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Growth and the Welfare State in the EU: A causality analysis

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Abstract. In this paper, we test for causality between GDP growth and social protection expenditure in the European Union. To that end, we apply Hsiao's (1981) sequential procedure to data for twelve EU countries along the 1970–1994 period. Our results suggest that, for Belgium, Germany, Ireland, Luxembourg, the Netherlands, Portugal, and Spain, causality runs only from social protection growth to GDP growth, while for Denmark, France, Greece, Italy, and the United Kingdom, no causality is found between social protection growth and GDP growth.

1. Introduction

Most member states in the European Union have a generalised and sophisticated Welfare State (WS, from now on, standing also for the plural), unparalleled in the world. Many years of a common economic and institutional framework have made these WS very much alike to each other so that, despite certain substantive differences, a "European WS model" is referred too often. Equally often, analysts blame or praise the WS, in Europe or elsewhere, for having strong implications for general economic performance or growth, although a conclusive answer to the implicit question above is neither yet available nor easy to find.

In general, WS are the result of complex historical evolutions, along with programmes designed to cope with emerging dependency situations staking on top of previous ones. Insurance considerations, however, have always accompanied the birth and development of the core programmes of the WS in European countries, like pensions or unemployment benefits, since more than one hundred years ago. Very often, however, incomes granted by certain welfare programmes, are higher than those from work, once the tax system is taken into account. On the other hand, the insurance component may be seen as differed wage and economic security against predictable or unpredictable risks. As a result, the mixture of incentives and disincentives is difficult to disentangle. Last, but not least, the financing of some huge WS programmes exerts strong pressure on personal incomes, company profits or household expenditure what in turn affects behaviour by households and firms.

In a series of recent papers we have explored the relationship between economic growth and the WS in the EU, either simply searching for correlation between growth and the WS (Herce, Sosvilla-Rivero and de Lucio, 1998a) or trying to find evidence of convergence in WS expenditure-GDP ratios across European countries (Herce, Sosvilla-Rivero, and de Lucio, 1998b). Our evidence points towards a positive correlation between the WS and growth and weak causality or convergence (catching-up) in social protection expenditures amongst European countries. These results however beg for a causality analysis given the intricate nature of this relationship. This is the objective of this paper. The outline of the remainder of the paper is as follows. Section 2 elaborates on the WS-growth relationship while reviewing some recent literature on it. The econometric procedure used to test for causality is briefly described in Section 3, and the empirical results are presented in Section 4. Some concluding remarks are offered in Section 5.

2. Does the Welfare State promote growth?

The Welfare State has, on a priory grounds, many implications for growth. Atkinson (1995, 1996), on which Figure 1 is based, discuses some of them as he addresses the lack of conclusiveness of empirical evidence on this relationship. Indeed, as we discussed in the previous section, the WS is a conglomerate of different targeted programmes, financed through social contributions levied upon wages or general taxes on income. It also implies expenditure amounting to an important proportion of output. As we summarise in Figure 1, four arguments can be invoked to explain evidence collected from econometric studies for different countries and time periods: we call them the "disincentives", "dependency", "social asset" and "normal good" arguments. Figure 1 is self-explanatory.

As mentioned before, Herce, Sosvilla-Rivero and de Lucio (1998a) found a positive correlation between WS and growth although no causality test was performed and thus several of the arguments shown in Figure 1 can be applied simultaneously to justify this results, namely the *social asset* and the *normal good* arguments. This result contrasts with the negative role that government expenditure exerts on growth in studies like those by Landau (1985) or Hansson and Henrekson (1994). The first author finds however mixed evidence for transfers when total government outlays are split into different categories. If one focus in the *social asset* argument mentioned above, considering for instance the positive role that less inequality has on economic performance as found by Persson and Tabellini (1994) or González-Páramo (1994), it

