The European Wage Structure, 1980- 2005: How much flexibility do we have?

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Abstract: *High unemployment has been a problem in Europe for three decades. The orthodox view points to the institutional rigidity of national labor markets in Europe as a principal cause of high unemployment, and to labor market 'flexibilization' as the cure. An alternative view argues that the problem of unemployment in Europe indicates macroeconomic policy failure – an insufficiency of aggregate effective demand, given the wage structure. Both of these perspectives accept that the European wage structure* is *inflexible. This paper examines the rigidity of the European wage structure at the continental level, using average wages by sectors within countries as the unit of observation. We analyze the variation in the movement of relative European wages from 1980 to 2005 with a combination of cluster and discriminant analysis, which permits us to isolate the largest variations, and then to focus in on progressively smaller one. We find that there is variability in the European wage structure, and that the variations we observe are mainly associated with differing rates of change of investment, consumption and overall GDP growth between countries. This source of flexibility is usually ignored in analyses of European labor markets, but as Europe has become an integrated continental economy, it deserves to be taken into account. Doing so casts doubt on the labor market flexibilization prescription for European unemployment, since there appear to be no cases where falling relative wages led to higher employment, as the LMF hypothesis would predict.*

I. INTRODUCTION

Unemployment in Europe was practically non-existent until the oil crises of 1970s; since that time it has risen episodically but persistently and has become an intractable problem and a leading policy concern. While a small group of Keynesians (Palley 2001,2004; Arestis and Sawyer 2006) continue to insist that the blame lies with the tight fiscal and monetary policies, a dominant view places responsibility on a rigid structure of European wages, particularly unable to adjust approximately to macroeconomic and supply-side shocks (Blanchard, 2005). The remedy--widely accepted in mainstream economic circles in Europe--is *flexibilization* of European labor markets.

Curiously, the mainstream and Keynesian perspectives agree on the core proposition that European wage structures are inflexible; the fundamental disagreement is over the side-effects of policies to reduce unemployment. Keynesians tend to see egalitarian wage structures as desirable per se; hence the relevant tradeoff for them is between equity and efficiency, whereas, for the mainstream school, flexibility trumps equity and the fear of expansionary policy is that it might generate inflation: the relevant tradeoff lies along some variant of Phillips Curve. Naturally, intermediate positions are possible: moderate members of the mainstream sometimes favor expansionary demand policies, and moderate Keynesians do not always oppose labor market reform.

On basis of the shared belief that European labor markets are (relatively) inflexible is to be found in a shared *a priori* commitment to viewing European labor markets as if they were separate and autonomous within each set of national frontiers- one country, one labor market. In reality, though, it has been decades- since at least the mid- 1970s, in fact- since it has been reasonable for anyone save an economist to view the European economy in this way. Financial investors and multinational corporations have long viewed the countries of Europe as close substitutes and competitors for their investment; in recent years all barriers to economic interchange within Europe including the nominal one of currency exchange have been removed.

However, nominal exchange rate flexibility persisted inside what is now Euroland until 1999, and it persists today between and among the euro, British pound, Swiss franc, and several Scandinavian currencies, as well as those of several accession countries. From the stand point of a pan-European investor, this flexibility is same as any type of relative wage flexibility. Yet no analysis so far (except Galbraith and Garcilazo 2004, Garcilazo 2005 and Galbraith 2006) has treated them as such.

This paper takes account of the fact that Europe is an integrated economy, especially from the point of view of pan-European investors or multinational corporations. We study the evolution of the European wage structure from 1980 to 2005. We measure the variability of relative wages for the region considered as a whole, and assess the relationship of relative wage change to changes in employment. We find considerable variability in relative wages seen this way, but the association between wages and employment change is invariably positive: relative wages and employment rise and fall together. The evidence therefore provides no support for the view that lowering relative wages- for instance, via a general currency devaluation- improves employment outcome or reduces unemployment.

The following section of this paper presents a literature review and theoretical foundations of the unemployment situation in Europe. The third section presents the analysis. The final section presents the conclusion.

II. BACKGROUND AND THEORY

a) The Problem of Unemployment

Unemployment in Europe was very low from the end of the Second World War to the end of 1960s. Since then it has increased through shocks and recessions, while falling little during periods of growth, and European unemployment today averages three times its 1960s values (Garcilazo, 2005), and roughly twice levels prevailing recently in the United States. Since the two regions have similar labor force participation rates and experienced the same shocks in the 1970s, explanations on these grounds are problematic. Similarly, the Bruno-Sachs (1985) view that European unemployment is due to declining total factor productivity growth runs afoul of the fact that European employment did not recover when the productivity slowdown ended, whereas employment did recover in United States. Reasoning along these lines leads Blanchard (2005) and others to conclude that the differences must lie in the institutional capacity to adjust to shocks; hence the alleged relative rigidity of European wages emerges logically as the prime suspect.

b) The Labor Market Flexibility Hypothesis

Since the late 1980s and 1990s the dominant explanation for the problem of unemployment in Europe has been allegedly "rigid and sclerotic labor markets" in Europe, which have hindered the adjustment of labor markets to rapidly changing demand conditions. This explanation is called the *labor market flexibility hypothesis* (LMF hypothesis). The hypothesis holds that institutional factors like union coverage, union density, centralized wage bargaining, employment protection laws, taxes, unemployment benefit, and benefit duration render wages downwardly rigid; European unemployment is therefore a price of the European welfare state. The theoretical basis of this hypothesis resides in neo-classical economic principles, according to which the labor market comprises labor supply and demand schedules that are functions of the real wage. The labor market clears at the intersection point of the two schedules; unemployment exists where the real wage fails to adjust to its equilibrium level. To restore full employment, according to the LMF hypothesis, labor market reforms are required: weakening unions, cutting down job protection, unemployment benefits, and reductions in the minimum wage.

In recent years the LMF and its corollary, labor market reform, have been advanced by the OECD's *Jobs Study* (OECD, 1994) and by, among others, Layard *et al*. (1991), Phelps (1994), Nickell (1997), Siebert (1997), Haveman (1997), Blanchard (1999), Nickell and Layard (1999), Blanchard and Wolfers (2000). A rare dissent comes from Baker *et al.* (2002). Garcilazo (2005) also provides an extensive review and critique of the studies based on the LMF hypothesis.

c) The Macroeconomic Policy Hypothesis

Theorists opposed to the LMF hypothesis generally argue that the cause of European unemployment lies in the choice of bad macroeconomic policies in European nations (Baker and Schmitt, 1998; Palley, 1998; 1999, Solow, 1994). This hypothesis has been called the Macroeconomic Policy (MP) hypothesis (Palley, 2004); it focuses on the anti-inflation monomania of the European Central Bank (and of the Bundesbank before it), and on the strict austerity imposed by the Maastricht criteria. MP theorists prescribe implementation of expansionary macroeconomic policies across European nations to cure unemployment. The theoretical background of the MP hypothesis lies in Keynesian principles. Palley (2001, 2004) tried to show that unemployment across European and other OECD nations depends on macroeconomic policy measures, with a model incorporating both macroeconomic policy variables (interest rates, inflation rate, GDP growth rate) and also institutional variables (unemployment benefits, tax wedge, union coverage). Palley (2001, 2004) found that the impacts of the institutional variables on unemployment are not robust: when macroeconomic variables are included the coefficients of institutional variables change sign and direction of impact and lose statistical significance. Howell (2005) provides another critical assessment of the LMF hypothesis.

The advocates of the LMF hypothesis and those of the MP hypothesis provide opposed explanations and recommendations. Yet they agree without having explicitly considered the matter that European labor markets are, in fact, both national and rigid. This paper challenges that supposition.

d) A Study of *European* Wage Structure

We treat Europe as a pan- European investor or a multinational corporation (MNC), which intends to invest and employ in Europe, would do. For an MNC Europe is a highly integrated economy. Investing in one country instead of other is a *location* decision, which depends on *competitiveness* (Porter, 1990). Investment flows affect growth, employment and wages. Relative wages can rise (or fall) particularly rapidly if exchange rates are flexible, and it is this source of relative wage variability inside Europe that we wish to investigate, since it has been omitted entirely from the study of European labor markets up to now.

III. METHOD AND DATA

We study the behavior of European wages over of 25 years, using a dataset[1] covering 15 countries of the European Union (EU) [2] and Switzerland and Norway. The dataset includes country-level data for total remuneration (measured in millions Euro) and employment for each economic sector within each country from 1980 to 2005. The data is available for fifteen economic sectors[3] of each country.

Using total remuneration and employment, we calculate the average remuneration (here called average wage) for each sector of each country, each year. The data set thus

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[1] *Source of Data:* Cambridge Econometrics
[2] The 15 EU nations include Belgium, Germany, Denmark, Greece, Spain, France, Ireland, Italy, Luxembourg, The Netherlands, Austria, Portugal, Finland, Sweden, UK
[3] The sectors include Agriculture, Forestry and Fishing (Ag), Mining and Energy Supply (ce), Food, Beverages and Tobacco manufacturing (da), Textiles and Clothing manufacturing (dbc), Fuels, Chemicals, Rubber and Plastic Products manufacturing (dfgh), Electronics manufacturing (dl), Transport Equipment manufacturing (dm), Other Manufacturing (do), Construction (f), Wholesale and Retail (g), Hotels and Restaurants (h), Transport and Communications (i), Financial Services (j), Other Market Services (k), and Non-Market Services (ns)

comprises 6630 cells including 255 (17 countries * 15 economic sectors) rows and 26 (years from 1980 to 2005) columns. We then compute the annual rate of change in wages for each cell, yielding a dataset of annual rates of change, comprising 6375 cells arranged in 255 rows and 25 (years from 1980-81 to 2004-05) columns.

a) Cluster Analysis

To this second dataset, we apply cluster analysis to discover meaningful structures among the 255 cases. The structures are obtained on the basis of similarities and dissimilarities in the movement of the average wages of each case (country-sector) over the 25 year period.

