The Allometry of Non-employment

What can compositional data analysis tell us about labour market performance across the UK's regions?[*]

Michael Anyadike-Danes
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Northern Ireland Economic Research Centre
22-24 Mount Charles
Belfast BT7 1NZ

Tel: (44) 28 90216810
Fax: (44) 28 90330054

e-mail: m.anyadike-danes@qub.ac.uk

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Abstract

The low levels of unemployment recorded in the UK in recent years are widely cited as evidence of the country's improved economic performance, and the apparent convergence of unemployment rates across the country's regions used to suggest that the longstanding divide in living standards between the relatively prosperous 'south' and the more depressed 'north' has been substantially narrowed. Dissenters from these conclusions have drawn attention to the greatly increased extent of non-employment (around a quarter of the UK's working age population are not in employment) and the marked regional dimension in its distribution across the country. Amongst these dissenters it is generally agreed that non-employment is concentrated amongst older males previously employed in the now very much smaller 'heavy' industries (e.g. coal, steel, shipbuilding).

This paper uses the tools of compositional data analysis to provide a much richer picture of non-employment and one which challenges the conventional analysis wisdom about UK labour market performance as well as the dissenters view of the nature of the problem. It is shown that, associated with the striking 'north/south' divide in non-employment rates, there is a statistically significant relationship between the *size* of the non-employment rate and the *composition* of non-employment. Specifically, it is shown that the share of unemployment in non-employment is negatively correlated with the overall non-employment rate: in regions where the non-employment rate is high the share of unemployment is relatively low. So the unemployment rate is not a very reliable indicator of regional disparities in labour market performance. Even more importantly from a policy viewpoint, a significant positive relationship is found between the size of the non-employment rate and the share of those not employed through reason of sickness or disability and it seems (contrary to the dissenters) that this connection is just as strong for women as it is for men.

Context and Motivation

The recent performance of the UK economy, particularly its continuing low rate of unemployment, has attracted admiration not least from governments elsewhere in Europe some of whom aspire to emulate its more 'flexible' labour market regime. What seems not to have been appreciated is that the structure of the UK labour market has changed in such a way that the unemployment rate data, taken at face value, may serve to conceal the true state of the labour market. As we shall see the *non*-employment rate - the proportion of the population not in employment – turns out to be a much more informative indicator of labour market conditions and it suggests an increased 'detachment' from the labour force of significant numbers of the working age population, particularly in the less prosperous regions. Equally, it is misleading to conclude from the convergence in unemployment rates across the UK's regions that the longstanding inter-regional ('north'/'south') gap in labour market performance is closing.

The route to these conclusions involves a somewhat novel investigative strategy. The structure of the labour market is viewed as a problem in allometry[1]: where the size of parts of an organism (the components of *non*-employment) are examined in relation to the size of the organism as a whole (the relative size of non-employment in the working age population in different regions of the UK); and this problem is analysed using the tools of compositional data analysis[2]. Here we partition the working age population into two: those who are employed and those who are not employed, and investigate the relationship between the proportion non-employed (size) and the shares in non-employment of its different constituent categories (composition).[3] More specifically we use data from the UK Labour Force Survey to construct a five-fold classification of the *non-employed* of working age for males and females. The categories are: unemployed; in education or training; not working by reason of sickness or disability; looking after the home; and retired or inactive for other reasons. Averages from this data for the period 1995 to 2002 for the 12 (NUTS1) regions of the UK are then used to calibrate the relationship between the size and composition of non-employment.

The main body of the paper is divided into three. The first section sets out the basic facts of regional non-employment and its composition by age and sex; the next section reports the results of the modeling of the size-composition relationship; whilst the third discusses some implications of the estimated relationships by age and sex for cross-regional

[1] More particularly *static* allometry: "The term allometry refers to three alternative phenomena … : ontogenetic, static and evolutionary. Ontogenetic allometry is the growth trajectory of an organ relative to the body during the growth of a single individual. Static allometry is the scaling relationship *among individuals* between one organ and the total body size, or between two organs, after growth has ceased or at a single developmental stage… Evolutionary (or phylogenetic) allometry is the size relationship between organs *across species*. The slopes of such scaling relationships are often not equal to 1; that is, large insects are not uniformly scaled-up versions of small insects." Stern and Emlen (1999, pp1091-1092).

[2] However there are precedents. For example, Aitchison applies compositional data analysis to an allometric problem, see "an early shape and size analysis" Aitchison (1986, pp 227-231) and there are parallels in his analysis of the "activity patterns of a statistician" (see Aitchison (1986, pp. 241-254)..

