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AN ALTERNATIVE APPROACH TO EXPLAINING UNEMPLOYMENT. EVIDENCE FROM A THREE COUNTRY STUDY

By

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Abstract

Creating sustained economic growth and tackling unemployment remain centre-stage in economic policy debate across the globe and look set to remain there for the foreseeable future. As a result, much academic debate has been developed regarding this macroeconomic problem, as well as policy measures to confront it. This study aims at gaining an insight into the relationship between capital stock and employment as one of the main factors that exacerbates the existing problem. An econometric analysis will provide us with some interesting results, concerning the behaviour of the two economic variables in question, over a period of time. More specifically, our econometric part will be concentrating on the analysis of the data of three European countries the UK, Germany, and France (JEL Classification: B22, E12).

1. Introduction

Within the European Community, UK is one of the countries that has experienced the highest rates of unemployment throughout the 1980s. As a result, much academic debate has been developed regarding this macroeconomic problem, as well as policy measures to confront it. Another prominent feature of this period is the widespread increase in earnings inequality, which to a great extent, is linked with the rise in unemployment. Many studies have pointed out that the wages of unskilled and uneducated workers have fallen in relative terms, and some times absolutely, thereby reversing the long post war trend towards greater equality.

This study will attempt to illuminate some aspects of the existing problem of high unemployment over the last decades. Its main focus will be on the

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relationship between employment and capital stock. In this domain, our work has been inspired by a recent study by Rowthorn (1995), and has been further stimulated by a book of Michie and Grieve (1996).

More specifically, section 2 takes us through the various ways that employment and capital stock are interrelated in light of the relevant literature. In section 3 we will be concentrating on the empirical part where descriptive statistics as well as econometric analysis are employed, in an attempt to look into the relationship of the two economic variables. At this stage annual time series for the period 1969-95 for the British, the French and the German economies are going to be used for our analysis. Finally, section 4 provides some conclusions, which are going to wrap up the final part of our study.

2. Capital formation and employment: a theoretical context. An alternative approach

Since 1960 European Union employment has increased by only 10 per cent, as opposed to an 80 per cent and 40 per cent increase in North America and Japan respectively. Evidently, the high rates of labour-force growth in North America and Japan have been matched by high rates of job creation. Of course, comparing rates of job creation does not mean much. It would have been impossible for the European Union to create as many jobs as North America, simply because the European rate of population growth was so much lower. The fundamental question is not why European job creation has been low in absolute terms, but why job creation in Europe did not keep pace with its rate of population growth.

Monetarist and free-market thinking was established as the predominant approach and in effect commenced to dominate economic policy. The notion that inflation could be avoided by controlling the money supply, was not a sufficient answer to the soaring problem of unemployment. Deregulation of labour markets added to, rather than mitigated the problem.

In the 1980s, with demand well below full employment levels, capacity throughout the EU was eroded by closures and inhibitions on investment. Smith (1996) pinpoints the problem in that today, depressing demand is more effective in reducing capacity than expanding demand is in increasing it. It is common sense that investment in new productive capacity will create jobs, while the destruction of existing capacity may destroy jobs.

However many Economists have shown complete disregard for the aforementioned proposition on the grounds that the problem of job creation is mainly a matter of encouraging more employment on existing capital stock (Layard and Nickell 1986).

For Smith (1996) encouraging the expansion of capacity and taking measures to reduce the tendency to inflation at any given level of capacity utilization so that the government is less concerned to hold down demand, are two major target areas.

The dominant view, however, seems to be that persistent unemployment is mainly due to labour market rigidities which, together with poor education and motivation, are preventing the unemployed from getting work on existing capital stock. This is certainly the view that is quite pervasive in reports such as the OECD Jobs study (1994a) and the OECD Economic outlook (1994b).

In addition, Rowthorn (1995) in an attempt to highlight the relationship between capital stock and employment maintained that inadequate investment over the past 20 years, which was more prominent in manufacturing and other tradables, has been an additional factor behind the rise in unemployment in Western Europe. Moreover, he pointed out that a substantial volume of investment is needed, should a reduction in unemployment is to be achieved. In the same article, he states that "the current fashion for education, training, and labour market reform is not entirely misplaced, but such measures are likely to be more effective at job creation if they are accompanied by substantially more investment in productive capacity" (Rowthorn 1995, pp. 16).

