# Gendered Occupations: Exploring the Relationship between Gender Segregation and Inequality*

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## Introduction

It is well known that occupations are gendered. In all countries there is a degree of occupational gender segregation, and in the more industrialised countries, such as those of North America and Europe, the levels are relatively high. Occupations tend to comprise disproportionately large numbers of women or of men. To be sure, segregation in a country is never complete; in almost all occupations there are workers of each sex, and there are some 'gender-mixed' occupations where the proportions of men and women are close to their proportions in the labor force as a whole. Furthermore, purely random processes of distribution of workers would produce some degree of segregation (Cortese et al. 1976a ,b). However, in many countries, including all the economically 'advanced' countries, the level of segregation is appreciably higher than would be expected from a random distribution, with relatively few in gender-mixed occupations and high concentrations in the more gendered occupations.

The occupational structure, in most countries, is large and complex and so conceptualizing the way in which it is gendered is an important first step in proceeding with an analysis. A useful start is to recognize the distinction between "segregation" - the tendency for men and women to be employed in different occupations from each other across the entire spectrum of occupations under analysis - and "concentration" - the representation of one sex *within* occupations (Siltanen et al. 1995). Both are important, and are related; segregation measures the combined effect of concentration in all the occupations involved. Some analysts (e.g. Anker 1998; Lewis 1985) choose to use the single concept of segregation to embrace both concentration and segregation, but there are fundamental differences; most notably, segregation is gender symmetrical (if women are segregated from men, men are equally segregated from women) while concentration cannot be (Siltanen et al. 1995; Blackburn et al. 1993; James and Taeuber 1984). Grusky and Charles (1998) appear to advocate the analysis of concentration (though they don't use the term) as though it were a new alternative to measuring segregation but, as Watts (1998) points out, such analysis is far from a new idea[1].

Most analysts, however, have been concerned with segregation. They are interested in the extent to which gender is an organizing principle of the occupational structure, and how far this entails women being occupationally separated from men in the labor market. Underlying these interests has usually been a concern with gender inequality entailed in segregation. Indeed occupational segregation has often been regarded as a form of gender inequality (e.g. Weeden 1998; Boyd et al. 1991). However, while inequality is still seen as central, it is now usually recognized that it is the vertical aspect of segregation that is the most important to understand with respect to inequalities. While this is easy to understand intuitively, conceptualizing the vertical dimension so that it can be measured in empirical data has been more of a problem. For instance Semyonov and Jones (1999: 242) argue 'occupational segregation and occupational inequality should be viewed as two distinct concepts'. They measure inequality with Lieberson's (1976) Index of Net Differences, which is not a dimension of segregation and so is not directly comparable to the segregation measure. Our approach decomposes segregation into vertical and horizontal components (Blackburn and Jarman 1997).

In this paper we illustrate the need for analysis of vertical segregation by exploring some surprising findings in two cross-national datasets provided by the ILO and the United Nations. We argue that such findings cannot be explained without reference to the vertical dimension, and proceed to present a way of measuring the vertical dimension, and then to use this operationalization to analyze data from three countries - the United Kingdom, Canada and the USA. We conclude that gender segregation and gender inequality are often inversely related in contemporary countries and that in some situations high levels of gender segregation can offer some advantages to women.

## Measuring Segregation

A variety of indexes have been used to measure segregation (Siltanen et al. 1995; James and Taeuber 1985) as well as some measures based on log-linear analysis, but here it will suffice to concentrate on some key points. The most popular index, particularly in the US, is the Index of Dissimilarity (ID), which is usually expressed as the sum of a set of terms with one for every occupation. But it can more simply be expressed as a simple difference of proportions in the 2x2 Basic Segregation Table of gender by gendered occupations (Blackburn et al. 1993). Most other measures of segregation used in social science and biology can be related to this table, but ID is probably the best. However, ID is influenced by the marginal totals of the table and the relationship between them.[2] To overcome these problems the Marginal Matching measure (MM) was introduced,[3] though in most circumstances its value is quite similar to that of ID. Subsequently M M was standardized as $MM_{200}$ to control for the tendency, shared with all other segregation indexes, to increase with the number of occupations (Blackburn et al. 1993, 2000). $MM_{200}$ is used in the following discussion.