[3] For background to the relationship between the state of the labour market and the categories of non-employment see MacKay (1999) and Beatty, Fothergill and Macmillan (2000).

comparisons, and for the incidence of non-employment due to sickness and disability. An Appendix provides information on data sources and construction.

1 .Variations in Non-Employment Rates by Age, Sex and Region

Before tackling the question of the relationship between the size and composition of non-employment it is worth summarising some basic facts about UK non-employment rates. First of all, the non-employment rate has a characteristic age-related shape. Chart 1 illustrates this using regional average data for males and females recorded for five-year age groups from 16 to 59 to 55 to 59 years old[4]. The connection between non-employment and stages in the life course is obvious. In the teenage years participation in education means that the non-employment rate is relatively high, it then falls quite steeply for 20 to 24 year olds as they make the transition to work. From the 25 to 29 year old age group up to 45 to 49 years old is 'prime' working age, after which non-employment rises, ultimately quite steeply, as retirement approaches. The female non-employment rate is always higher than the male rate, the broad pattern of change is similar and if we exclude the proportion of females whose labour force activity is recorded as "looking after the home" (the dashed line on the chart labelled 'excHD') you will see that over the 'prime' working age range male and female rates are virtually identical.

{Chart 1 near here}

Of course, the nature of the connection between the life course and the non-employment rate implies that the composition of non-employment will also vary with age. Chart 2 displays a plot of the female non-employment rate by age group and category of non-employment. We already know that for most age groups the looking after the home category is about 10 percentage points, and the importance of education for the younger age groups and retirement (the largest component of 'other inactive') has also been mentioned. What is new, and most striking is the remarkable growth in the sick/disabled rate over the prime working age groups. For 30 to 34 year olds the rate is 3.5%, for 45 to 49 year olds it has more than doubled and for the 55 to 59 year olds it is more than five times larger, with the rate standing at just over 18%. By contrast, the unemployed rate[5] is small and relatively constant (over the prime age range always less than 5%). The corresponding data on the composition of male non-employment displays much the same features. Of course the living-after-the-home category is tiny, but otherwise the pattern is very similar and, in particular, the size and rate of growth of the sick/disabled rate is almost identical, whilst the unemployed rate remains close to 5% for all prime age males.

{Chart 2 near here}

[4] Although according to the official UK definition the working age for males is 16 to 64 years, in order to make the results for males more obviously comparable with those of working age females (that is 16 to 59 years) the 'working age male' results reported here do not include 60 to 64 year old males. See Anyadike-Danes (2004) for a discussion of male non-employment which does include this age group.

[5] This is not the conventional unemployment rate since the denominator here is population, not (as in the ILO case) the labour force.

Chart 3 completes the background. It displays a scatter of working age non-employment rates by region, female against male. Two important features of the data stand out. First, there is a wide inter-regional range – almost 15 percentage points separate rates in the most prosperous parts of the 'south' (South East and East England) from those in the most disadvantaged, extreme 'north' (North East England and Northern Ireland). Second, although (as we saw) non-employment rates differ quite substantially by sex, the female/male differential of about 12 percentage points seems not to vary much between regions. Indeed, if again we exclude the proportion looking after the home, we find that the 'gap' virtually disappears for the ten regions in the (male) 15% to 25% range. And for the extreme 'north' female non-employment rates are actually lower than those for males by about five percentage points.

{Chart 3 near here}

2. Modelling the Relationship between Size and Composition

As we have just seen regional average figures for non-employment and its composition vary systematically, and in an intuitively plausibly way, by sex and age. Against this background we are concerned to determine the nature and extent of the connection between the composition of non-employment and working age and individual region's non-employment rates, as we move across the inter-regional range displayed on Chart 3. The raw data itself is suggestive as we can see from Table 1, which displays non-employment rates for working age males and females for the two regions at either end of the 'spectrum' of regional prosperity: the South East of England (SE) and Northern Ireland (NI). For both sexes the 'south'/'north' differential is around 15 percentage points; and we can also see that,

- The unemployed rate for NI males is larger than for SE (but the differential is small relative to non-employment), female rates are roughly the same
- The education rate is higher in NI than in SE (male/female rates similar within regions)
- The sick/disabled rate is higher in NI than in SE (male/female rates similar within regions)
- The looking-after-the-home rate for NI females is about 5 percentage points larger than for SE females
- SE female other inactive rate at 4% twice as large as the others

{Table 1 near here}

Simply put, the objective here is to determine the extent to which these measured inter-regional differences in the component rates making up the overall non-employment rate – that is the composition of non-employment - can be accounted for by the differences in the size of the non-employment rate itself. Clearly this is a question which compositional data analysis can help to answer.