Cluster analysis[4] is an exploratory data analysis tool that is used to develop taxonomies. It sorts cases into clusters by computing a measure of distance (or association) between them, and by progressively assigning cases to clusters so as to minimize within-group and maximize between-group distances. This technique is mostly used at the exploratory phase of research; hence there are no *a priori* hypotheses and no role for statistical significance testing.

We use a hierarchical clustering method with the results displayed as a tree-plot. The tree diagram shows the similarity and differences between the paths of movement through time of a criterion variable (here, annual rate of change in average wages) of all pairs of cases under observation. The tree diagram helps to reduce a large and cumbersome list of cases into a small number of meaningful clusters, while minimizing the loss of information through aggregation. We adopted a Euclidean distance measure and Ward's clustering rule, which is distinctive in using an analysis of variance approach to evaluate the distances between clusters. In short, Ward's method minimizes the sum of

[4] Cluster Analysis was first used by Tryon, 1939.

squared (SS) Euclidean distance between any two (hypothetical) clusters that can be formed at each step. In general, this method is regarded as very efficient; moreover, it tends to create compact clusters.

b) Discriminant Function Analysis

Cluster analysis helps to discover meaningful structures in a data, but it does not explain why they exist. In a way cluster analysis answers the only question**, "how are cases best organized into clusters?"** The multivariate tool known as the discriminant function analysis (DFA) can answer the question**, "why do clusters differ?"** To help determine why clusters form, we employ this second tool; the resulting eigenvectors of the discriminant matrix can be associated with the historical forces driving the differences between clusters (Calistri and Galbraith, 2001). In this way two non-parametric techniques are combined to yield evidence on fundamental sources of variation in a complex data set, again without significance testing (Galbraith and Lu, 2001).

The discriminant function is also known as a *canonical root* or a latent variable. It is expressed as:

$$L= c+a_1*x_1+ a_2*x_2+\ldots\ldots.+ a_n*x_n$$

that is, as a linear combination of independent variables, also called discriminating variables. Here the variable x_i is the annual rate of change in average wages of i^{th} year and i=1,2,…….25 for the time series from 1980 to 2005. DFA yields a_i's that are unstandardized discriminant coefficients, also called the partial coefficients; they show the unique contribution of each variable to the classification of the latent variable, corresponding to a particular case, into a particular cluster. DFA yields (k-1) set of a_i's, where there are k clusters. For each set of a_i's, DFA computes a corresponding L, which takes values for each of the cases. Thus if one starts DFA with 4 clusters for 255 cases, one gets 3 sets of a_i's and three corresponding latent variables or discriminant functions, with each latent variable yielding 255 values, also known as the canonical score for each case.

The discriminant functions are orthogonal (uncorrelated) to each other. In other words, the first function maximizes the differences between the clusters, the second function maximizes the differences between the clusters, controlling for the first factor, and so on.

The DFA yields an eigenvalue corresponding to each discriminant function. The eigenvalues show the ratio of importance of their corresponding function in classifying a case into a cluster. The relative importance is represented in terms of percentage of variance explained in the discriminant function.

c) Canonical Scores and Pseudoscores:

DFA also yields sets of standardized coefficients of the discriminant functions, expressed as:

$$L = b_1*x_1 + b_2*x_2 + \ldots\ldots. + b_n*x_n$$

Here the b_i's are standardized coefficients, which in our particular analysis are by construction sets of year-to-year coefficients- a constructed time-series. Following Calistri and Galbraith (2001) we contend that these coefficients correspond to some known or discoverable historical forces that separate the cases into clusters. The linear combination of the x_i variables yield canonical scores (values of dependent variable L) for each case. The b_i coefficients are estimated by taking account of the variability in the annual rate of change in average wages, x_i's, into consideration, as these are used to separate the clusters. For different sets of $b_{i,}$ DFA yields different sets of canonical scores. Using the b_i's corresponding to the first discriminant function one gets a first set of canonical scores for all the cases. Similarly, the b_i's corresponding to the second discriminant function yield a second set of canonical scores for all the cases, and so forth.

To discover the economic forces which these sets of coefficients may indicate, one can replace the b_i's by some known economic time-series, and calculate a pseudoscore, analogous to the canonical score. The pseudoscore can be expressed as:

$$P= p_1*x_1+ p_2*x_2+\ldots\ldots.+ p_n*x_n$$

Here P is the pseudoscore (a scalar) and the p_i's represent an economic time series that runs through period 1 to n (n=25).

Once pseudoscores for all the cases are obtained for a particular discriminant function, we calculate the correlation coefficient between the pseudoscores and the corresponding canonical scores. If the correlation is high and significant we may argue that the b_i's (corresponding to say, the k^{th} discriminant function) that separate clusters at the k^{th} dimension represent such-and-such an economic force. If the historical record yields multiple possibilities, the one with the highest correlation between pseudo-score and canonical score is the most probable. That is, it is the economic time series that most likely leads to the pattern of variation in the behavior of average wages which produced the cluster pattern that has been observed.

d) Levels of Analysis:

We perform the data analysis at four levels. At each level a cluster analysis is performed to obtain the cluster structure. After that, DFA is performed using the cluster structure. For the first two dimensions, which separate the clusters maximally, canonical scores are obtained and corresponding to those canonical scores pseudoscores are obtained from candidate economic time series data. After that, the correlation coefficients between the pseudoscores and canonical scores are calculated.

This approach permits us to analyze greater and lesser sources of variation *seriatim*, achieving a finer resolution and more complete understanding of the sources of relative wage change at each stage. The details of the level of analyses and the findings are presented in the following section.

IV. ANALYSIS AND FINDINGS

(a) Level 1

We perform cluster analysis on all the 255 cases (economic sectors within countries) at the first level of analysis by using the data for annual rate of change in average wages of each economic sector of each country from 1980 to 2005. Cluster analysis yields three well defined clusters. The details of the three clusters are given in table A(i) of appendix A. Cluster 2 consists of manufacturing sectors and agriculture, forestry and fishing sectors of Greece. Cluster 3 comprises the mining and energy supply sectors, agriculture, forestry and fishing sectors and manufacturing sectors of Portugal. Cluster 1 consists of the remaining cases. These three clusters have as much between-group difference as possible, and the least possible within-group difference.

To determine why the 255 cases resolve into a group structure comprising three well-defined clusters we perform a discriminant function analysis (DFA). The DFA helps to identify which variables discriminate between the three clusters. As there are three clusters the DFA yields two discriminant functions (or canonical roots); the first function accounts for 73.24% of the variability between the clusters and the second function accounts for 26.76%. The eigenvalues, percentage of variability explained by the functions, and canonical correlations are given in table B(i) of appendix B.

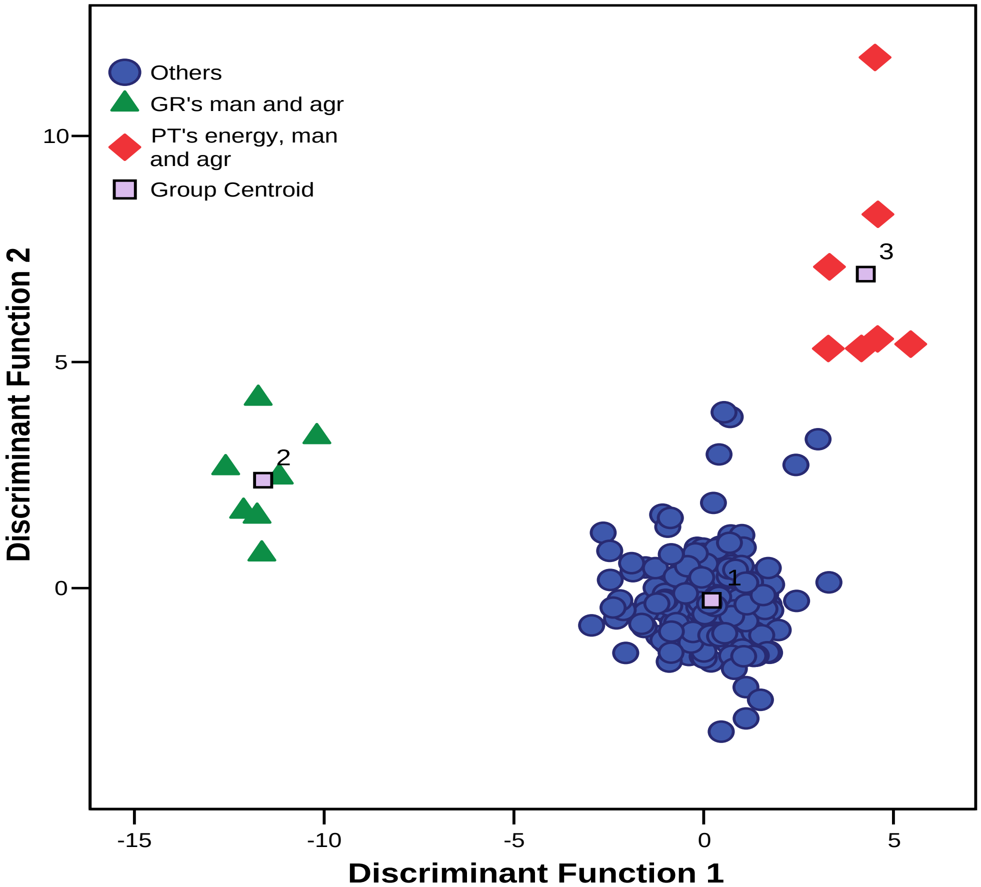
Figure 1 shows the way two discriminant functions discriminate between the three clusters. Along the x-axis the canonical scores corresponding to the first discriminant function (DF 1-1)[5] are plotted. Along the y-axis the canonical scores corresponding to the second discriminant function (DF 2-1) are plotted. It can be observed from the figure that DF 1-1 separates Cluster 2 from rest of the cases while DF 2-1 separates Cluster 3 from rest of the cases. We infer that these functions may represent some economic forces that differentially affect these clusters (Calistri and Galbraith, 2001).