## Segregation and inequality

Having established the relevant measure, we are now in a position to review the empirical findings. The data we use here consist of two sets. The larger set was supplied to us by the United Nations and comprise data on 161 countries. This data set contains only seven occupational categories for each country, which is not really satisfactory. Ideally we would like 200, though we estimate that 20 is enough to give fairly reliable estimates. The problem is that with small numbers the error component in measured segregation can be quite large, but on the whole the seven category occupational data provide a reasonable guide. The smaller data set was supplied by the ILO and contains data for years around 1990[4]. This comprises data on 32 countries with the number of occupations ranging from 24 in Iran to 1050 in Bahrain. We also use data from UN Human Development Reports for 1996 onwards (years chosen for comparability with other data). The highly segregated countries are located throughout the world, but with a disproportionate representation of the economically developed. In contrast, the countries with low segregation are overwhelmingly from Africa (particularly sub-Saharan) and Asia, and include no economically developed countries.

There is good reason to question the popular interpretation of occupational segregation and inequality. It is well known, and often remarked, that egalitarian Sweden has a particularly high level of gender segregation in the workforce. Furthermore, Sweden is not alone in this tendency. Table 1 compares countries with high and low segregation, in terms of whether the countries are above or below average on four United Nations indicators of women's empowerment - Seats in parliament, Earned income share, Percentage female of Administrators and Managers, and of Professional and Technical workers. The variables measure the extent to which the position of women approaches that of men. In all countries women lag behind men in achieving these positions. However, on all four variables we see that *women are less disadvantaged in the highly segregated countries* of this sample.

**Table 1. Numbers of Countries with High or Low Gender Segregation which are Above and Below Average on Four Gender-related Measures of Empowerment**

| | **Percent who are Women** | | | |
|---|---|---|---|---|
| **Country Type** | With seats in Parliament | Admin. & Managers | Professional & Technical | Women's Share of Earned Income |
| | *Above*[*] *Average Empowerment* | | | |
| **High Segregation** | 12 | 19 | 17 | 10 |
| **Low Segregation** | 5 | 6 | 6 | 7 |
| | *Below Average Empowerment* | | | |
| **High Segregation** | 10 | 3 | 5 | 12 |
| **Low Segregation** | 19 | 18 | 18 | 17 |
| **Total High** | 22 | 22 | 22 | 22 |
| **Total Low** | 24 | 24 | 24 | 24 |

Data to measure above or below average taken from *United Nations Human Development Report 1996.*

[*] Above includes a few instances of equal value.

High segregation is defined as $MM_{200} > 0.6$. Low segregation is defined as $MM_{200} < 0.3$. Data on empowerment not available for about one third of these countries.

There is only a weak contrast between high and low segregation countries on the share of income going to women, which might be seen as the most general measure of occupational inequality. On closer inspection, however, the lack of contrast is less remarkable. This variable is affected by two factors, the relative pay levels of women and men and the gender composition of the labor force. Thus more women working means a higher value for a given level of pay differential, but not necessarily higher segregation. Table 1 shows that even among the highly segregated countries there is a small majority of countries where women's share of income is below average, though this is much less marked than the tendency among the low segregation countries. To understand this we have to recognize that the distribution of this variable is quite skewed, so that two thirds of all countries covered by the UN have values below the mean.

When we consider seats in the national parliament the contrast is in the same direction but rather stronger. This may be regarded as another indicator of women's empowerment in a country. A little over half of the highly segregated countries have an above average proportion of women members, but few of the low segregation countries have above average membership of women. It is, however, the extent to which women hold occupations at high stratification levels that most clearly differentiates the high and low segregation countries in Table1. In most highly segregated countries women are more likely than average to have administrative and managerial occupations, while in low segregation countries they are very much less likely to hold such posts. The contrast is only slightly less marked in relation to professional and technical occupations.

The United Nations (2001) uses two summary measures to compare across countries the position of women in the public sphere. These measures are the *Gender Development Index (GDI)* and the *Gender Empowerment Measure (GEM)* which specifically measures women's empowerment. These measures are constructed to indicate the extent to which national labor markets approach gender equality. The UN also uses a *Human Development Index (HDI)* as a measure of such things as education, life expectancy and GDP per capita. Although there is no direct gender component in this measure, we might expect countries with high levels of HDI (e.g. USA, European countries) to have firm commitments to achieved vs. ascribed characteristics for determining entrance to occupations, to have well-established women's movements and to have enacted anti-discrimination legislation. Thus the HDI may also be seen as an indicator of gender equality, though less clearly so than the other two measures. Table 2 presents the correlations, using Spearman's rho, of these three measures with $MM_{200}$, the standardized measure of segregation.[5]