Following Aitchison (1986), the first step in modelling a compositional dataset is to form a set of 'log-ratios'. We have five categories of non-employment: unemployed (UN); education and training (ED); sick/disabled (SD); looking after the home (HD); and retired and other inactive (OI). For females we formed four ratios and for males three ratios (men 'looking after the home' was included with 'other inactive'), in both cases OI was used as the base category. After taking natural logarithms of the ratios and we have four relationships to estimate for females, and for males just the first three. For each age group 'i' we have,

$$\ln(UN_i/OI_i) = \alpha_{Ui} + \beta_{Ui} \times \ln(NEM)$$
$$\ln(ED_i/OI_i) = \alpha_{Ei} + \beta_{Ei} \times \ln(NEM)$$
$$\ln(SD_i/OI_i) = \alpha_{Si} + \beta_{Si} \times \ln(NEM)$$
$$\ln(HD_i/OI_i) = \alpha_{Hi} + \beta_{Hi} \times \ln(NEM)$$

where NEM is the working age non-employment *rate*. For each sex there are nine five year age groups, plus the working age aggregate. We have used the working age non-employment rate as the independent variable since it might be expected to better reflect the general state of a region's labour market than the age-specific rates.[6]

The estimation results are summarised in Table 2. Whilst their detail is not readily interpretable (the relative size of the coefficients becomes more interesting after their implications for projected shares are computed), nonetheless the overall pattern is worthy of comment. For males, aside from the youngest (16 to 19 years) age group, there is almost no evidence of a size effect on composition until we reach the 40 to 44 year old age group, and then for each of the four age groups from 40 to 44 up to 55 to 59 the preferred model has a positive size effect on the (relative) sick/disabled share (and, except in one case, only on the sick/disabled share). The female results display a similar pattern, but the size effect on the sick/disabled share starts younger: from the 30 to 34 year old age group onwards. Moreover from the 40 to 44 year old age group onwards the preferred model for females has a positive size effect on the looking-after-the-home share as well.

{Table 2 near here}

In order to derive the projected composition of non-employment it is necessary to 'solve' the model using the three sets of estimated relationships and the 'adding up constraint',

$$UN + ED + SD + HD + OI = 100$$

Clearly the solutions for the shares are non-linear. The 'solution' for the unemployment share is, for example,

$$UN = \{[(e^{aUN} * NEM^{bUN}) * 100] / B\}$$

[6] In practice using the appropriate age-specific NEM as the 'size' variable made little difference to the overall character of the results. This alternative set of model estimates are available from the author on request.

Where,

$$B = e^{aUN} * NEM^{bUN} + e^{aED} * NEM^{bED} + e^{aSD} * NEM^{bSD} + e^{aHD} * NEM^{bHD}$$

Substituting data on the working age regional non-employment rate (NEM) into the 'solutions' for the non-employment categories yields a set of projected shares. Chart 4 displays an illustrative projected composition of male non-employment, and Chart 5 the corresponding projections for females, for age groups from 40 to 44 up to 55 to 59. The HIGH and LOW projections represent the regional 'extremes', They are calculated by substituting into the estimated model for each age group the corresponding regional maximum and minimum non-employment rate (either North East England or Northern Ireland is the maximum, one of the three regions of southern England (South East, East, South West) is the minimum, see Appendix Table A).

We can see a similar, pretty clear cut, pattern in both charts. Taking males first, the LOW projection on Chart 4 shows the sick/disabled share relatively constant across the age groups, whilst the other inactive (essentially retired) share expands by a factor of five (from 10% to 50%) at the 'expense' of the unemployed share. The other inactive share expands in the HIGH projection too, but much less dramatically, and in this case the sick/disabled share expands along side it with, again, the unemployed share contracting across the age groups. It is worth emphasising here that these are projected shares of very different sized non-employment rates: for most of these age groups there is a 20 percentage point difference between the regional maximum and minimum, and we will return in the next section to examine the implication of projected shares for inter-regional variations in sick/disabled rates.

{Chart 4 near here}

The picture for females from the projections recorded in Chart 5 is similar to that for males, despite the extra complications in the pattern of estimated coefficients. Again the sick/disabled share in the LOW projection is relatively small and constant, again the other inactive share expands steadily with age. But here it is not just the unemployed share which contracts, the looking-after-the-home share does too. The HIGH projection corresponds with that for males. The sick/disabled share is relatively large and expands with age and the (relatively smaller) other inactive share expands with age too; for females in the HIGH case both the unemployed share and the looking-after-the-home share contract.