Moreover, necessary action for education and reform of the labour market will enable production to expand, encourage firms to invest and therefore increase profits. It is essential that capital stock increases rather than encourage employment on the existing one. The employment implications of investment depend on the extent to which it causes real wages to rise and thereby induces a change in factor proportions.

It is beyond any shadow of doubt that decisions to invest in new capacity are influenced by the cost and availability of capital and the target rates of return sought by firms and financial institutions. Using interest rates both to combat inflation and to bolster weak currencies creates a bias towards higher real interest rates.

Overvalued exchange rates and high interest rates have dominated UK's macroeconomic policy over the past thirty years. The repercussions of such policies have been pernicious to manufacturing, while industrial policy has been ineffectual, with little attempt to use the public sector as a modernising force. In addition, the steady upward trend of interest rates in conjunction with their unprecedented volatility have contributed to impeding investment and business confidence.

According to Cambridge survey (SBRC 1992) interest rate policy during the 1980s has been identified as the main government policy which has inhibited the growth of firms. Since 1979 UK Government's main preoccupation has been the targeting of nominal variables (inflation and interest rates) rather than real variables (jobs and output).

The extent of the post-1979 recession forced a number of firms to reduce capacity in order to minimize short-term costs and maximize the possibility of survival.

Another interesting feature that capital stock has, is its impact on even the employed work-force. It is argued that in highly regulated economies, premature scrapping and inadequate investment manifest themselves mainly in the form of lower employment. On the one one hand, in regulated economies, due to the small number of secondary labour market, low investment will not result in actually forcing people into accepting badly paid jobs (generous state benefits). On the other hand, in deregulated economies the opposite is the case. Workers are willing to accept any kind of a job since the state benefits are not sufficient and poverty is more severe. As a result wages are forced down, creating still more inequality.

Thus, capital shortage can manifest itself in either unemployment or earnings inequality. In highly regulated economies, unemployment will be the main outcome of capital shortage, while in deregulated economies the result may be grater earnings inequality.

Smith (1996) stresses that firms look upon profit (demand) expectations as being a major factor influencing their decisions to expand capacity. It is very important that firms are reassured about a sustained growth in demand so that they can uninhibitedly embark on investment activities. However, recent experience suggests that businesses suffered huge losses which had an adverse effect in investment. Kitson and Michie (1996) posit that the outrageous decline in manufacturing employment in Britain is

mainly due to the fact that output has failed to grow. This failure is to be blamed on insufficient manufacturing capacity and lack of competitiveness. In other words lack of investment, particularly in capital equipment but also skills, has impaired this sector of the economy.

The argument that low profits are one of the reasons why investment is in such a dire state, should be taken with a pinch of salt. Increased profits in Britain all too often simply feed dividend payments rather than increased investment (Glyn 1992). Thus policies that seek to raise profits will not be sufficient to increase investment and may have adverse impacts on aggregate demand and the distribution of income.

Michie and Smith (1996) have argued that the real problem about encouraging investment in new capacity is that of risk . The question that has to be answered is how you entice firms into taking this risk. Once this is recognised as one of the central problems of economic policy today, attention will focus on the various means by which this can be affected: the government's own economic strategy, the institutional factors determining the supply of capital, interest rates, company taxation, and so on.

3. Empirical analysis

Table 1, shows what happened to capital stock and employment in UK, Germany, and France over the period 1966-95. During the period 1966-79 the mean growth rates of gross capital stock and employment for UK were 3.5 and 0.5 per cent respectively. For Germany 4.3 and 0.5 per cent, and finally for France 4.6 and 0.6 per cent. The following period and more specifically between 1979-95, in UK there was some considerable change of about (-1.6) per cent in gross capital stock, and (-0.4) in employment. As regards Germany and France, the observed changes are the following: a (-1.6) per cent change in gross capital stock and (-0.3) per cent in employment for the former; a (-2.1) per cent change in gross capital stock and (-0.2) per cent in employment for the latter. As we can discern all three countries have experienced a major slow-down in the growth rate of capital stock since 1979, which has been accompanied by a widespread decline in employment growth. The yielding evidence, in conjunction with the already existing theories, reinforce the notion that there is a strong relationship between capital stock and employment.