		Causality		
		The WS causes g_y	**g_y causes the WS**	**No causality**
Correlation between the WS and g_y	**Negative**	- High transfers and taxes cause poor growth (the *disincentives argument*)	- Poor growth implies larger transfers (the *dependency argument*)	- The mix of disincentives and dependency prevents one-way causation but correlation is clear - The economy catches-up and the WS reaches maturity
	Positive	- High transfers cause high growth (the *social asset argument*)	- High growth permits higher transfers (the *normal good argument*)	- The mix of incentives and normality prevents one-way causation but correlation is clear - Industrialisation first and globalisation latter increase growth and, at the same time, require a larger and more sophisticated WS
	No correlation	- The mix of incentives and disincentives has no definite effect on growth but causation is clear	- The mix of dependency and normality has no definite effect on growth but causation is clear	- Too many factors at play, in fact a complex mix of the various arguments contained in the shadowed cells, prevent a clear-cut pattern of causality and correlation between the WS and growth

Sources: Atkinson (1995) and Atkinson (1996) and own elaboration

Figure 1. The role of the Welfare State on output growth (g_y).

should not be difficult to justify our result provided that social protection programmes reduce inequality. The level of social protection is also important to this respect. McCallun and Blais (1987) find that social expenditure plays a positive role towards economic growth below a certain level and a negative one beyond it. None of these studies however, perform causality test. We now turn to the methodology we use in this paper in order to do so.

3. Econometric methodology

Granger's causality test is widely used to test for the relationship between two variables. However, the causality tests are sensitive to lag length and, therefore, it is important to select the appropriate lengths. Otherwise, the model estimates will be inconsistent and, therefore, it is likely we draw misleading inferences. In this paper, we use Hsiao's (1981) generalisation of the Granger notion of causality. He proposed a sequential method to test for causality, which combines the Akaike's final predictive error (FPE, from now on) and the definition of Granger causality.

Consider the following models,

$$X_t = \alpha_0 + \sum_{i=1}^{m} \delta_i X_{t-i} + \varepsilon_t \tag{1}$$

$$X_t = \alpha_0 + \sum_{i=1}^{m} \delta_i X_{t-i} + \sum_{j=1}^{n} \gamma_j Y_{t-j} + \varepsilon_t \tag{2}$$

where X_t and Y_t are stationary variables [i. e., they are I(0) variables]. The following steps are used to apply Hsiao's procedure for testing causality:

(i) Treat X as a one-dimensional autoregressive process (1), and compute its FPE with the order of lags m varying from 1 to M. Choose the order which yields the smallest FPE, say m, and denote the corresponding FPE as $FPE_X(m,0)$.
(ii) Treat X as a controlled variable with m number of lags, and treat Y as a manipulated variable as in (2). Compute again the FPE of (2) by varying the order of lags of Y from 1 to N, and determine the order which gives the smallest FPE, say n, and denote the corresponding FPE as $FPE_X(m,n)$.
(iii) Compare $FPE_X(m,0)$ with $FPE_X(m,n)$ [i. e., compare the smallest FPE in step (i) with the smallest FPE in step (ii)]. If $FPE_X(m,0) > FPE_X(m,n)$, then Y is said to cause X. If $FPE_X(m,0) < FPE_X(m,n)$, then X is an independent process.
(iv) Repeat steps (i) to (iii) for the Y variable, treating X as the manipulated variable.

When X and Y are not stationary variables, but they are first-difference stationary [i. e., they are I(1) variables] and they are cointegrated (see Dolado et al., 1990), it is possible to investigate the causal relationships from ΔX to ΔY and from ΔY to ΔX, using the following error correction models:

$$\Delta X_t = \alpha_0 + \beta Z_{t-1} + \sum_{i=1}^{m} \delta_i \Delta X_{t-i} + \varepsilon_t \tag{3}$$

$$\Delta X_t = \alpha_0 + \beta Z_{t-1} + \sum_{i=1}^{m} \delta_i \Delta X_{t-i} + \sum_{j=1}^{n} \gamma_j \Delta Y_{t-j} + \varepsilon_t \tag{4}$$

where Z_t is the OLS residual of the cointegrating regression $X_t = \mu + \lambda Y_t$. Note that, if X_t and Y_t are I(1) variables, but they are not cointegrated, then β in (3) and (4) is assumed to be equal to zero.

In both cases [i. e., X_t and Y_t are I(1) variables, and they are or they are not cointegrated], we can use Hsiao's sequential procedure substituting X with ΔX and Y with ΔY in steps (i) to (iv), as well as substituting expressions (1) and (2) with equations (3) and (4).