{Chart 5 near here}

3. Discussion

One of the key contributions of this study is the extra insight it provides into the contrast between South East England and Northern Ireland already clearly evident in the data recorded in Table 1. The model underpinning the projections allows us to construct a decomposition which reveals the contribution of the 'north'/'south' difference in non-

employment rates to the 'north'/'south' difference in the composition of non-employment. The first two columns of Table 3 (in both panels (a) and (b)) record the simple transformation of the shares projected by the estimated coefficients for working age non-employed into rates using the pair of non-employment rates, the HIGH rate (Northern Ireland) and the LOW rate (South East) [7]. The difference between the two cases (recorded in the third column) can then be divided into two: a 'scale' effect (the HIGH/LOW difference if composition were independent of size); and the 'size' effect itself[8].

{Table 3 near here}

The key feature of the 'rate' results (and consistent with the pattern which emerged in our earlier discussion of the 'share' results for older males and females) is that for the working age group as a whole, the most striking aspect of the HIGH/LOW contrast, is the large size effect on the difference in sick/disabled rates. The difference in sick/disabled rates accounts for roughly half the HIGH/LOW difference for both males and females, and of that difference between half (male) and two thirds (female) is accounted for by 'size' effects. For both males and females, the largest negative, 'offsetting', size effect is the other inactive (mainly retired) component of non-employment (and, in the case of females, looking after the home).

Another feature of the table worth noting is what it tells us about the unemployed rate - for both males and females the 'size' effect is negative (and in the case of females, it is large relative to the 'scale' effect). Evidently then, taking the working age population as a whole, this is clear evidence that in regions where the non-employment rate is high the unemployment rate may well understate the extent of labour market slack, *and do so quite systematically*.[9]

However, since it is the contrast in the sick/disabled category between the 'LOW' and 'HIGH' cases which is particularly noteworthy (and so uniform for males and females) it is worth digging a little deeper into this aspect of the results. Table 4 records data on the projected sick/disabled rate by sex and age group for the two cases. Not only do the projected rates rise almost monotonically by age (excepting only the rates for 25 to 29 year old females) but, more significantly, so does the difference between them. Up to the mid-30s for females, and late-30s for males, the difference is relatively modest, less than 5 percentage points; but for 55 to 59 year olds the gap is four times larger at 20 percentage points. Indeed, for every age group over 30 for females and over 40 for males, the rate in the 'HIGH' case is three times as large as the rate in the 'LOW' case. Clearly there is a remarkable parallel between male and female the sickness/disability rates of males and females: not only do regional average sick/disabled rates for men and women

[7] The agreement between the data in Table 1 and the projections in Table 3 is an indication of the 'fit' of the estimated model for the South East of England and Northern Ireland.

[8] Of course, were the preferred model to have been one with non non-zero coefficients (for example, 20 to 24 year olds), the 'scale' effect would equal the difference and the 'size' effect would be zero.

[9] This finding supports a conclusion in a recent paper by MacKay: " The general rule is, the greater the degree of labour-market disadvantage, the less appropriate is unemployment as a measure of labour-market slack." MacKay(1999, p.1933).

grow in parallel with age, so does the difference between 'HIGH' and 'LOW' case regions.

The results reported here have a number of different kinds of implications. First of all there is a methodological message. Compositional data analysis can be a very powerful tool for sorting out inter-relationships where the data represent the categorical classification of a population. Second, there are some important, substantive, findings. We have uncovered the significant effects of the 'size' of non-employment on its 'composition' which is immediately relevant to the interpretation of inter-regional comparisons of labour market conditions in the UK. In particular, the larger the non-employed rate the smaller the unemployed share in non-employment and moreover (and contrary to the received wisdom) we have been able to show that females are being recorded as 'not working through reasons of sickness or disability' at very similar rates to males.[10] Third, and last, there is a lesson here for policy-makers. Whilst health/welfare/education policy may well affect the form in which non-employment is recorded[11] – it need not necessarily be its root cause. It follows then, by implication, that health/education/welfare policy may not necessarily be the appropriate cure.

[10] See Alcock *et al* (2003) for a comprehensive treatment of the detachment from the UK labour force of older males.

[11] See Bowker and Star (1999) for a useful discussion of this issue.

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Appendix

A.1 Data Sources and Construction

The data used here are from the spring 1995 to 2001 sweeps of the Labour Force Survey and were supplied by Statistics Branch of DETINI.