We contend that these functions may represent some economic time series that lead the wages of Greece and Portugal to behave differently over time relative to wages elsewhere in Europe. To discover what those economic forces might be, we replace the standardized coefficients that are used to compute the canonical scores by various economic time series, and calculate the pseudoscores. Macroeconomic variables such as the change in GDP and its various components, including investment and consumption, can be tested in this way. We find that the correlations between the pseudoscores for the rate of change in investment in Cluster 2's sectors relative to investment in all the sectors of other countries of Europe and the first canonical score are high. The correlation coefficients[6] vary from 0.71 for Portugal and Luxembourg to 0.66 for Austria, 0.65 for

[5] DF i-j represents i^{th} discriminant function of j^{th} level analysis.
[6] The correlation coefficients presented in the data analysis section are absolute values of the correlation coefficients. The reason is since the variables are relative terms changing the numerator by the denominator and vice versa for the relative terms will only change the sign of the correlation. Their actual values are reported in the appendix.

Germany, and 0.64 for Belgium. The details of the correlation results are given in table C(i) of Appendix C. All are highly significant at the 0.01 level.

Figure 1: Discriminant Function Analysis at level 1: 255 cases



For DF 2-1 we find that the correlations between the pseudoscore for rate of change in household expenditure (consumption) of Portugal relative to the household expenditure of other countries of Europe, and the second canonical score are high. The absolute values of correlations for Switzerland, Belgium, and Greece are 0.63, 0.45, and 0.40 respectively. We present the details of the correlation results in table C(ii) of Appendix C. All are significant at the 0.01 level except for Norway (significant at 0.05) and Luxembourg (not significant).

At this level of analysis Cluster 1 remains a huge cluster comprising 241 out of 255 cases. It is possible that the two discriminant functions, depicting economic forces, may have dominated the forces that can discriminate between the cases in Cluster 1. In such a case we may find further cluster structure in the Cluster 1 of first level of analysis. Hence, using the 241 cases of Cluster 1 of first level we perform a second level of analysis. The second level analysis is explained below.

(b) Level 2

We begin the second level analysis with the 241 cases out of 255 cases: Clusters 2 and 3 of first level analysis are omitted. Once again we perform cluster analysis on the annual rate of change in average wages, but only on the 241 cases. We use the same method, distance measure and linkage rule of the first level analysis. The level two analysis yields four clusters; details are presented in table A(ii) of appendix A. Cluster 2 comprises, predominantly, the manufacturing sectors of Austria while Cluster 4 consists of all the sectors of the UK. Clusters 1 and 2 remain two big clusters each comprising 108 cases. Cluster 1 comprises the mining and energy supply sectors and service sectors of Austria, most of the sectors of Belgium, Switzerland, Germany, Denmark, France, The Netherlands, 11 out of 15 sectors of Luxembourg and six others. Cluster 2 consists of most of the sectors of Spain, Finland, Ireland, Italy, Norway, Sweden, mining and energy supply sectors and service sectors of Greece, service sectors of Portugal, three sectors of Denmark and Luxembourg and three others.

Next we again perform DFA, using the level 2 grouping. The DFA yields three discriminant functions that discriminate between the four clusters. The first function accounts for 51% of the variation between the clusters. The second and third functions account for 30.5% and 18.38% of the discrimination between the clusters respectively. The eigenvalues, percentage of variability explained by each function, and canonical correlations are presented in table B(ii) of appendix B.

Figure 2: Discriminant Function Analysis at level 2: 241 cases

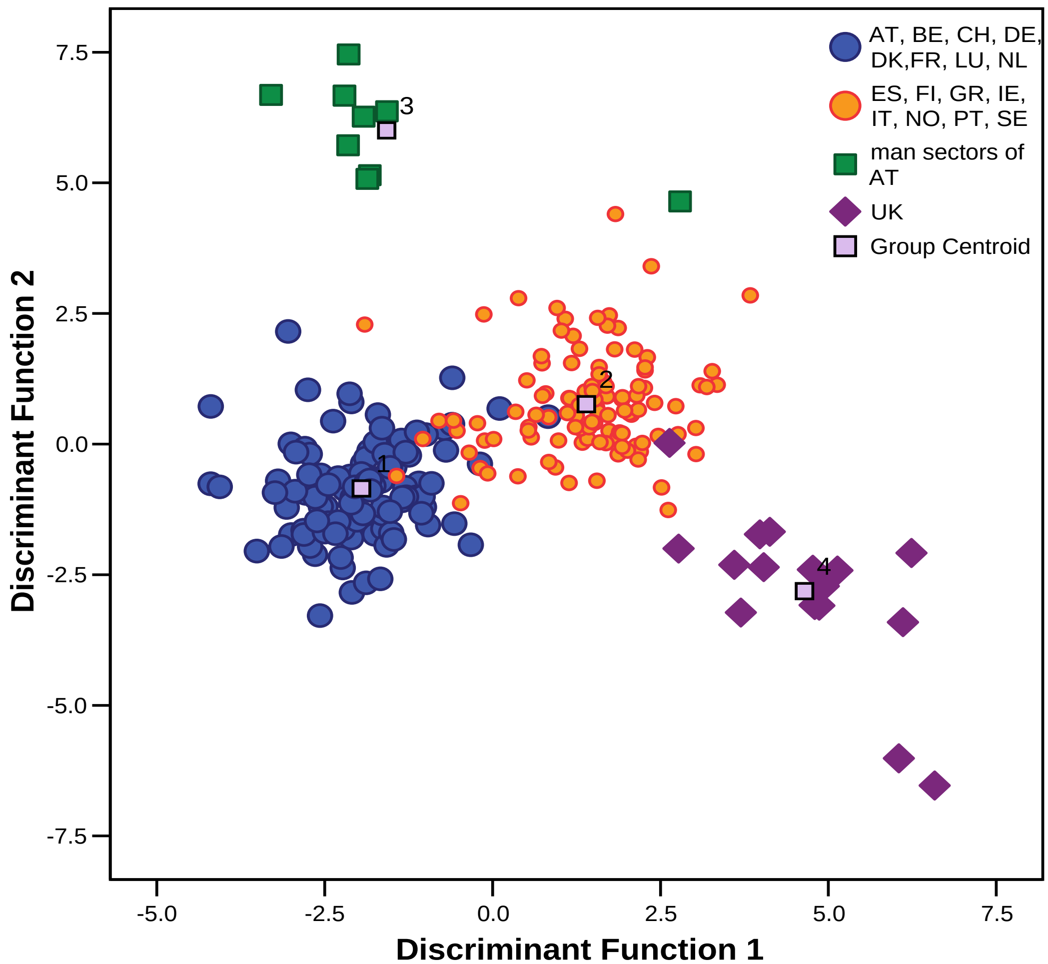


Figure 2 shows that DF1-2 separates Cluster 4 (the UK) from the rest of the cases while DF 2-2 separates Cluster 2 (Austria) from the rest of the cases. To find the economic forces that lead these clusters to behave differently, we once again use macroeconomic time series to calculate pseudoscores. The correlations between the pseudoscore for rate of change in GDP of the UK relative to the GDP of other countries, and the first canonical score are high. Correlations vary from 0.43 in case of both

Germany and Greece to 0.63 in case of Ireland, 0.71 in case of France and 0.83 in case of Spain. We present the details of the correlation results in table C(ii) of Appendix C. All are highly significant at the 0.01 level except for two cases (Denmark and Switzerland).

For DF 2-2 the correlations between the pseudoscore for the rate of change in GDP of Austria relative to that of other countries, and the second canonical score are high. All are significant at the 0.01 level. In case of The Netherlands and Spain the correlation coefficients are both around 0.70 and in case of Portugal and Belgium the correlation coefficients are both around 0.69. Only the correlation between pseudoscore for Austria's GDP growth relative to that of Switzerland and the second canonical score is not high; its absolute value is just 0.20 but it is nevertheless significant at the 0.01 level. The details of the correlation results are given in table C(ii) of Appendix C.

At the second level of analysis Clusters 2 and 3 remain huge. Each can be used to run two further third level analyses to discover further group structures in each of the two clusters. We perform two third level analyses and present the results below.