The data we are going to use for our econometric analysis, consists of annual time-series for total employment and gross capital stock, for UK, Germany and France for the period 1966-1995 (See Table 2 for the definition of the variables).

Our econometric methodology is the following: initially we analyse the statistical properties of the data. More specifically, we look into our series to see whether they contain unit roots or not. The standard Dickey-Fuller (DF) and augmented Dickey-fuller (ADF) tests are employed to test the order of integration of the variables. Next, we engage in testing the cointegration of the series. Finally, we proceed to the regression analysis.

3.1 Unit roots tests

Identifying the order of the integration of our variables is the first step in our regression analysis . Table 3, summarises the ADF tests for our variables. A quick inspection of the table indicates that for all variables in all three countries, the null hypothesis can not be rejected.

In order to specify the order of integration of the non-stationary variables, we repeat the unit root tests on the first differences of each time series, the results of which are documented in Table 3. Table 3 suggests that we can reject the null hypothesis for all variables in all three countries. Therefore according to the ADF test, we can treat employment and capital stock as I(1) variables.

3.2 Cointegration tests

Since all variables appear to be integrated of order one, then the first difference must be taken in the regression analysis, to avoid spurious regressions. However, one drawback of the procedure of differencing is that it results in a loss of valuable long-run information in the data.

Given that we treat the variables in all three countries as I(1) processes, it becomes possible to use cointegration methodology in order to test whether there is a long run relationship between employment and capital stock in each country. There are different ways to test for cointegration. In this work, we will carry out the Johansen procedure using VAR model to test the cointegration of the non-stationary variables in levels, the results of which are reported in Tables 4, 5, and 6. The results obtained suggest

that there is a unique long-run relationship between the dependent and the independent variables.

3.3 Regression analysis

Before we proceed to the actual specification of the equation, it is essential that we stipulate the reasons why, we have employed logarithms to carry out this task.

(i) Economic variables are usually non-negative

(ii) Coefficients in a log-log regression can be interpreted as elasticities: measuring the percentage change in the dependent variable in response to a one per cent change in the independent variable.

(iii) Disturbances in logarithmic regressions are more likely to be homoskedastic.

(iv) Changes in logarithms approximate growth rates very closely, when the growth rate is very small.

Our econometric methodology is based on the autoregressive distributed lag approach to cointegration analysis (ARDL) proposed by Pesaran and Shin, described in the previous section. We start off by estimating an autoregressive distributed lag model of order three (ARDL, 3,3), with a deterministic trend:

$$Et=\alpha+\sum_{i=1}^{3}\ \beta iEt\text{-}i+\sum_{i=0}^{3}\ \gamma iKt\text{-}i+Dt+t$$

where Et is the log of employment, Kt is the log of capital stock, Dt is a dummy and t is a time trend.

By applying the Schwartz Bayesian Criterion(SIC), the Akaike Information Criterion (AIC), and the Likelihood Ratio test(LR) (see Appendix III), we end up with an ADRL (2,2) for UK and Germany and an ARDL (3,2) for France (see Appendix II). Two dummy variables, one for UK and one for Germany, are entered in the models. The DUK (dummy for UK) is entered in our equation, in an attempt to capture the impact of the restrictive economic policies that have been implemented by the British conservative government since 1979, whereas the DGE (dummy for Germany) will enable

us to take a closer look at the relationship between the two variables after the German unification.

Appendix II presents the OLS estimates of the chosen regressions for all three countries. After the application of a full range of mispecification tests in all estimated regressions, we fail to reject the nul hypothesis. Therefore, there is no evidence of failure of linearity, normality homoskedasticity and serial correlation. Moreover the CUSUM and CUSUMSQ tests which are not presented in this paper suggest that our models are structurally stable.

3.4 Interpretation of results

At this stage it is essential that we look into the regression analysis of each country individually. We start off by exposing the analysis concerning UK. As we explained earlier on, after having applied the AIC, SIC, and the LR test we end up with our final equation (2). All the coefficients of the variables in equation (2) are statistically significant at the 5% level of significance. What emerges from the whole analysis so far, can be concisely interpreted in the following paragraph.