4. Empirical results

We have applied the methodology described in the previous section to data for the twelve EU countries existing before the enlargement to Austria, Finland and Sweden. We have used data both on Gross Domestic Product (GDP) and Social Protection Benefits (SPB) in per capita terms. Data on GDP and total population comes from Bell (1994) and have been extended to 1994 using OECD (1996) data. The data on SPB comes from EUROSTAT (1988 and 1996). Both GDP and SPB were expressed at constant 1985 prices, and then the local currencies converted to a common standard using the OECD (1996) purchasing power parity estimates. We have taken logarithms of both variables and so in the tables that follow y and sp denote the logs of real GDP per capita and real SPB per capita, respectively.

As a first step, we tested for the order of integration of the variables y and sp by means of the Dickey-Fuller tests. The results, shown in Table 1, suggest that all the variables could be treated as first-difference stationary.

Second, we have tested for cointegration between the pair of variables y and sp for all the countries in our sample. To that end, we use both the Johansen (1991, 1995) cointegration test for the null hypothesis of no cointegration and the Leybourne and McCabe (1994) test for the null of cointegration. As can be seen in Table 2, the results suggest that y and sp are cointegrated at the usual levels of significance only for Belgium, Denmark, France, Luxembourg and the Netherlands.

Therefore, for Greece, Belgium, Denmark, France, Luxembourg and the Netherlands, we tested for causality in first differences of the variables, with an error-correction term added [i. e., equations (3) and (4)]. For the cases of Germany, Greece, Ireland, Italy, Spain and the United Kingdom, we tested for causality in first differences of the variables, with no error-correction term added [i. e., equations (3) and (4), with $\beta = 0$]. Notice that, since we are dealing with logs of the variables, we would be testing Granger causality between the rates of growth of SPB and GDP. The resulting FPE statistics are reported in Table 3.

As can be seen, for Belgium, Germany, Ireland, Luxembourg, the Netherlands, Portugal, and Spain, $FPE\Delta_y(m, 0) > FPE\Delta_y(m, n)$ and $FPE_{\Delta sp}(m, 0) < FPE_{\Delta sp}(m, n)$, suggesting Granger causality running from SPB growth to GDP growth. On the other hand, for Denmark, France, Greece, Italy, and the United Kingdom, $FPE_{\Delta y}(m, 0) < FPE_{\Delta y}(m, n)$ and $FPE_{\Delta sp}(m, 0) < FPE_{\Delta sp}(m, n)$, and no Granger causality would be present between SPB growth and GDP growth.

In order to further check our results, we test whether the differences between RMEs suggested by the FPE statistics in Table 3 are statistically significant or not. To that end, we have considered the Williams-Kloot test

Table 1. Dickey-Fuller tests for unit roots

	Panel A: I(2) *versus* I(1)					
	Δy			Δsp		
	τ_τ	τ_μ	τ	τ_τ	τ_μ	τ
Belgium	-3.7728^{b}	-3.1836^{b}	-2.5648^{b}	-3.6531^{b}	-3.4789^{b}	-2.8134^{a}
Denmark	-4.9717^{a}	-3.5630^{b}	-2.7671^{a}	-3.6670^{b}	-3.7520^{b}	-2.5528^{b}
France	-3.9715^{b}	-3.1294^{b}	-2.2194^{b}	-4.5424^{b}	-3.5015^{b}	-2.3661^{b}
Germany	-4.0479^{b}	-3.6077^{b}	-2.7701^{a}	-3.8899^{b}	-3.6022^{b}	-2.6019^{b}
Greece	-3.6784^{b}	-2.9183^{c}	-2.0494^{b}	-4.3229^{b}	-3.8542^{b}	-1.9791^{b}
Ireland	-3.7691^{b}	-2.9920^{c}	-2.0470^{b}	-3.7525^{b}	-3.1193^{b}	-2.7916^{a}
Italy	-3.7411^{b}	-3.3298^{b}	-2.5132^{b}	-3.7231^{b}	-3.1541^{b}	-2.5715^{b}
Luxembourg	-3.7603^{b}	-3.1384^{b}	-1.9804^{b}	-3.8379^{b}	-3.4246^{b}	-2.1968^{b}
Netherlands	-3.8820^{b}	-3.5334^{b}	-2.2115^{b}	-3.7897^{b}	-3.3797^{b}	-2.2615^{b}
Portugal	-3.7503^{b}	-3.1898^{b}	-2.3871^{b}	-3.9819^{b}	-3.2753^{b}	-2.1679^{b}
Spain	-3.7544^{b}	-3.4397^{b}	-2.4664^{b}	-4.2530^{b}	-3.5601^{b}	-2.3615^{b}
U.K.	-3.7347^{b}	-3.1599^{b}	-2.7736^{b}	-3.7995^{b}	-3.8964^{a}	-3.0439^{b}