In the labour force survey the employed are defined as, "… people aged 16 or over who did some paid work in the reference week (whether as an employee or self-employed); those who had a job that they were temporarily away from (on holiday, for example); those on government-supported training and employment programmes; and those doing unpaid family work." The term non-employed is defined here as all those of working age (16 to 59 for females, 16 to 64 for males) who were not employed plus those classified as employed who were on, "the government-supported training and employment programmes".

The five category classification of non-employment used here is built up from the almost 30 categories distinguished in the labour force survey itself. The LFS categories are listed and the correspondence table below shows how our non-employment categories relate to it,

Category number	LFS (INECACA) Category
1	Employee
2	Self-employed
3	Government scheme
4	Unpaid family worker
5	ILO unemployed
6	Inactiveive ,seeking,unavailable,student
7	Inactive,seeking,unavailable,home/family
8	Inactive,seeking,unavailable,temp sick
9	Inactive,seeking,unavailable,long term sick/disabled
10	Inactive,seeking,unavailable,other reason
11	Inactive,seeking,unavailable,no reason
12	Inactive,not seeking,would like,waiting on results of job app
13	Inactive,not seeking,would like,student
14	Inactive,not seeking,would like,home/family
15	Inactive,not seeking,would like,temp sick
16	Inactive,not seeking, would like,long term sick/disabled
17	Inactive,not seeking,would like,belives no job available
18	Inactive,not seeking,would like,not yet looking
19	Inactive,not seeking,would like,not looked
20	Inactive,not seeking,would like,no reason
21	Inactive,not seeking,would not like job,waiting on results of job application
22	Inactive,not seeking,would not like job,student
23	Inactive,not seeking,would not like job,home/family
24	Inactive,not seeking,would not like job,temp sick
25	Inactive,not seeking,would not like job,long term sick/disabled
26	Inactive,not seeking,would not like job,does not need/want job
27	Inactive,not seeking,would not like job,retired

28	Inactive,not seeking,would not like job,other reason
29	Inactive,not seeking,would not like job,no reason

Non-Employment	Corresponding LFS Categories
Education&Training	3+6+13+22
Unemployed	5
Sick / Disabled	8+9+15+16+24+25
Home / Family Duties	7+14+23
Retired/Other Inactive	10+11+12+17+18+19+20+21+26+27+28+29

A2. Supplementary Data

Table A: Non-Employment Rates by Age
regional minima and maxima, ratio to population (%)

	Male				Female			
	Minimum		Maximum		Minimum		Maximum	
Age Group (years)	Rate (%)	Region	Rate (%)	Region	Rate (%)	Region	Rate (%)	Region
16-19	43.2	SE	70.3	NI	41.2	SE	72.3	NI
20-24	20.2	EN	34.4	NE	30.6	EN	42.1	NE
25-29	9.5	SE	19.6	NE	25.2	SE	35.2	NE
30-34	7.3	SW	18.9	NE	27.5	SW	35.9	NE
35-39	7.3	SW	18.6	NI	23.7	SW	36.6	NI
40-44	7.7	SE	19.7	NI	20.2	SE	33.3	NI
45-49	8.0	SE	21.5	NI	18.4	SE	34.0	NI
50-54	11.6	SE	29.2	NE	24.5	SE	43.1	NE
55-59	20.7	SE	44.1	NE	37.7	SE	57.8	NE

Table 1: Non-Employment of Working Age Population and its Composition by Sex, South East England and Northern Ireland, ratio to population %

	Male			Female		
	SE	**NI**	**Difference**	**SE**	**NI**	**Difference**
UN	4.3	7.9	3.6	3.2	3.4	0.2
ED	4.3	9.1	4.8	4.1	9.3	5.2
SD	2.9	8.3	5.4	3.5	8.6	5.1
HD	0.5	1.3	0.8	12.6	17.8	5.2
OI	1.7	1.9	0.2	4.0	2.4	-1.6
NEM	13.7	28.5	14.8	27.4	41.5	14.1

Key: UN, unemployed; ED, education and training; SD, sick/disabled; HD, looking after the home; OI; other inactive (mainly retired); NEM, non-employed.
Note: Working age 16 to 59 years for both males and females.