There is a strong positive relationship between capital stock and employment. A 1% increase in capital stock, is going to cause employment to go up by 3.31% in the short run. The negative coefficient of the additive dummy (Dt), shows that the policies adopted by the Thatcher administration resulted in a reduction in employment.

Our next step is the calculation of the long run solution (see Appendix III). In the long run the elasticity of employment with respect to capital is 0.03 for the entire period.

The results concerning the regression analysis for Germany indicate that employment and capital stock are positively related. Our final equation is given in appendix II together with all the relevant econometric analysis. Specifically, the coefficients of the variables in equation 4 are statistically significant at the 5% level of significance. A 1.0% increase in capital stock, will cause employment to go up by 1.99% in the short run. In Germany's case the fact that the dummy variable is found to be insignificant implies that the German unification had no impact on the relationship between employment and capital stock. In the long run the elasticity of employment with respect to capital is 0.0548 for the entire period. What follows from the above is that there is a unique relationship between the two economic variables in question.

As regards France, we started off with an ARDL (3,3) without dummy, and after the application of the aforementioned criteria we end up with equation (6). The coefficients of the variables in equation (6) are statistically significant at the 5% level of significance. A 1.0% increase in capital stock is going to cause employment to go up by 1.7% in the short run. In the long run the elasticity of employment with respect to capital is 0.06 for the whole period.

As we can discern from the preceding analysis, the behaviour of our variables in question is paramount in all three countries.

4. Conclusions

The findings that pop out from the preceding econometric analysis, suggest that capital stock and employment are inextricably linked with one another. Any changes in capital stock, will have a positive impact on employment. More specifically, in the UK during the period 1960-79, the decline in the growth rate of capital stock, had a negative effect on employment. After that, the problem has been further exacerbated, mainly, due to the contractionary policies fostered by the conservative government. In Germany the two economic variables reacted in the same way as in the UK. The interesting thing that emerges is that the German unification had no impact on the way employment and capital stock interact during the observed period. Finally, the model used for the analysis of the French data rounds up the technical part by reinforcing the notion that gross capital stock and employment are closely related.

Moreover, it is currently fashionable to stress the role of labour market policies as a means to encourage employment on existing capital stock. However, these policies also stimulate the formation of new capital stock, since they increase the rate of profit by improving the quality of the labour supply and restraining the growth of wages. The problem of unemployment is ultimately one of investment. To create the required number of acceptable jobs will require substantial investment both in fixed capital and in education and training. These types of investment should be seen not as substitutes, but as complements.

To sum up, the whole issue surrounding the relationship between employment and capital formation deserves a more rigorous treatment, should any illuminating evidence emerge and effectively interpret some of the causes of unemployment.

APPENDIX I

TABLE 1

Annual Percentage Growth of Capital and Employment (1966-95)

COUNTRIES	CAPITAL STOCK		EMPLOYMENT	
	1966-79	1979-95	1966-79	1979-95
UK	3.5	1.9	0.5	0.1
GERMANY	4.3	2.7	0.5	0.2
FRANCE	4.6	2.5	0.6	0.4

Source: OECD Economic Outlook.

TABLE 2

Definitions of Variables

EUK = ln (total employment, UK)
KUK = ln (gross capital stock, UK)
EGE = ln (total employment, Germany)
KGE = ln (gross capital stock, Germany)
EFR = ln (total employment, France)
KFR = ln (gross capital stock, France)
C = Constant.
DUK = dummy variable (D = 1 for the period 1979-95, D= 0 otherwise)
DGE = dummy variable (D = 1 for the period 1990-95, D = otherwise)
DE = first difference of employment
DK = first difference of capital stock
T = deterministic trend

APPENDIX II

TABLE 3

Unit Root Tests (1966-1995)

VARIABLES	UK	GERMANY	FRANCE
E (log of employment)	ADF^1 -2.24 (-3.55)	ADF^1 -3.03 (-3.54)	ADF^2 -1.90 (-3.55)
K (log of capital stock)	ADF^1 -0.744 (-3.54)	ADF^2 -2.13 (-3.55)	ADF^2 -2.01 (-3.56)
DE (first difference of employment)	ADF^1 -3.00 (-2.94)	ADF^2 -3.43 (-2.94)	ADF^1 -4.02 (-3.55)
DK (first difference of capital stock)	ADF^1 -4.19 (-3.55)	ADF^2 -3.96 (-2.55)	ADF^1 -3.95 (-3.56)

Notes: ADF: Augmented Dickey-Fuller test.; superscript denotes the order of augmentation. 95% critical values in brackets with trend.