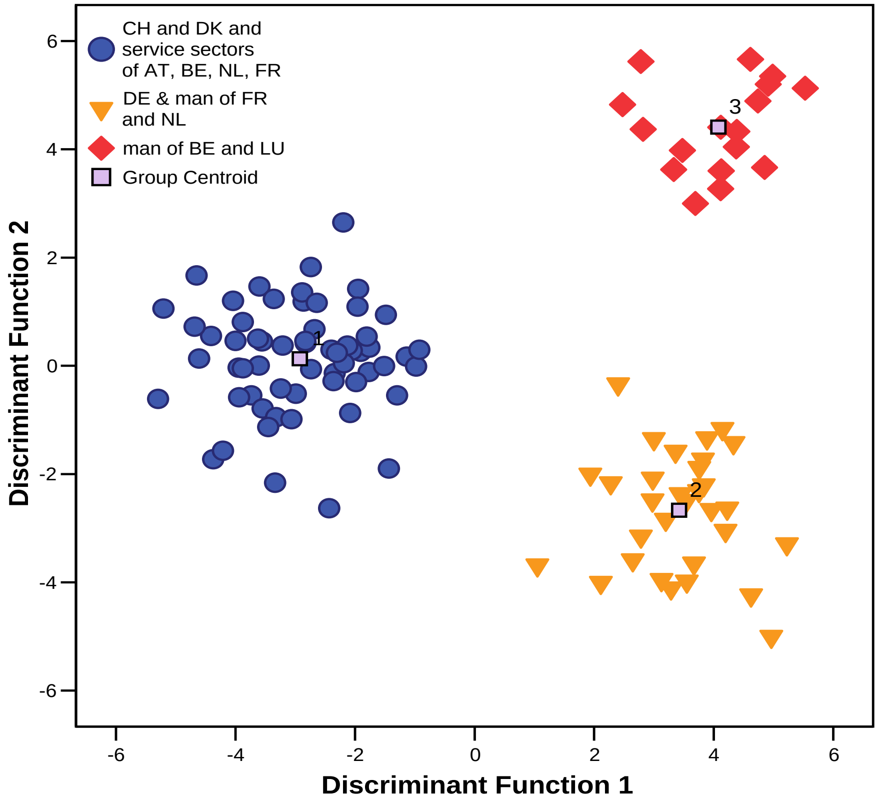
(c) Level 3: first analysis

The first level 3 analysis is on 108 cases of Cluster 1 in level 2; clustering these cases yields three well-defined clusters. The details are given in table A(iii) of appendix A. Cluster 3 consists, predominantly, of the manufacturing sectors of Belgium and Luxembourg and a few other sectors of Belgium and Luxembourg. Cluster 2 consists of 12 out of 15 sectors of Germany, manufacturing sectors of France and The Netherlands and some miscellaneous sectors (financial sector of France, The Netherlands, Norway and Portugal and agricultural sector of Ireland). Cluster 1 consists of 60 cases including the service sectors of Austria, Belgium, all the sectors of Switzerland, 11 out of 15 sectors of Denmark, the service sectors of France and The Netherlands and some miscellaneous sectors.

Based on this clustering, we again apply DFA. Figure 3(i) shows that DF 1-3(i) separates Cluster 1 from the rest of the cases. DF 2-3(i) separates the cases of Cluster 2 from the rest of the cases. DF 1-3(i) accounts for 67.69% of the discrimination between the clusters and DF 2-3(i) accounts for 32.3%. We present the eigenvalues, percentage of variability explained by the functions, and canonical correlations in table B(iii) of appendix B.

To find the economic forces that lead Clusters 1 and 2 to differ from the rest of the cases pseudoscores are again calculated by using macroeconomic time series of Switzerland, Denmark and other countries in Cluster 1. The correlation between the pseudoscore for the rate of change in household expenditure of Switzerland relative to that of Germany and the first canonical score is 0.54; significant at the 0.01 level. The correlation coefficients between the pseudoscore for rate of change in Switzerland's investment relative to investment in the sectors of France in Cluster 2 and relative to that of Belgium in Cluster 3, and the first canonical score are 0.49 and 0.33 respectively; both are significant at the 0.01 level.

Figure 3(i): Discriminant Function Analysis at level 3 (first analysis): 108 cases



The correlation between the pseudoscore for the rate of change in GDP of Denmark relative to the GDP of Germany and the first canonical score is 0.35; again significant at the 0.01 level. The correlations between the pseudoscore for the rate of change in investment in Austria's sectors in Cluster 1 relative to investment in the sectors of Germany, France in Cluster 2, The Netherlands in Cluster 2 and first canonical score are 0.54, 0.64, and 0.53 respectively; all are significant at the 0.01 level. Only in the case of Belgium is the correlation coefficient not significant. In case of Luxembourg, it is low, 0.20, but is significant at the 0.05 level. The correlations between the pseudoscore for the rate of change in investment in France's sectors in Cluster 1 relative to investment in the sectors of Germany, France in Cluster 2, Netherlands in Cluster 2, Belgium in Cluster 3, and the first canonical score are 0.30, 0.68, 0.30 and 0.46 respectively. Each correlation coefficient is significant at the 0.01 level. The correlations between the pseudoscore for the rate of change in investment in The Netherlands' sectors in Cluster 1 relative to investment in the sectors of France in Cluster 2, The Netherlands in Cluster 2, and Belgium in Cluster 3 are 0.63, 0.40 and 0.42 respectively; all are significant at 0.01 level. The details of the correlation results are given in table C(iii) of Appendix C.

DF 2-3(i) separates the manufacturing sectors of Belgium and Luxembourg in Cluster 3 from the rest of cases including sectors of Germany, manufacturing sectors of France and The Netherlands in Cluster 2 and the cases in Cluster 1. Luxembourg is known as a tax haven, and we use taxes of Luxembourg relative to those for France to calculate pseudoscores. The correlation between the pseudoscore for the rate of change in current taxes on income and wealth of Luxembourg relative to those for France and the second canonical score is 0.55; significant at the 0.01 level. The taxes of Belgium relative to those for France are also used to calculate pseudoscores. The correlation between the pseudoscore for the rate of change in current taxes on income and wealth of Belgium relative to those for France, and the second canonical score is 0.52; again significant at the 0.01 level. The correlations between the pseudoscores for the rate of change in taxes on production and imports of Belgium and Luxembourg relative to those for France and the second canonical score are 0.58 and 0.21 respectively. Each correlation is significant at the 0.01 level. The correlations between the pseudoscores for rate of change in total receipts from taxes and social contributions of Belgium and Luxembourg relative to those for France and the second canonical score are 0.67 and 0.32 respectively; again these are significant at the 0.01 level. The correlations between the pseudoscore for the rate of change in investment in Belgium's sectors in Cluster 3 relative to the investment in the sectors of Netherlands and Austria in Cluster 1, and the second canonical scores are 0.51 and 0.41 respectively. These correlations are significant at the 0.01 level. Finally, the correlations between the pseudoscore for the rate of change in investment in Luxembourg's sectors in Cluster 3 relative to the investment in the sectors of Netherlands and Austria in Cluster 1 and the second canonical scores are 0.49 and 0.56 respectively; both are significant at the 0.01 level. The details of the correlation results are given in table C(iii) Appendix C.

(d) Level 3: second analysis

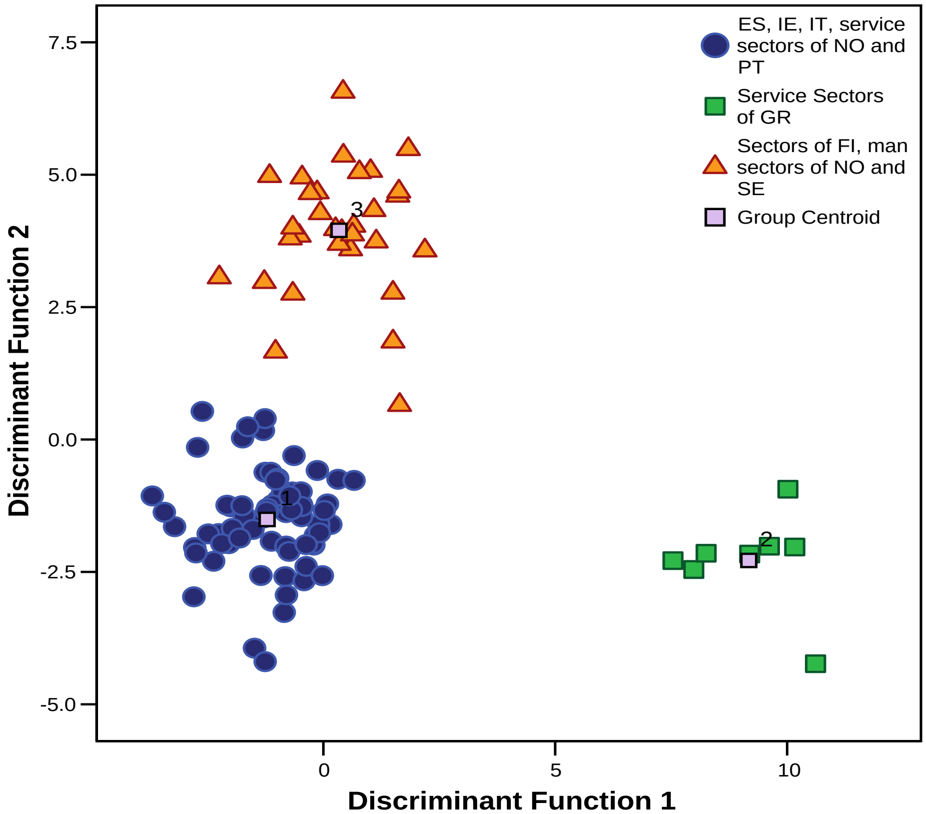
We perform the second analysis at level 3 on 108 cases of Cluster 2 of level 2 analysis. Cluster analysis yields three well-defined clusters; cluster details are given in table A(iv) of appendix A. We find that Cluster 2 consists of service sectors and mining and energy supply sectors of Greece, Cluster 3 comprises 12 out of 15 sectors of Finland, 9 (manufacturing sectors, mining and energy supply sectors and agricultural, forestry and fishing sectors) out of 15 sectors of Norway and all manufacturing sectors, finance sector and agricultural, forestry and fishing sectors of Sweden and Cluster 1 consists of 69 cases including service sectors of Norway, Sweden and Portugal, all the sectors of Italy, 14 out of 15 sectors of Spain, 13 out of 15 sectors of Ireland, three sectors of Luxembourg and some others.