Table 2 Summary of Estimation Results by Sex and Age

	Male			**Female**			
Age Group (years)	b_U	b_E	b_S	b_U	b_E	b_S	b_H
16-19	0.043	0	0.086	0.067	0	0	0
20-24	0	0	0	0	0	0	0
25-29	0	-0.027	0	0	0	0	0
30-34	0	0	0	0	0	0.063	0
35-39	0	0	0	0	0	0.072	0
40-44	0	0	0.033	0.052	0.052	0.118	0.071
45-49	0	0	0.039	0	0	0.068	0.054
50-54	0.045	0	0.079	0	0	0.107	0.068
55-59	0	0	0.082	0	0	0.096	0.056
Working age	0.025	0.018	0.053	0.037	0.067	0.086	0.043

Notes:
1. For model specification see text.
2. Subscripts on b's refer to: U, unemployed; E, education and training; S, sick/disabled; H, looking after the home.
3. Males looking after the homeincluded in other inactive.
4. All tests conducted at 5%.
5. Working age 16 to 59 years for both males and females.

Table 3: Projected Components of Working Age Non-Employment, 'North'/South' Differences with Scale/Size Decomposition, ratio to population (%)

(a) Male

	LOW 'South' (13.5%)	HIGH 'North' (28.5%)	Difference	Scale Effect	Size Effect
UN	4.3	8.7	4.4	4.8	-0.4
ED	3.9	7.2	3.3	4.3	-1.0
SD	3.1	9.5	6.4	3.4	3.0
OI	2.3	3.2	0.9	2.6	-1.7
NEM	13.5	28.5	15.0	15.0	0.0

(b) Female

	LOW 'South' (27.5%)	HIGH 'North' (41.5%)	Difference	Scale Effect	Size Effect
UN	3.4	4.3	0.9	1.7	-0.8
ED	4.0	7.7	3.7	2.0	1.7
SD	4.1	10.3	6.2	2.1	4.1
HD	11.9	16.2	4.5	6.1	-1.8
OI	4.0	3.0	-1.0	2.0	-3.0
NEM	27.5	41.5	14.0	14.0	0.0

Key: UN, unemployed; ED, education and training; SD, sick/disabled; HD, looking after the home; OI; other inactive (mainly retired); NEM, non-employed.

Notes:
1. Working age is 16 to 59 years for both males and females.
2. OI for males includes HD.
3. The projected rates for 'LOW' and 'HIGH' are calculated from the estimated coefficients of the model.
4. The 'Scale' effect is calculated by multiplying the rates from the LOW column by the ratio [(HIGH NEM/LOW NEM)-1]. The 'Size' effect is 'Difference' less 'Scale'.
5. Columns may not add due to rounding.

Table 4: Projected Male and Female Sick/Disabled Rates by Age, 'HIGH'/'LOW' Comparisons, ratio to population (%)

	Male			Female		
	'LOW'	'HIGH'	difference	'LOW'	'HIGH'	difference
16-19	0.6	1.9	1.3	0.8	1.4	0.6
20-24	1.6	2.7	1.1	2.3	3.2	0.9
25-29	1.9	4.3	2.4	6.9	9.6	2.7
30-34	2.0	5.3	3.3	2.0	6.1	4.1
35-39	2.6	6.5	3.9	2.4	9.3	6.9
40-44	2.8	9.5	6.7	3.8	11.9	8.1
45-49	3.5	12.6	9.1	5.5	14.3	8.8
50-54	5.2	18.8	13.6	7.3	22.5	15.2
55-59	8.2	30.6	22.4	10.7	30.8	20.1

Note:
The rates for 'LOW' and 'HIGH' are calculated for each age group from the estimated coefficients of the model using the regional minimum and maximum non-employment rates from Appendix Table A.

Chart 1: Male & Female Non-Employment Rate by age, ratio to population, regional average (%)