TABLE 4

Johansen Test for Cointegration in the UK

Maximum lag in VAR=1				
TEST			MAXIMAL EIGENVALUE	
Null	Alternative	Statistic	5% Critical Val.	10% Critical Val.
r=0	r=1	68.05	14.07	12.07
r<1	r=2	3.66	3.76	2.69
TEST			TRACE STATISTIC	
Null	Alternative	Statistic	5% Critical Val.	10% Critical Val.
r=0	r>=1	20.37	17.95	15.66
r<=1	r=2	3.57	8.18	6.50

Notes: Variables, EUK, KUK
-r= number of cointegrating vectors.

TABLE 5

Johansen Test for Cointegration in Germany

Maximum lag in VAR=1				
TEST			MAXIMAL EIGENVALUE	
Null	Alternative	Statistic	5% Critical Val.	10% Critical Val.
r=0	r=1	15.89	14.07	12.07
r<=1	r=2		3.76	2.69
TEST			TRACE STATISTIC	
Null	Alternative	Statistic	5% Critical Val.	10% Critical Val.
r=0	r>=1	16.51	15.41	13.32
r<=1	r=2	.62	3.76	2.69

NOTES: Variables, EGE, KGE
-r= number of cointegrating vectors.

TABLE 6

Johansen Test for Cointegration in France

Maximum lag in VAR=1				
TEST			MAXIMAL EIGENVALUE	
Null	Alternative	Statistic	5% Critical Val.	10% Critical Val.
r=0	r=1	15.99	14.9	12.91
r<=1	r=2	6.30	8.17	6.50
TEST			TRACE STATISTIC	
Null	Alternative	Statistic	5% Critical Val.	10% Critical Val.
r=0	r>=1	22.29	17.95	15.66
r<=1	r=2	6.30	8.17	6.50

NOTES: Variables, EFR, KFR
-r= number of cointegrating vectors.

APPENDIX III

OLS-REGRESSION RESULTS (UK)

Equation 1

$EUK_t = 2.97 + 1.16EUK_{t-1} - .63EUK_{t-2} + .163EUK_{t-3} + 3.2KUK_t -$

(1.2) (.215) (.29) (.15) (.60)

$4.8KUK_{t-1} + 2.24KUK_{t-2} - .56KUK_{t-3} - .01DUK + .003T$

(1.3) (1.5) (.76) (.005) (.001)

Standard errors in parenthesis

$R^2 = .96$

Equation 2

$DEUK_t = 3.1 - .32EUK_{t-2} + 3.31KUK_{t-4} .77KUK_{t-1} + 1.46KUK_{t-2} -$

(.82) (-.07) (.55) (1.0) (.57)

$.012DUKt + .003T$

(.005) (.0011)

Standard errors in parenthesis

$R^2 = .87$

OLS-REGRESSION RESULTS (GERMANY)

Equation 3

$EGE_t = 6.6 + .78EGE_{t-1} - .63EGE_{t-2} + .16EGE_{t-3} + 2.03KGE_t -$

(1.8) (.10) (.24) (.14) (.37)

$2.66KGE_{t-1} + 1.88KGE_{t-2} - 1.22KGE_{t-3} + .005DGE + .0037T$

(.92) (1.05) (.57) (.008) (.001)

Standard errors in parenthesis

$R^2 = .97$

Equation 4

$DEGE_t = 3.24 - .34EGE_{t-2} + 1.99KGE_t - 2.7KGE_{t-1} + .73KGE_{t-2} +$

(1.01) (.09) (.37) (.68) (.36)

$.001DGEt + .002T$

(.007) (.009)

Standard errors in parenthesis

$R^2 = .815$

OLS-REGRESSION RESULTS (FRANCE)

