The Welfare State in Postwar Germany—Institutions, Politics and Social Change shortened version of Germany - Reform from within , in. Alcock, P.; Craig, G. (eds.) (2001) *International Social Policy: Welfare Regimes in the Developed World London*.

Lindert, P. H. (2003) Why the Welfare State looks like a Free Lunch, NBER Working Paper 9869.

Lindert, P. H. (2016) Real and Imagined Threats to the Welfare State Hitotsubashi Institute for Advanced Study: Hitotsubashi University, Working Paper HIAS-E-30.

Loyaza, N.; Ranciere, R. (2005) Financial Development, Financial Fragility, and Growth IMF Working Paper WP/05/170. Washington.

Narajan, P. K.; Smyth, R. (2006) What Determines Migration Flows from Low-Income to High-Income Countries? An Empirical Investigation of Fiji-U.S. Migration 1972—2001, *Contemporary Economic Policy* 24(2): 332-342.

Sánchez-Barricarte, J. J. (2017) The long-term determinants of martial fertility in the developed world (19th and 20th centuries): The role of welfare policies, *Demographic Research* 36: 1255-1298.

Simoes, M.; Duarte, A.; and Andrade, J. S. (2014) Assessing the Impact of the Welfare State on Economic Growth: A Survey of Recent Developments, Faculdade de Economia da Universidade de Coimbra Grupo de Estudos Monetários e Financeiros (GEMF) *Estudos do GEMF* No. 20.

Tanner, M.; Hughes, C. (2015) The Work versus Welfare Trade-off: Europe, *Cato Institute Policy Analysis* No. 779.

Toda, H.Y.; Yamamoto, T. (1995) Statistical inference in Vector Autoregressions with possibly integrated processes, *Journal of Econometrics* 66: 225-250.