Based on the clustering obtained from the cluster analysis we perform DFA. Figure 3(ii) shows that DF 1-3(ii) discriminates Cluster 2 from rest of the clusters while DF 2-3(ii) discriminates Cluster 3 from rest of the clusters. The function 1 yields 53.3% of the discrimination between the clusters and function 2 yields 46.69%. The eigenvalues, percentage of variability explained by the functions, and canonical correlations are given in table B(iv) of appendix B.

To find the economic forces that lead the wages of sectors in Cluster 2 and that of sectors in Cluster 3 to behave differently relative to that of the rest of the cases we once again calculate pseudoscores. The correlations between the pseudoscore rate of change in investment in Greece's sectors in Cluster 2 relative to the investment in the sectors of Italy, Portugal and Norway and the first canonical score are 0.40, 0.42, and 0.33 respectively. All are significant at the 0.01 level.

In the case of DF 2-3(ii) we use several macroeconomic time series of Finland, Norway and Sweden to calculate pseudoscores. The correlations between the pseudoscore rate of change in investment in sectors of Finland relative to the investment in sectors of Italy, Portugal, Norway in Cluster 1 and Ireland and the second canonical score are 0.45, 0.56, 0.65 and 0.37 respectively. All the correlations are significant at the 0.01 level. The absolute values of the correlations between the pseudoscore for rate of change in investment in Norway's sectors in Cluster 3 relative to the investment in sectors of Italy, Portugal, Ireland, Spain and Norway in Cluster 1 and the second canonical score are 0.48, 0.57, 0.49, 0.40 and 0.27 respectively. Each correlation is significant at the 0.01 level. The correlations between the pseudoscore for rate of change in investment in sectors of Sweden in Cluster 3 relative to the investment in sectors of Italy, Portugal, Ireland, Spain, and Norway in Cluster 1 and the second canonical score are 0.67, 0.71, 0.60, 0.53 and 0.24 respectively. The first four correlations are significant at the 0.01 level and the fifth one is significant at the 0.05 level. The details of the correlation results are given in table C(iv) of Appendix C.

Figure 3(ii): Discriminant Function Analysis at level 3 (second analysis): 108 cases



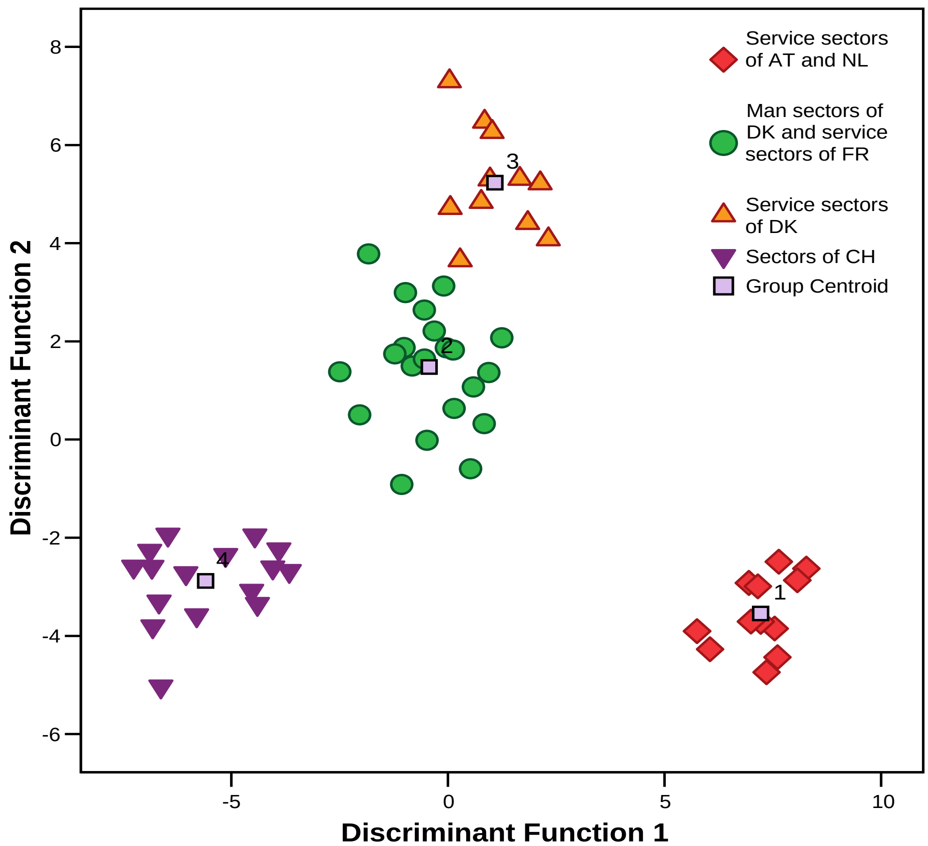
The Cluster 1 of first analysis at level 3 comprises 60 cases and that of the second analysis at level 3 consists of 69 cases. We further perform two separate analyses to discover structures within the two clusters at fourth level. The analyses are explained below.

(e) Level 4: first analysis

We perform the first analysis at level 4 on the 60 cases of Cluster 1 of level 3's first analysis; clustering yields four clusters. The cluster details are given in table A(v) of appendix A. Cluster 1 consists of service sectors of Austria and The Netherlands, cluster 2 comprises 5 sectors of Denmark (mostly manufacturing), service sectors of France, three service sectors of Luxembourg and some others, Cluster 3 consists of service sectors of Denmark and three service sectors of Belgium and Cluster 4 consists of all the sectors of Switzerland and mining and energy supply sectors of Sweden and Finland.

We perform DFA based on the clustering obtained from the cluster analysis. Figure 4(i) shows that DF 1-4(i) separates Switzerland in Cluster 4 from Cluster 1 and DF 2-4(i) separates Cluster 3 from rest of the cases. DF 1-4(i) and DF 2-4(i) account for 57.31% and 31.67% of the discrimination between the clusters respectively. Since there are four clusters DFA yields three discriminant functions. The third function yields only 10.9% of variation between the clusters. The eigenvalues, percentage of variability explained by the functions, and canonical correlations are given in table B(v) of appendix B.

Figure 4(i): Discriminant Function Analysis at level 4 (first analysis): 60 cases



We calculate pseudoscores to find the economic forces that lead the wages of sectors in Cluster 4 and that of in Cluster 3 to behave differently relative to those of the service sectors of Austria and The Netherlands. The correlations between the pseudoscore for rate of change in investment in Cluster 4 sectors relative to the investment in the service sectors of Austria and The Netherlands and the first canonical score are 0.73 and 0.81 respectively; significant at the 0.01 level.

We also calculate the pseudoscores in case of DF 2-4(i). The correlation between the pseudoscore for the rate of change in investment in sectors of Denmark relative to the investment in sectors of Austria in Cluster 1 and the second canonical score is 0.42; significant at the 0.01 level. The correlation between the pseudoscore for the rate of change in household expenditure of Denmark relative to that of Switzerland and The Netherlands and the second canonical score are 0.51 and 0.33; both significant at the 0.01 level. The details of the correlation results are given in table C(v) of Appendix C.