Equation 5

$EFR_t = 1.26 + 1.2EFR_{t-1} - .63EFR_{t-2} + .3EFR_{t-3} + 1.8KFR_{t-3}.12KFR_{t-1} + 1.5KFR_{t-2} -$

(1.47) (.22) (.26) (.15) (.30) (.82) (.898)

$.167KFR_{t-3} - .0097T$

(.39) (.007)

Standard errors in parenthesis

$R^2 = .98$

Equation 6

$DEFR_t = 1.82 - .47EFR_{t-2} + .223EFR_{t-3} + 1.72KFR_{t-2}.7KFR_{t-1} + 1.05KFR_{t-2}$

(.92) (.124) (.12) (.27) (.52) (.262)

$-.001T$

(.006)

Standard errors in parenthesis

$R^2 = .82$

AIC, SIC, LR test

	Eq. (1)	Eq. (2)	Eq. (3)	Eq. (4)	Eq. (5)	Eg. (6)
AIC	102.837	104.842	121.689	123.3	117.172	119.404
SIC	349.701	356.588	413.888	419.367	398.525	406.116
LR		1.98		1.536		0.778

Notes: AIC was calculated as MLL-k for k the number of parameters.
SIC was calculated as MLL-k.ln T for T=30.
LR=2 (MLL_{UR}-MLL_R)~x^2(r)

LONG RUN SOLUTIONS

U.K	E = 9.633 + 0.03Kt - 0.036 Dt + 0.0085T
GERMANY	E = 9 .51 + 0.055 Kt+ 0.0304 Dt + 0.0516T
FRANCE	E = 1.458+0.061 Kt + 0.00506T

Notes

1. The most obvious cases of sterling being overvalued as a result of macroeconomic policy were firstly, the effects of the Thatcher Government's initial monetarist policies in 1979-1980 and secondly, the membership of the Exchange Rate Mechanism at an overvalued rate.

2. This was particularly apparent during the early 1980s when high interest rates created cash-flow problems for many companies leading to bankruptcies and plant closures as well as contributing to the appreciation of sterling and the squeeze on exports.

3. This is opposite to the view held by Neo-classists, that it is the high cost that causes the trouble.

4. According to the relevant econometric literature, the regression results are spurious if the variables are not stationary and not cointegrated. Particularly, it is argued that the Gauss-Markov theorem would not hold if the variables were random walks. As a result, the OLS would not be a consistent parameter estimator.

5. The order of the ADF tests was chosen so that the underlying regressions were free of serial correlation.

6. Generally a linear combination of I(l)variables will also be I(1). Therefore, with integrated variables there is major danger of spurious regression. None of the standard results for Least Squares apply in this case.

7. In light of recent developments in econometric theory, the concept of cointegrating variables has been suggested as one solution to the problem. The theory of cointegration, which has been developed by Granger (1981) proposes that although some series individually could be an I(1) processes, a particular linear combination might be an I(0) process. The

latter implies that, if there is cointegration between non-stationary variables, then the data can be used in levels without loosing information about the long run relationship of the variables.

8. Recent literature on cointegration which is concerned with the analysis of the long-run relationship between integrated variables, implicitly asserts that in the presence of I(1) variables, the traditional regression analysis is no longer applicable. However, a large number of alternative estimation and hypothesis testing procedures have been developed for the analysis of I(1) variables. In particular, Pesaran and Shin (1995), examine the use of the traditional autoregressive distributed lag modelling(ARDL) approach for the analysis of long-run relations when the underlying variables are I(1). Their basic premise is the existence of a unique long-run relationship between the dependent and the independent variables. Under this assumption, and the appropriate augmentation of the order of the ARDL model, which deals with the endogeneity of the regressors, Pesaran and Shin (1995) emphasise the validity of the OLS estimation of the short-run and long-run parameters of the model. As a result, they argue that the traditional ARDL approach is valid even if the regressors are first difference stationary.

9. The lagged employment terms arise because firms face costs of adjusting employment, thus their labour demand decisions generally depend on their past employment. The lagged terms of the exogenous variables are justified especially when agents are forward looking rather than having perfect foresight (see for example, Alogoskoufis and Manning, 1988).

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