**Table 2: Association between standardized segregation measure, $MM_{200}$, and measures of national social development and equality (HDI, GDI, and GEM): Spearman rank correlations**

| | **Human Development Index (HDI)** | **Gender-Related Development Index (GDI)** | **Gender Empowerment Measure (GEM)** |
|---|---|---|---|
| | | ***Developing and Industrialized Countries*** | |
| | 0.124 | 0.204 | 0.422 |
| N | 32 | 28 | 28 |
| Sig. | 0.250 | 0.149 | 0.013 |

***Industrialized Countries***

| | | | |
|---|---|---|---|
| | 0.284 | 0.618 | 0.603 |
| N | 16 | 16 | 16 |
| Sig. | 0.143 | 0.005 | 0.007 |

Significance levels are for the one-tail test
The table is based on tables 3 and 4 in Blackburn et al. (2000: 125-6)

Using $MM_{200}$ is important as it removes the element of spurious correlation that would occur with MM, due to the tendency for countries with higher HDI, GDI and GEM levels to record data with more occupational categories, which in turn increase the unstandardized measures of segregation including MM.

The table presents correlations for two sets of countries in the data set provided by the ILO. The top set includes all 32 countries, or all for which the UN had a particular measure, while the lower set is restricted to 16 industrial countries.[6]

The most important aspect of this table is that all the values are *positive*. This is in keeping with the positive values we observed in Table 1. However, all the results are precisely *the opposite of what would be predicted on orthodox approaches*. The usual approaches have assumed a strong negative correlation between segregation and gender equality or even (as we noted above) taken segregation to be a direct measure of inequality[7]. We find that the higher the level of gender segregation in a society, the less tends to be the degree of gender inequality. Among the 16 industrial countries this is particularly striking, with the correlations of the GDI and GEM with $MM_{200}$ greater than 0.6. These are the two measures that reflect the empowerment and limitation of social disadvantage of women in the public sphere.

When the non-industrial countries are included, the correlations are appreciably weaker, and only the correlation involving the GEM is statistically significant. There are too few non-industrial countries in the sample to draw any clear conclusion. However, it appears that the same sort of relationship holds at a lower level of segregation, and so reduces the correlations. As different countries are dropped for lack of data when estimating the correlations with GDI and GEM, it is worth noting that if we limit analysis to the 25 countries for which all three measures are available the correlations increase. For HDI, GDI and GEM the respective correlations with $MM_{200}$ are 0.326, 0.413 and 0.444, bringing the GDI correlation into statistical significance.

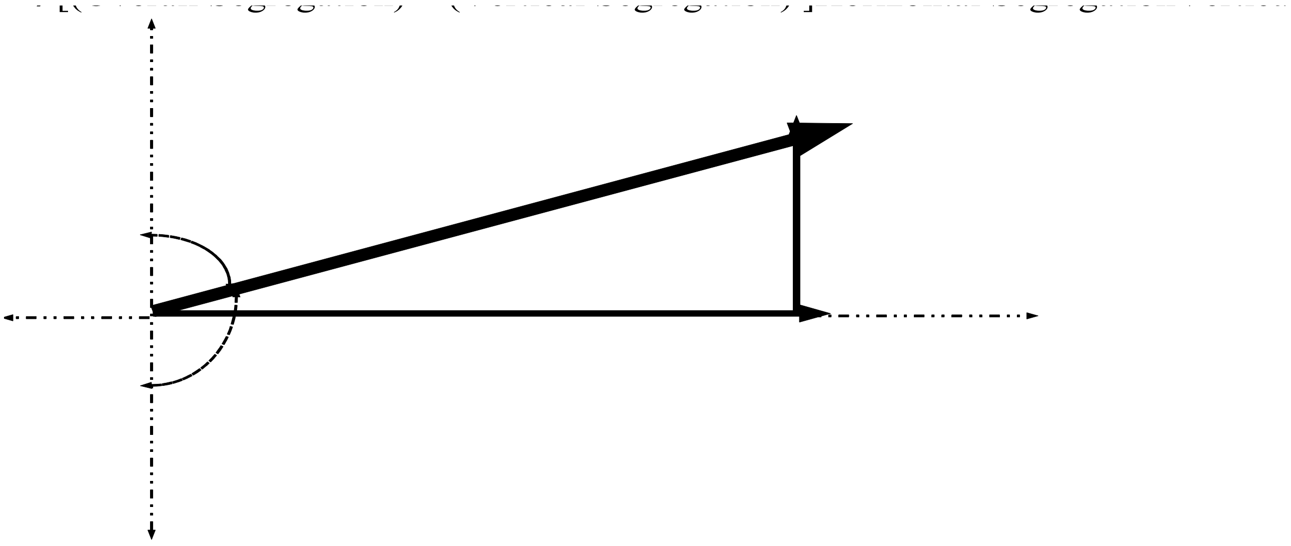
As expected, the HDI is less strongly related to $MM_{200}$ and the relation is not statistically significant for any of the occupational groupings. Nevertheless, the pattern is clear. Using the same UN data set as in Table 1 we find that 72 per cent of the highly segregated countries have above average GDP per capita compared to only 13 per cent of the countries with low segregation. Also the highly segregated countries are clearly advantaged in terms of life expectancy , education and literacy. These are variables included in the HDI and suggest the relation of the HDI with segregation is genuine. Importantly the relation is in the same direction as the GDI and the GEM, and like them is the reverse of what we might have expected.