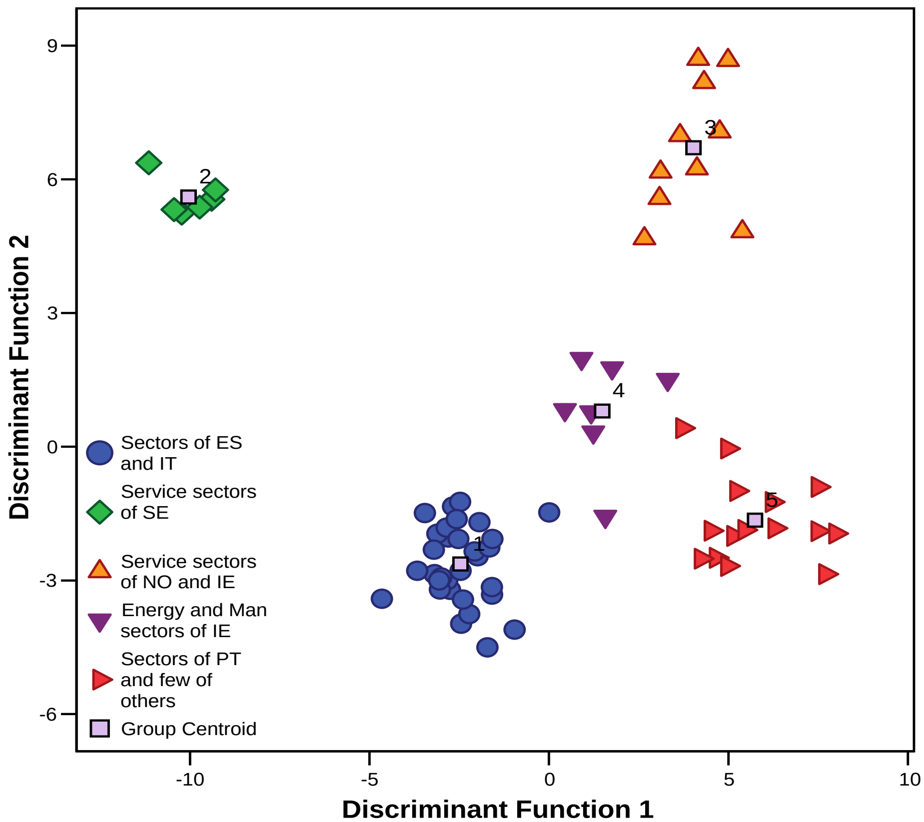
(f) Level 4: second analysis

We perform the second analysis at level 4 on the 69 cases of Cluster 1 of level 3's second analysis. The cluster analysis yields five well-defined clusters. We present the cluster details in table A(v) of appendix A. Cluster 1 consists of all the sectors of Italy and 14 out of 15 sectors of Spain, Cluster 2 consists of service sectors of Sweden, Cluster 3 consists of service sectors of Norway and 4 out of 7 service sectors of Ireland, Cluster 4 consists of mining and energy supply sector and manufacturing sectors of Ireland and Cluster 5 consists of service sectors of Portugal and some others.

We perform DFA by using the clustering structure obtained from the cluster analysis. Figure 4(ii) shows that DF 1-4(ii) separates service sectors of Sweden in Cluster

2 from the rest of the cases and DF 2-4(ii) separates the service sectors of Norway in Cluster 3 and also service sectors of Sweden in Cluster 2 from the rest of the cases. Since there are five clusters DFA yields four discriminant functions. The functions 1, 2, 3 and 4 respectively account for 50.16%, 30.7%, 12.36% and 6.7% of the discrimination between the clusters. The eigenvalues, percentage of variability explained by the functions, and canonical correlations are given in table B(v) of appendix B.

Figure 4(ii): Discriminant Function Analysis at level 4 (second analysis): 69 cases



We once again calculate pseudoscores to find the economic force that leads the wages of Sweden's sectors in Cluster 2 and that of Norway in Cluster 3 to behave differently relative to that of the rest of the cases. The correlations between the pseudoscore for the rate of change in investment in the sectors of Sweden in Cluster 2 relative to that of the sectors of Italy, Spain, Ireland and Portugal, and the first canonical score are 0.55, 0.45, 0.46, and 0.55 respectively. The correlations are all significant at the 0.01 level. The cluster of Sweden is also discriminated from the sectors of Norway in Cluster 3. Since Norway is world's third largest oil exporting nation and seventh largest world oil producer, changes in the price of oil may affect wages in Norwegian sectors. Hence we use rate of change in oil price (both real and nominal) as an economic force that may be discriminating between the behaviors of wages of Sweden from that of Norway. The correlations between the pseudoscore for rate of change in nominal oil price and real oil price and the first canonical score are 0.60 and 0.66 respectively; both significant at the 0.01 level.

We also calculate the pseudoscores in case of DF 2-4(ii) by using several macroeconomic time series. The correlation between the pseudoscore for the rate of change in investment in sectors of Norway relative to the investment in sectors of Spain and Portugal in Cluster 5 and the second canonical score are 0.57 and 0.56 respectively; both are significant at the 0.01 level. The pseudoscore for rate of change in oil prices are tried again. The correlation between the pseudoscore, rate of change in nominal and real oil price, and the second canonical score are 0.45 and 0.47 respectively; both are significant at the 0.01 level. The details of the correlation results are given in table C(vi) of Appendix C.

The summary of the findings from all the levels of analyses are given in the table 1 below:

Table 1.

Level of Analysis	Discriminant Function	Cluster	Macroeconomic Variable(s)
Level 1	1	Manufacturing and Agricultural sectors of GR	Investment
	2	Energy, Manufacturing and Agricultural sectors of PT	Consumption
Level 2	1	Fourteen sectors of UK	GDP
	2	Manufacturing sectors of AT	GDP
Level 3(1)	1	CH, some sectors of AT, DK, service sectors of BE, NL, and FR	Investment/Consumption/ GDP
	2	Manufacturing Sectors of BE and LU	Investment/Taxes
Level 3(2)	1	Service Sectors of GR	Investment
	2	Sectors of FI, Manufacturing sectors of NO and SE	Investment
Level 4(1)	1	Service Sectors of AT and NL	Investment
	2	Service sectors of DK	Investment/ Consumption
Level 4(2)	1	Service sectors of SE	Oil Price/Investment
	2	Service sectors of NO and IE	Oil Price/Investment

V. CONCLUSION

This paper performs a systematic decomposition of wage variations across sectors and countries of Europe, taking the continent as a whole and treating wage variations as any multinational investor or corporation would be expected to do. The result challenges the notion of wage inflexibility in Europe. We find that there is substantial systematic adjustment in European relative wages over time. This variability is primarily between nations, and it is generally associated with changing national economic fortunes, expressed in the movement of macroeconomic variables such as investment and consumption..

If the LMF hypothesis were correct, we should expect to find employment rising in countries that successfully reduce their relative wage rates. We do not test this proposition directly in this paper. But we do find that differences in the movement of macroeconomic variables account for most of the variation in relative wage rates one observes. Most notably investment, consumption, effective tax rates and (in the case of Norway) oil prices are highly correlated with differential wage movements. However, it is obvious that rising relative investment is associated with both rising wages and rising employment. This suggests that, contrary to the LMF hypothesis, wages in Europe rise and fall with, and not contrary to, movements of employment. The exercise thus casts grave doubt over the idea that unemployment in European countries can be explained by a failure of their wages to fall, or that unemployment can be remedied, in general, by policies aimed at cutting relative wages. For if this was true, cases would be observed. And we find none.

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APPENDICES

Appendix A: Cluster Details

Table A(i): Cluster Details from Analysis at Level 1

Cluster 1						**Cluster 2**	**Cluster 3**
AT ce	DE ce	FI ce	IE ce	NL ce	SE ce	GR da	PT ce
AT da	DE da	FI da	IE da	NL da	SE da	GR dbc	PT da
AT dbc	DE dbc	FI dbc	IE dbc	NL dbc	SE dbc	GR dfgh	PT dfgh
AT dfgh	DE dfgh	FI dfgh	IE dfgh	NL dfgh	SE dfgh	GR dl	PT dl
AT dl	DE dl	FI dl	IE dl	NL dl	SE dl	GR dm	PT dm
AT dm	DE dm	FI dm	IE dm	NL dm	SE dm	GR do	PT do
AT do	DE do	FI do	IE do	NL do	SE do	GRAg	PTAg
AT f	DE f	FI f	IE f	NL f	SE f		
AT g	DE g	FI g	IE g	NL g	SE g		
AT h	DE h	FI h	IE h	NL h	SE h		
AT i	DE i	FI i	IE i	NL i	SE i		
AT j	DE j	FI j	IE j	NL j	SE j		
AT k	DE k	FI k	IE k	NL k	SE k		
AT ns	DE ns	FI ns	IE ns	NL ns	SE ns		
ATAg	DEAg	FIAg	IEAg	NLAg	SEAg		
BE ce	DK ce	FR ce	IT ce	NO ce	UK ce		
BE da	DK da	FR da	IT da	NO da	UK da		
BE dbc	DK dbc	FR dbc	IT dbc	NO dbc	UK dbc		
BE dfgh	DK dfgh	FR dfgh	IT dfgh	NO dfgh	UK dfgh		
BE dl	DK dl	FR dl	IT dl	NO dl	UK dl		
BE dm	DK dm	FR dm	IT dm	NO dm	UK dm		
BE do	DK do	FR do	IT do	NO do	UK do		
BE f	DK f	FR f	IT f	NO f	UK f		
BE g	DK g	FR g	IT g	NO g	UK g		
BE h	DK h	FR h	IT h	NO h	UK h		
BE i	DK i	FR i	IT i	NO i	UK i		
BE j	DK j	FR j	IT j	NO j	UK j		
BE k	DK k	FR k	IT k	NO k	UK k		
BE ns	DK ns	FR ns	IT ns	NO ns	UK ns		
BEAg	DKAg	FRAg	ITAg	NOAg	UKAg		
CH ce	ES ce	GR ce	LU ce	PT dbc			
CH da	ES da	GR f	LU da	PT f			
CH dbc	ES dbc	GR g	LU dbc	PT g			
CH dfgh	ES dfgh	GR h	LU dfgh	PT h			
CH dl	ES dl	GR i	LU dl	PT i			
CH dm	ES dm	GR j	LU dm	PT j			
CH do	ES do	GR k	LU do	PT k			
CH f	ES f	GR ns	LU f	PT ns			
CH g	ES g		LU g				
CH h	ES h		LU h				
CH i	ES i		LU i				
CH j	ES j		LU j				
CH k	ES k		LU k				