	Panel B: I(1) *versus* I(0)					
	y			sp		
	τ_τ	τ_μ	τ	τ_τ	τ_μ	τ
Belgium	–1.5537	–2.2454	0.7866	–2.6459	–0.3882	–1.3593
Denmark	–1.1831	0.4375	–1.0182	–1.9535	0.2184	–1.0858
France	–1.9417	–2.0766	0.1076	–1.6477	–1.9360	–1.1879
Germany	–0.5875	–1.6478	0.9018	–1.5168	–2.0515	1.3514
Greece	–1.5355	–0.9652	1.8162	0.0086	–1.6554	–0.0581
Ireland	–0.0585	–1.0582	–0.2881	–1.4649	–0.4656	–1.1669
Italy	–0.6404	–1.7429	1.2185	–1.0331	–2.0823	0.4747
Luxembourg	–2.0803	0.5902	–1.2439	–1.6264	–0.1557	–1.0982
Netherlands	–2.8820	0.4561	–0.9716	0.1692	–2.1439	–1.3141
Portugal	–1.5738	–1.6989	1.0680	–1.3516	–1.4823	0.0488
Spain	–2.2466	–1.4794	0.2799	–2.2473	–1.5012	–0.1912
U.K.	–1.4018	–1.9610	0.7741	–1.6099	–1.0104	–0.8105

Notes: The ADF statistic is a test for the null hypothesis of a unit root.
τ_τ, τ_μ and τ denote de ADF statistics with drift and trend, with drift, and without drift, respectively (see Dolado, Jenkinson and Sosvilla-Rivero, 1990). In Panel A, the null of two unit roots is rejected in favor of the one unit root alternative if the statistic is larger (more negative) than the critical value. In Panel B, the null of a unit roots is rejected in favor of the alternative of level stationarity if the statistic is larger (more negative) than the critical value. The critical values at the 5% and 1% significance levels are –3.60 and –4.38 for τ_τ, –3.00 and –3.75 for τ_μ, and –1.95 and –2.66 for τ (see Fuller, 1976).
[a] and [b] detone significance at the 5% and 1% level, respectively.

Table 2. Cointegration tests

	Johansen	Leybourne and McCabe
Belgium	19.304[b]	0.176[b]
Denmark	40.472[a]	0.144[b]
France	24.480[a]	0.108[b]
Germany	14.456	0.613
Greece	11.471[a]	0.644
Ireland	7.379	0.594
Italy	12.883	0.643
Luxembourg	23.723[a]	0.140[b]
Netherlands	17.649[b]	0.186[b]
Portugal	9.196	0.642
Spain	7.731	0.561
U.K.	5.378	0.649

Notes: Johansen is the so-called trace statistic for the number of cointegrating relations with the null hypothesis of no cointegration. The null of no cointegration is rejected in favour of the cointegration alternative if the ststistic is larger than the critical values: 15.41 and 20.04, at the 5% and 1% significance leveles, respectively (see Osterwald-Lenun, 1992).
Leybourne and McCabe is a test for the null hypothesis of cointegration. The null of cointegration is rejected in favour of the no cointegration alternative if the statistic is larger than the critical values: 0.308 and 0.557, at the 5% and 1% significance leveles, respectively (see Leybourne and McCabe, 1994).
[a] and [b] detone significance at the 5% and 1% level, respectively.

for forecasting accuracy described in Williams (1959). Let f_1 and f_2 denote alternative forecasts of the variable z, the Williams-Kloot test statistic is the t-ratio for the hypothesis that the coefficient on $f_1 - f_2$ is zero in a regression of $z - (f_1 + f_2)/2$ on $f_1 - f_2$. A significantly negative value implies that f_2 is statistically superior to that of f_1 (and *vice versa*). Therefore, we generated forecasts for Δy and Δsp both considering only past values of the forecasted variable and considering also, in addition, past values of the other variable (and the error correction term for the cases of Greece, France, Portugal and the United Kingdom, where cointegration was found).