So far our findings indicate that segregation in employment works to the advantage of women, a very surprising finding indeed. If this is correct, then clearly segregation cannot be regarded as an indicator of women's disadvantage in the labor market, as has generally been assumed. However, we should bear in mind that even in the most segregated countries women are at a disadvantage according to the GDI and GEM measures. Thus we have a paradoxical situation. Without gender segregation there would be no gender inequality in the occupational distribution; yet women are always seen as disadvantaged while segregation is negatively related to male advantage. To make sense of these findings we need to refine the measurement of gender segregation.

## Refining the concept of segregation

The way forward is to recognize that segregation can be decomposed into *vertical* and *horizontal* dimensions. We use the terms vertical and horizontal in the usual mathematical sense to represent two orthogonal dimensions. The resultant of the two dimensions is segregation as it has traditionally been conceived, which we now call *overall segregation* to avoid confusion. The relation between overall segregation and its component dimensions is illustrated in Figure 1. Vertical segregation measures inequality, while horizontal segregation measures the extent of difference which does not entail inequality in terms of the vertical criterion (Blackburn et al. 2001a).

**Figure 1 The Dimensions of Segregation**



The idea of vertical segregation is certainly not new. Hakim employed the concept as early as 1979, though her usage was somewhat different from ours. Whereas we see all occupations distributed on the same vertical dimension, she conceives of separate vertical dimensions for each of a range of situses, e.g. head teachers above teachers and hospital doctors above nurses, but no vertical relation of doctors and teachers. Hakim (1979) also uses the term horizontal segregation, but for what has otherwise been known as segregation instead of for a dimension orthogonal to the vertical. As this conceptualization has been utilized by others, we need to stress it is not our approach.

The measures of (overall) segregation discussed so far dichotomize the occupations into 'male' and 'female' categories. However, the gender composition of occupations is a continuous variable ranging from completely female to completely male (or vice versa). This dichotomizing of the occupational order condenses information, but this does not matter when we are simply measuring overall segregation (gendered occupations by gender) as the strength of the relationship (ID, MM, etc.) reflects the spread of the distribution across the occupations.

However, when we use the vertical and horizontal components of segregation, this entails introducing a vertical measure of inequality, such as occupational pay or social stratification. To dichotomize such measures would entail a serious loss of information. So we need a continuous, or more precisely an ordinal measure of overall segregation to relate it to the vertical component. The gini coefficient has been used as a measure of segregation (e.g. Silber 1989, 1992), and we have shown that this is a limiting case of Somers' D for the cross tabulation of occupation by sex. When occupations are ordered by gender composition, say from most female to most male, Somers' D is maximized (for the data set) and it becomes the gini coefficient. We use this to measure segregation, which we now call overall segregation. When occupations are ordered by a criterion of inequality (such as pay), Somers' D measures vertical segregation, and the vertical measurement is directly comparable to the measurement of overall segregation. Just as it was desirable to standardize MM, in order to control for the effect of the number of occupations used in constructing the measure, so is it desirable to standardize the gini coefficient G to $G_{200}$. Now it is also desirable to standardize the vertical and horizontal components V and H to $V_{200}$ and $H_{200}$.[8]

It must be clearly understood that, like overall segregation, the vertical and horizontal components are properties of the labor force or section of the labor force under consideration. They are not properties of particular occupations. We can compare two occupations only if we define them as the relevant labor force, in which case segregation is entirely vertical or entirely horizontal. Such extremes are extremely unlikely in any labor force with more than two occupations.