Cluster 1						Cluster 2	Cluster 3
CH ns	ES ns		LU ns				
CHAg	ESAg		LUAg				

Table A(ii): Cluster Details from Analysis at Level 2

Cluster1				Cluster2			Cluster3	Cluster4
AT ce	DE ce	FR ce	NL ce	ATAg	GR ce	LU ce	AT da	BEAg
AT f	DE da	FR da	NL da	BE k	GR f	LU h	AT dbc	FI ns
AT g	DE dbc	FR dbc	NL dbc	DK dbc	GR g	LU k	AT dfgh	UK ce
AT h	DE dfgh	FR dfgh	NL dfgh	DK dl	GR h	NO ce	AT dl	UK da
AT i	DE dl	FR dl	NL dl	DKAg	GR i	NO da	AT dm	UK dbc
AT j	DE dm	FR dm	NL dm	ES ce	GR j	NO dbc	AT do	UK dfgh
AT k	DE do	FR do	NL do	ES da	GR k	NO dfgh	DEAg	UK dl
AT ns	DE f	FR f	NL f	ES dbc	GR ns	NO dl	LUAg	UK dm
BE ce	DE g	FR g	NL g	ES dfgh	IE ce	NO dm	UK k	UK do
BE da	DE h	FR h	NL h	ES dl	IE da	NO do		UK f
BE dbc	DE i	FR i	NL i	ES dm	IE dbc	NO g		UK g
BE dfgh	DE j	FR j	NL j	ES do	IE dfgh	NO h		UK h
BE dl	DE k	FR k	NL k	ES f	IE dl	NO i		UK i
BE dm	DE ns	FR ns	NL ns	ES g	IE dm	NO j		UK j
BE do	DK ce	IEAg	NLAg	ES h	IE do	NO k		UK ns
BE f	DK da	LU da	NO f	ES i	IE f	NO ns		UKAg
BE g	DK dfgh	LU dbc	PT f	ES k	IE g	NOAg		
BE h	DK dm	LU dfgh	SE ce	ES ns	IE h	PT dbc		
BE i	DK do	LU dl		ESAg	IE i	PT g		
BE j	DK f	LU dm		FI da	IE j	PT h		
BE ns	DK g	LU do		FI dbc	IE k	PT i		
CH ce	DK h	LU f		FI dfgh	IE ns	PT j		
CH da	DK i	LU g		FI dl	IT ce	PT k		
CH dbc	DK j	LU i		FI dm	IT da	PT ns		
CH dfgh	DK k	LU j		FI do	IT dbc	SE da		
CH dl	DK ns	LU ns		FI f	IT dfgh	SE dbc		
CH dm	ES j			FI g	IT dl	SE dfgh		
CH do	FI ce			FI h	IT dm	SE dl		
CH f				FI i	IT do	SE dm		
CH g				FI j	IT f	SE do		
CH h				FI k	IT g	SE f		
CH i				FIAg	IT h	SE g		
CH j				FRAg	IT i	SE h		
CH k					IT j	SE i		
CH ns					IT k	SE j		
CHAg					IT ns	SE k		
					ITAg	SE ns		
						SEAg		

Table A(iii): Cluster Details from Analysis at Level 3's first analysis

Cluster 1		Cluster 2	Cluster 3
AT ce	DE f	DE ce	BE ce
AT f	DE ns	DE da	BE da
AT g	DK ce	DE dbc	BE dbc
AT h	DK da	DE dfgh	BE dfgh
AT i	DK dfgh	DE dl	BE dl
AT j	DK do	DE dm	BE dm
AT k	DK f	DE do	BE do
AT ns	DK g	DE g	BE ns
BE f	DK h	DE h	LU da
BE g	DK i	DE i	LU dbc
BE h	DK j	DE j	LU dfgh
BE i	DK k	DE k	LU dl
BE j	DK ns	DK dm	LU dm
CH ce	ES j	FR ce	LU do
CH da	FI ce	FR da	LU f
CH dbc	FR g	FR dbc	LU ns
CH dfgh	FR h	FR dfgh	NL ns
CH dl	FR i	FR dl	
CH dm	FR j	FR dm	
CH do	FR k	FR do	
CH f	FR ns	FR f	
CH g	LU g	IEAg	
CH h	LU i	NL ce	
CH i	LU j	NL da	
CH j	NL dm	NL dbc	
CH k	NL g	NL dfgh	
CH ns	NL h	NL dl	
CHAg	NL i	NL do	
	NL j	NL f	
	NL k	NO f	
	NLAg	PT f	
	SE ce		

Table A(iv): Cluster Details from Analysis at Level 3's second analysis

Cluster 1		Cluster 2	Cluster 3
BE k	IT ce	GR ce	ATAg
DK dbc	IT da	GR f	DKAg
DK dl	IT dbc	GR g	FI da
ES ce	IT dfgh	GR h	FI dbc
ES da	IT dl	GR i	FI dfgh
ES dbc	IT dm	GR j	FI dl
ES dfgh	IT do	GR k	FI dm
ES dl	IT f	GR ns	FI do
ES dm	IT g		FI g
ES do	IT h		FI h
ES f	IT i		FI i
ES g	IT j		FI j
ES h	IT k		FI k
ES i	IT ns		FIAg
ES k	ITAg		IE dm
ES ns	LU ce		NO ce
ESAg	LU h		NO da
FI f	LU k		NO dbc
FRAg	NO g		NO dfgh
IE ce	NO h		NO dl
IE da	NO i		NO dm
IE dbc	NO j		NO do
IE dfgh	NO k		NOAg
IE dl	NO ns		SE da
IE do	PT dbc		SE dbc
IE f	PT g		SE dfgh
IE g	PT h		SE dl
IE h	PT i		SE dm
IE i	PT j		SE do
IE j	PT k		SE f
IE k	PT ns		SEAg
IE ns	SE g		
	SE h		
	SE i		
	SE j		
	SE k		
	SE ns		

Table A(v). Cluster Details from Analysis at Level 4's first analysis

Cluster 1	Cluster 2	Cluster 3	Cluster 4
AT f	AT ce	BE f	CH ce
AT g	AT ns	BE g	CH da
AT h	BE h	BE i	CH dfgh
AT i	BE j	DK f	CH dl
AT j	CH dbc	DK g	CH dm
AT k	DE ns	DK h	CH do
DE f	DK ce	DK i	CH f
NL g	DK da	DK j	CH g
NL h	DK dfgh	DK k	CH h
NL i	DK do	ES j	CH i
NL j	DK ns	NLAg	CH j
NL k	FR g		CH k
	FR h		CH ns
	FR i		CHAg
	FR j		FI ce
	FR k		SE ce
	FR ns		
	LU g		
	LU i		
	LU j		
	NL dm		

Table A(vi). Cluster Details from Analysis at Level 4's second analysis

Cluster 1		Cluster 2	Cluster 3	Cluster 4	Cluster 5
ES ce	IT ce	SE g	IE f	IE ce	BE k
ES da	IT da	SE h	IE h	IE da	DK dbc
ES dbc	IT dbc	SE i	IE i	IE dbc	DK dl
ES dfgh	IT dfgh	SE j	IE k	IE dfgh	FRAg
ES dl	IT dl	SE k	NO g	IE dl	IE g
ES dm	IT dm	SE ns	NO h	IE do	IE ns
ES do	IT do		NO i	IE j	LU h
ES f	IT f		NO j		LU k
ES g	IT g		NO k		PT dbc
ES h	IT h		NO ns		PT g
ES i	IT i				PT h
ES k	IT j				PT i
ES ns	IT k				PT j
ESAg	IT ns				PT k
FI f	ITAg				PT ns
	LU ce				

Table A(a): Codes for sectors

Code	Sectors
Ag	Agriculture, Forestry and Fishing
ce	Mining and Energy Supply
da	Food, Beverages and Tobacco
dbc	Textiles and Clothing
dfgh	Fuels, Chemicals, Rubber and Plastic Products
dl	Electronics
dm	Transport Equipment
do	Other Manufacturing
f	Construction
g	Wholesale and Retail
h	Hotels and Restaurants
i	Transport and Communications
j	Financial Services
k	Other Market Services
ns	Non-Market Services

Table A(b): Codes for Country Names

Code	Country
BE	BELGIUM
DK	DENMARK
DE	GERMANY
GR	GREECE
ES	SPAIN
FR	FRANCE
IE	IRELAND
IT	ITALY
LU	LUXEMBOURG
NL	NETHERLANDS
AT	AUSTRIA
PT	PORTUGAL
FI	FINLAND
SE	SWEDEN
UK	UNITED KINGDOM
NO	NORWAY
CH	SWITZERLAND

Appendix B: Eigenvalues from Discriminant Function Analyses

Table B(i): Eigenvalues for analysis at Level 1

Discriminant Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	4.29	73.237	73.236	0.901
2	1.57	26.763	100	0.781

Table B(ii): Eigenvalues for analysis at Level 2

Discriminant Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	4.18	51.07	51.07	0.898
2	2.49	30.54	81.61	0.845
3	1.50	18.39	100	0.775