The results are shown in Table 4. As one can see, the Williams-Kloot test suggests that for Belgium, Germany, Ireland, Luxembourg, the Netherlands, Portugal, and Spain, GDP growth can be better predicted by adding the information content of the SPB growth, rather than by past values of GDP growth alone. This is not the case for Denmark, France, Greece. On the other hand, forecasting accuracy for SPB growth rates cannot be gained

Table 3. FPE statistics

	$FPE_{\Delta y}$ (m,0) $X10^{-3}$	$FPE_{\Delta y}$ (m,n) $X10^{-3}$	Comment	$FPE_{\Delta sp}$ (m,n) $X10^{-3}$	$FPE_{\Delta sp}$ (m,0) $X10^{-3}$	Comment
Belgium	1.1599	1.1470	Causality $y \rightarrow sp$	1.7075	1.7701	No causality $sp \rightarrow y$
Denmark	0.5702	0.6211	No causality $y \rightarrow sp$	0.7266	0.8401	No causality $sp \rightarrow y$
France	0.6382	0.6724	No causality $y \rightarrow sp$	1.2158	1.3173	No causality $sp \rightarrow y$
Germany	1.1182	1.0885	Causality $y \rightarrow sp$	3.0218	3.5586	No causality $sp \rightarrow y$
Greece	4.9808	5.4126	No causality $y \rightarrow sp$	9.5308	10.9301	No causality $sp \rightarrow y$
Ireland	3.2917	2.9089	Causality $y \rightarrow sp$	6.4222	6.6511	No causality $sp \rightarrow y$
Italy	1.6516	1.7917	No causality $y \rightarrow sp$	3.0176	3.2017	No causality $sp \rightarrow y$
Luxembourg	1.2461	0.9356	Causality $y \rightarrow sp$	9.3792	10.4292	No causality $sp \rightarrow y$
Netherlands	0.7185	0.5281	Causality $y \rightarrow sp$	1.2433	1.3883	No causality $sp \rightarrow y$
Portugal	3.5000	3.0472	Causality $y \rightarrow sp$	11.4500	15.5260	No causality $sp \rightarrow y$

Table 3. Continued

	$FPE_{\Delta y}$ (m,0) $X10^{-3}$	$FPE_{\Delta y}$ (m,n) $X10^{-3}$	Comment	$FPE_{\Delta sp}$ (m,n) $X10^{-3}$	$FPE_{\Delta sp}$ (m,0) $X10^{-3}$	Comment
Spain	1.0500	0.8755	Causality $y \rightarrow sp$	3.6705	3.7867	No causality $sp \rightarrow y$
U.K.	2.4344	2.5436	No causality $y \rightarrow sp$	2.5940	2.7238	No causality $sp \rightarrow y$

Notes: The FPE statistic is the minimum final prediction error.
The FPE(m,0), FPE(m,n), m and n are defined in Section 3.

by considering also the information content of GDP growth. Therefore, these results reinforce our earlier conclusion from Table 3.

Finally, we have checked the possible effects on the previous results following the German reunification. To this end, we have re-evaluated the results for the German case, excluding the subperiod 1991–1994 (as in Henry and Weidmann, 1995). Table 5 offers the results for the FPEs and Williams-Kloot test. As can be seen, we obtain qualitative similar results than those for the whole period.

5. Concluding remarks

This paper has tried to establish whether the welfare state through social protection expenditure causes growth. This also implies a positive correlation between the WS and economic performance, although the opposite is not true. Our results point towards statistically significant Granger causality running from social protection expenditures towards growth, the latter being promoted by the former for seven countries out of twelve in the EU. We cannot associate a definite pattern for those countries where the WS seems to cause growth, for all these countries present a variety of characteristics related to size, composition and financing of the WS. This is a question to be explored in the future.

Based thus on our characterisation of the possible interactions between the WS and economic performance we would tend to focus on the relative dominance of the social asset argument over the normal good argument and, even more, over the disincentives and dependency arguments as the explanation of our results. This does not imply that the other three arguments do not apply, but rather that their operation is overtaken by the social asset effect. Neither can we claim that social protection promotes growth below a certain size of the WS and not beyond that level. For our analysis is not able to discriminate why certain countries pass the causality test while the rest do not.