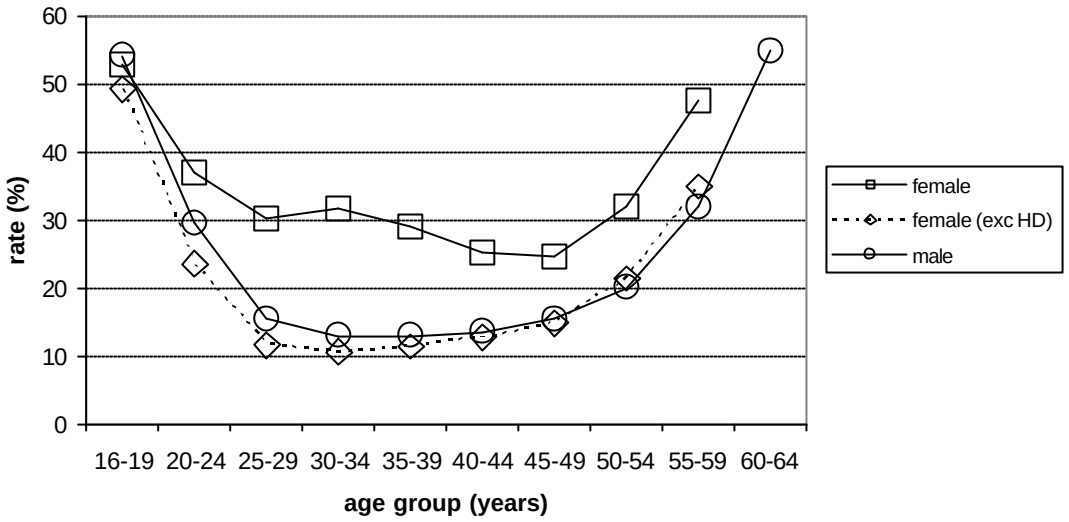


Chart 2: Female Non-Employment Rate and its Composition, by Age, regional average, ratio to population (%)

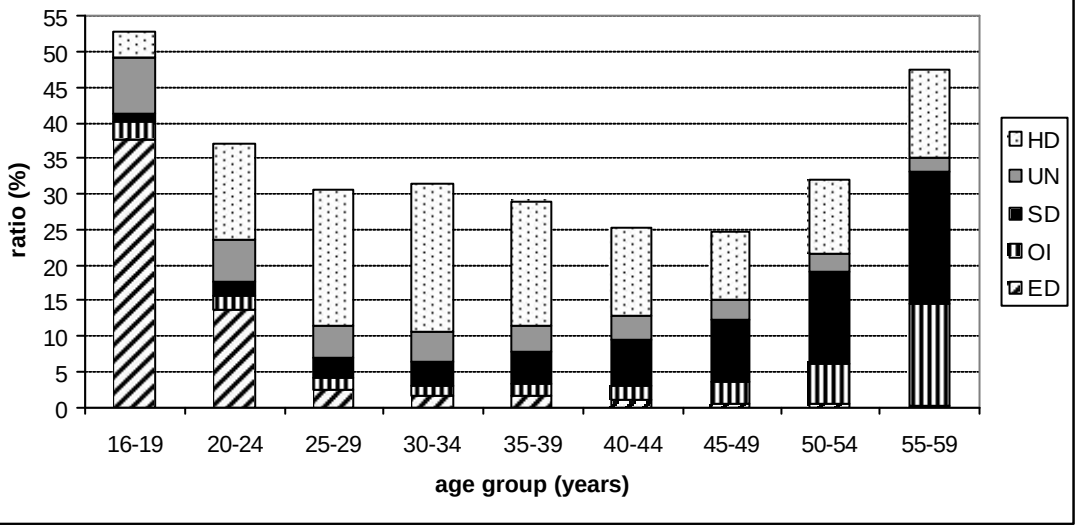


Chart 3: Male & Female Non-Employment Rates by Region,Working Age Female vs Male (16-59yrs), ratio to population %