Table B(iii): Eigenvalues for first analysis at Level 3

Discriminant Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	11.03	67.69	67.69	0.9575
2	5.26	32.31	100	0.917

Table B(iv): Eigenvalues for second analysis at Level 3

Discriminant Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	7.42	53.30	53.30	0.939
2	6.49	46.70	100	0.930

Table B(v): Eigenvalues for first analysis at Level 4

Discriminant Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	20.40	57.40	57.40	0.976
2	11.26	31.68	89.07	0.958
3	3.88	10.92	100	0.892

Table B(vi): Eigenvalues for second analysis at Level 4

Discriminant Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	22.89	50.17	50.17	0.979
2	14.04	30.76	80.92	0.966
3	5.64	12.36	93.28	0.922
4	3.07	6.72	100	0.868

Appendix C: Correlation Coefficient between canonical scores and pseudoscrores for all levels of analyses

Table C(i): Correlation coefficients: Analysis at Level 1

Level	**Canonical Score (A)**	**Pseudoscore (B)**	**Country**	**Correlation between (A) & (B)**	**Level of significance**
1	1	Rate of change in investment of GR's manufacturing, agriculture, forestry and fishing sectors relative to investment of all the sectors of	BE	-0.639	0.01
			DK	-0.589	0.01
			DE	-0.655	0.01
			ES	-0.612	0.01
			FR	-0.604	0.01
			IE	-0.508	0.01
			IT	-0.651	0.01
			LU	-0.710	0.01
			NL	-0.616	0.01
			AT	-0.666	0.01
			PT	-0.717	0.01
			FI	-0.515	0.01
			SE	-0.571	0.01
			UK	-0.395	0.01
			NO	-0.362	0.01
			CH	-0.541	0.01
			Eurozone	-0.652	0.01
			EU25	-0.644	0.01
			All Countries	-0.640	0.01
1	2	Rate of change in household expenditure of PT relative to the household expenditure of	BE	0.448	0.01
			DK	-0.211	0.01
			DE	-0.233	0.01
			GR	0.403	0.01
			ES	0.368	0.01
			FR	0.480	0.01
			IE	0.300	0.01
			IT	0.425	0.01
			LU	0.035	No
			NL	0.297	0.01
			AT	0.395	0.01
			FI	0.452	0.01
			SE	0.586	0.01
			UK	0.377	0.01
			NO	0.171	0.05
			CH	0.627	0.01
			Eurozone	0.222	0.01
			EU25	0.261	0.01
			All Countries	0.288	0.01

Table C(ii): Correlation Results: Analysis at Level 2

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
2	1	Rate of change in GDP of UK relative to the GDP of	BE	-0.59	0.01
			DK	0.08	No
			DE	-0.43	0.01
			GR	-0.43	0.01
			ES	-0.83	0.01
			FR	-0.71	0.01
			IE	-0.63	0.01
			IT	-0.42	0.01
			LU	-0.54	0.01
			NL	-0.59	0.01
			AT	-0.47	0.01
			PT	-0.70	0.01
			FI	-0.67	0.01
			SE	-0.54	0.01
			NO	0.49	0.01
			CH	-0.05	No
			Eurozone	-0.59	0.01
			EU25	-0.58	0.01
			All Countries	-0.55	0.01
2	2	Rate of change in GDP of AT relative to the GDP of	BE	-0.691	0.01
			DK	-0.638	0.01
			DE	-0.501	0.01
			GR	-0.549	0.01
			ES	-0.699	0.01
			FR	-0.682	0.01
			IE	-0.673	0.01
			IT	-0.635	0.01
			LU	-0.618	0.01
			NL	-0.702	0.01
			PT	-0.691	0.01
			FI	-0.569	0.01
			SE	-0.638	0.01
			UK	-0.592	0.01
			NO	-0.469	0.01
			CH	-0.197	0.01
			Eurozone	-0.681	0.01
			EU25	-0.723	0.01
			All Countries	-0.716	0.01

Table C(iii): Correlation Results: Analysis at Level 3

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
3(1)	1	Rate of change in investment of AT's sectors in cluster 1 relative to investment in the sectors of	DE	-0.543	0.01
			FR in cluster 2	0.638	0.01
			NL in cluster 2	-0.525	0.01
			BE in cluster 3	0.186	No
			LU in cluster 3	-0.210	0.05
3(1)	1	Rate of change in investment of FR's sectors in cluster 1 relative to investment in the sectors of	DE	-0.299	0.01
			FR in cluster 2	0.681	0.01
			NL in cluster 2	-0.299	0.01
			BE in cluster 3	0.461	0.01
			LU in cluster 3	0.100	No
3(1)	1	Rate of change in investment of NL's sectors in cluster 1 relative to investment in the sectors of	DE	-0.184	No
			FR in cluster 2	0.634	0.01
			NL in cluster 2	-0.401	0.01
			BE in cluster 3	0.424	0.01
			LU in cluster 3	0.144	No
3(1)	1	Rate of change in investment of DK relative to investment in the sectors of	DE	-0.012	No
			FR in cluster 2	0.614	0.01
			NL in cluster 2	-0.249	0.01
			BE in cluster 3	0.471	0.01
			LU in cluster 3	0.209	0.05
3(1)	1	Rate of change in investment of CH relative to investment in the sectors of	DE	-0.010	No
			FR in cluster 2	0.492	0.01
			NL in cluster 2	-0.152	No
			BE in cluster 3	0.326	0.01
			LU in cluster 3	0.129	No

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
3(1)	2	Rate of change in Current taxes on income and wealth of BE relative to that of	FR	0.516	0.01
	2	Rate of change in Current taxes on income and wealth of LU relative to that of	FR	0.550	0.01
3(1)	2	Rate of change in taxes on production and imports of BE relative to that of	FR	0.576	0.01
	2	Rate of change in taxes on production and imports of LU relative to that of	FR	-0.210	0.05
3(1)	2	Rate of change in total receipts from taxes and social contributions BE relative to that of	FR	0.672	0.01
	2	Rate of change in total receipts from taxes and social contributions of LU relative to that of	FR	0.321	0.01
3(1)	2	Rate of change in investment of BE's sectors in cluster 3 relative to the investment in the sectors of	BE in cluster 1	-0.222	0.05
			NL	-0.509	0.01
			FR	-0.014	No
			DK	-0.079	No
			DE	-0.180	No
			CH	0.159	No
			AT in cluster 1	-0.410	0.01

Table C(iv): Correlation Results: Analysis at Level 3

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
3(2)	1	Rate of change in investment of GR's sectors in cluster 2 relative to the investment in the sectors of	ES	0.267	0.01
			FI	0.226	0.05
			IE	0.149	No
			IT	0.393	0.01
			PT	0.416	0.01
			NO	0.325	0.01
			SE	0.189	No
3(2)	2	Rate of change in investment of FI relative to the investment in sectors of	ES	0.170	No
			IE	0.370	0.01
			IT	0.446	0.01
			PT	0.556	0.01
			NO in cluster 1	-0.654	0.01
3(2)	2	Rate of change in investment of NO's sectors in cluster 3 relative to the investment in sectors of	ES	0.391	0.01
			IE	0.486	0.01
			IT	0.480	0.01
			PT	0.573	0.01
			NO in cluster 1	-0.274	0.01
3(2)	2	Rate of change in investment of SE sectors in cluster 3 relative to the investment in sectors of	ES	0.533	0.01
			IE	0.595	0.01
			IT	0.665	0.01
			PT	0.714	0.01
			NO in cluster 1	-0.242	0.05

Table C(v): Correlation Results: Analysis at Level 4

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
4(1)	1	Rate of change in investment of CH relative to the investment in sectors of	AT	0.732	0.01
			NL	0.813	0.01
	2	Rate of change in investment of DK relative to the investment in sectors of	CH	-0.399	0.01
			AT	0.423	0.01
			NL	-0.277	0.05
	2	Rate of change in household expenditure of DK relative to that in sectors of	CH	0.509	0.01
			AT	0.195	No
			NL	0.333	0.01
	2	Rate of change in	CH	0.388	0.01

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
		GDP of DK relative to the GDP in sectors of	AT	0.378	0.01
			NL	-0.051	No

Table C(vi): Correlation Results: Analysis at Level 4

Level	Canonical Score (A)	Pseudoscore (B)	Country	Correlation between (A) & (B)	Level of significance
4(2)	1	Rate of change in nominal oil price		0.601	0.01
		Rate of change in real oil price		0.657	0.01
	1	Rate of change in investment of SE's sectors in cluster 2 relative to the investment in sectors of	ES	0.451	0.01
			IE	-0.456	0.01
			IT	-0.552	0.01
			PT	0.552	0.01
			NO in cluster 3	-0.114	No
	1	Rate of change in household expenditure of SE's sectors in cluster 2 relative to the household expenditure in sectors of	ES	0.453	0.01
			IE	-0.236	0.01
			IT	0.558	0.01
			PT	0.389	
	1	Rate of change in GDP of SE's sectors in cluster 2 relative to the GDP in sectors of	ES	0.455	0.01
			IE	0.113	No
			IT	0.296	0.05
			PT	0.259	0.05
	2	Rate of change in nominal oil price		0.446	0.01
		Rate of change in real oil price		0.469	0.01
	2	Rate of change in investment of NO's sectors in cluster 3 relative to the investment in sectors of	ES	0.573	0.01
			PT in cluster 5	0.562	0.01