Some externalities favouring growth, however, seem to be present when a country has a developed system of social or collective protection. This is relevant, in our view, for the current debate about the privatisation of social security in Western countries. In particular, the important thing is that citizens have a sense of security solidly rooted on the existence of widespread institutions for collective security. Whether these institutions are safer or more efficient under public or private management and financing is another issue. Privatisation of social security, if this is the final outcome of the efficiency comparison and as far as our results go, should not diminish the protection of individuals against the standard contingencies now covered by the Welfare State.

Table 4. Willian-Kloot tests

$y \to sp$ $\Delta y = \alpha + \sum_{i=1}^{m} \delta_i \Delta y_{t-i}$ vs $\Delta y = \alpha + \sum_{i=1}^{m} \delta_i \Delta y_{t-i} + \sum_{j=1}^{n} \gamma_j sp_{t-j}$	
Germany	–2.6615[b]
Greece	2.1573[b]
Ireland	–2.8462[a]
Italy	2.4852[b]
Portugal	–3.6344[a]
Spain	–2.7915[a]
U.K.	2.0495[b]
$y \to sp$ $\Delta y = \alpha + \sum_{i=1}^{m} \delta_i \Delta y_{t-i} + \beta Z_{t-1}$ vs $\Delta y = \alpha + \sum_{i=1}^{m} \delta_i \Delta y_{t-i} + \sum_{j=1}^{n} \gamma_j sp_{t-j} + \beta Z_{t-1}$	
Belgium	–2.8553[a]
Denmark	3.9771[a]
France	2.2134[b]
Luxembourg	–2.9180[a]
Netherlands	–3.9428[a]
$sp \to y$ $\Delta sp = \alpha + \sum_{i=1}^{m} \delta_i \Delta sp_{t-i}$ vs $\Delta sp = \alpha + \sum_{i=1}^{m} \delta_i \Delta sp_{t-i} + \sum_{j=1}^{n} \gamma_j y_{t-j}$	
Germany	2.3331[b]
Greece	2.0511[b]
Ireland	2.7393[a]
Italy	3.1956[a]
Portugal	2.5038[b]
Spain	2.6048[a]
U.K.	2.4534[b]
$sp \to y$ $\Delta sp = \alpha + \sum_{i=1}^{m} \delta_i \Delta sp_{t-i} + \beta Z_{t-1}$ vs $\Delta sp = \alpha + \sum_{i=1}^{m} \delta_i \Delta sp_{t-i} + \sum_{j=1}^{n} \gamma_j y_{t-j} + \beta Z_{t-1}$	
Belgium	2.7292[a]
Denmark	–3.3841[a]
France	3.1324[a]
Luxembourg	3.9831[a]
Netherlands	2.8103[a]

Notes: The Williams-Kloot statistic is a test for forecasting accuracy. A significantly negative value implies that the forecast from the second model is statistically superior to that from the first model(and *vice versa*). The critical values at the 5% and 1% significance levels are 2.58 and 1.96, respectively.
[a] and [b] denote significance at the 5% and 1% level, respectively.

Table 5. FPE and Willian-Kloot tests before German reunification

EPE tests				Willian-Kloot test	
FPEΔy(m,0) X10^{-3}	FPEΔy(m,n) X10^{-3}	FPEΔsp(m,0) X10^{-3}	FPEΔsp(m,n) X10^{-3}	$\Delta y = \alpha + \sum_{i=1}^{m} \delta_i \Delta y_{t-i}$ vs $\Delta y = \alpha + \sum_{i=1}^{m} \delta_i \Delta y_{t-i} + \sum_{j=1}^{n} \gamma_j sp_{t-j}$	$\Delta sp = \alpha + \sum_{i=1}^{m} \delta_i \Delta sp_{t-i}$ vs $\Delta sp = \alpha + \sum_{i=1}^{m} \delta_i \Delta sp_{t-i} + \sum_{j=1}^{n} \gamma_j sp_{t-j}$
0.5624	0.5087	1.5202	1.6628	–3.9532[a]	2.4439[b]

Notes: See Table 3 and 4.

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