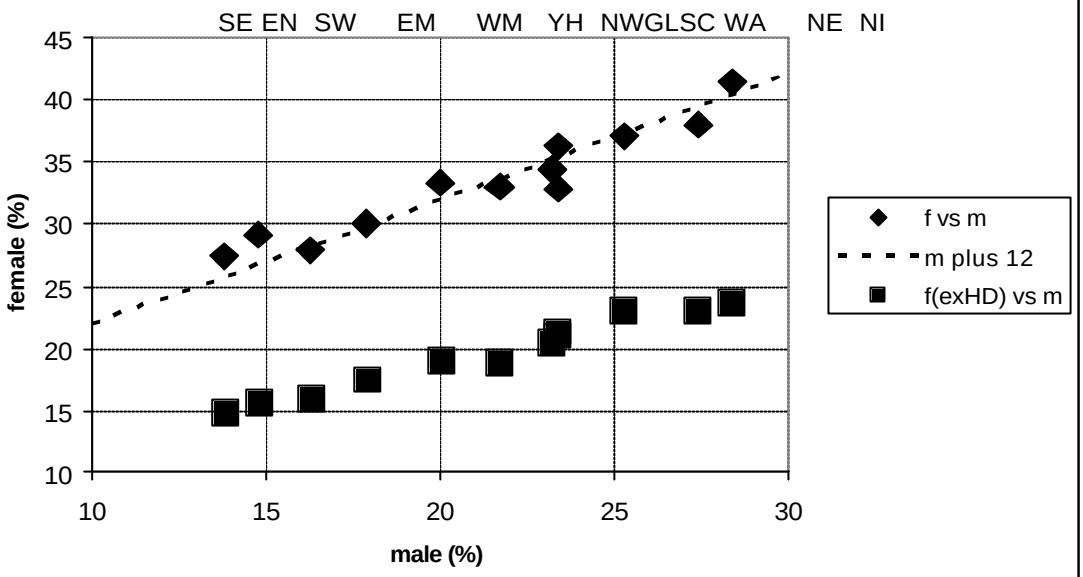
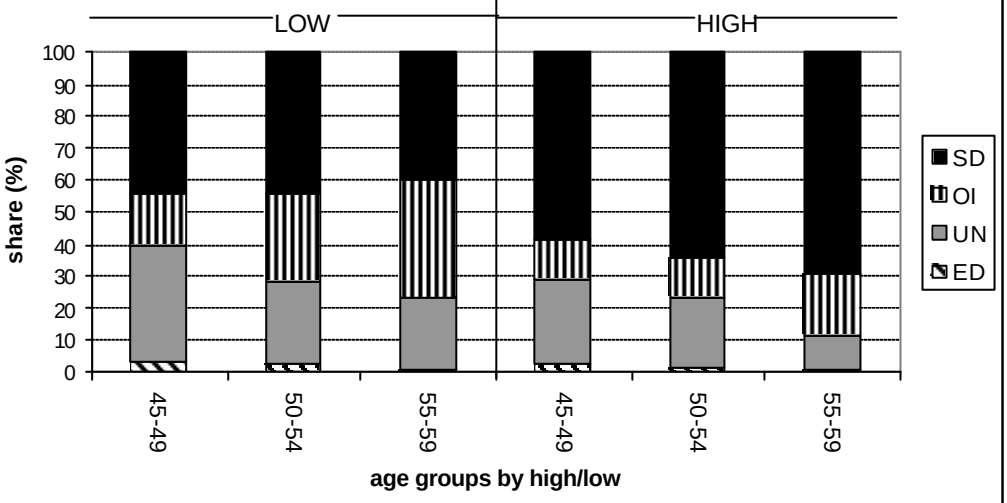


Chart 4: Projected Composition of Male Non-Employment by Age, High & Low, stacked shares (%)



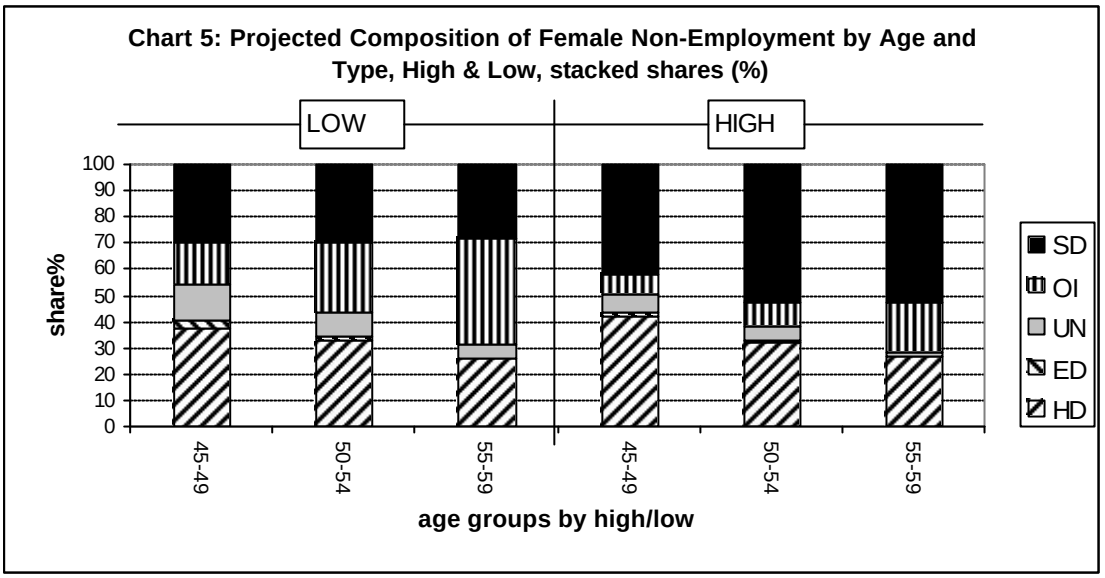


Chart 5: Projected Composition of Female Non-Employment by Age and Type, High & Low, stacked shares (%)
LOW
HIGH
share%
100
90
80
70
60
50
40
30
20
10
0
45-49
50-54
55-59
45-49
50-54
55-59
age groups by high/low
SD
OI
UN
ED
HD