There are several ways of measuring vertical segregation as occupations may be hierarchically differentiated on several criteria. It is possible to combine criteria to create the vertical dimension, but it is important to be sure the combination is meaningful and the components are appropriately weighted. Some form of factor analysis might be appropriate for creating a suitable vertical component. If only two variables are combined a simple addition is likely to give a reasonable estimate. Often, however, it is more interesting to consider the vertical variables singly, which then gives us the ability to compare the segregation effect of different factors. In our analyses we have used pay and stratification to measure the vertical dimension. These are, we suggest, the two most important aspects of occupational inequality, and as explained below, the most appropriate for our purposes.

## Vertical and Horizontal Segregation

The answer to our puzzle should now be clear. The more egalitarian countries, as measured by the GDI and GEM, have low levels of vertical segregation but high levels of horizontal segregation which tend to produce high levels of overall segregation. This indicates a tendency for the vertical and horizontal components to be inversely related, and for declines in vertical segregation to be more than matched with larger increases in horizontal segregation. There is the possibility of egalitarian policies and practices in a country producing lower gender segregation in general, that is, reducing overall and its vertical component together. However, the findings we have described suggest that the first trend is considerably more dominant than the second, at least for the industrialized countries.

In order to test this conclusion empirically we have to decide on the appropriate measurement of the vertical dimension. There is no way of creating a vertical dimension which is directly comparable to the UN measures (GEM, GDI). Nor is there any sense in looking for the ‘true’ vertical dimension. However, the most appropriate general measure is undoubtedly one of *social stratification* which is based on occupations. *Pay* is an important and generally available *economic* indicator of occupational inequality; it taps a different aspect of inequality but is quite well related to stratification. Furthermore, pay is the usual measure used to indicate occupational gender inequality, while social stratification is the most comprehensive measure of occupationally based inequality. These are, therefore, our chosen measures of inequality for the vertical dimension.[9]

### *Inequality in Pay*

We begin by comparing Canada, Britain and the USA, with the vertical dimension measured by pay. For Canada and Britain we compare the years 1991 and 1996 to see how segregation has been changing in this short period, as there was good reason to see the 1990's as a time of modest change in terms of gendered employment patterns, and part of a long term trend reducing overall segregation in both countries. For the USA we are able to bring the analysis more up-to-date with data for 2000, which we compare with 1990. For all three countries we have quite large data sets, giving considerable confidence in the findings.

**Table 3: Dimensions of Segregation: Canada, Britain and the USA,**

**Vertical Dimension measured by Pay**

| Segregation | Canada 1991 | Canada 1996 | Britain 1991 | Britain 1996 | USA 1990 | USA 2000 |
|---|---|---|---|---|---|---|
| Overall ($G_{200}$) | .689 | .692 | .771 | .761 | .686 | .668 |
| Vertical ($V_{200}$) | .309 | .268 | .277 | .289 | .309 | .253 |
| Horizontal ($H_{200}$) | .616 | .638 | .719 | .704 | .612 | .618 |
| N of Occupations | 512 | 514 | 371 | 371 | 504 | 509 |

Source Data: Canadian Census, supplied by Statistics Canada; British Labour Force Survey and New Earnings Survey; and IPUMS US Census data.

We find the vertical dimension is positive in every case, indicating women are disadvantaged in their levels of pay. However, the size of the vertical dimensions is decidedly less than we might have expected; in all cases the horizontal component is substantially bigger than the vertical one. It is important to bear in mind that pay is not the only form of inequality, and although all forms of inequality tend to be positively correlated with earnings, in so far as any form of inequality is not perfectly correlated with earnings it is not included in this vertical dimension. Also these findings are based on the rank ordering of occupational incomes which underestimates the full extent of inequality. Because the exceptionally huge incomes (say greater than $500,000) go overwhelmingly to men (usually company directors), the mean income difference by gender is rather greater than our findings indicate. Nevertheless, our results give a good guide to the inequalities relevant to the majority of the population. It should be clearly understood that these are inequalities related to the occupations men and women are engaged in, and do not include further inequalities due to discrimination[10].

**Table 4: Segregation of Part-time Women and All Men: USA and Britain**
**Vertical Dimension measured by Pay**

| Segregation | | Britain 1991 | Britain 1996 | USA 1990 | USA 2000 |
|---|---|---|---|---|---|
| Overall ($G_{200}$) | . | .847 | .839 | .747 | .729 |
| Vertical ($V_{200}$) | . | .464 | .510 | .530 | .493 |
| Horizontal ($H_{200}$) | . | .708 | .667 | .527 | .537 |
| N of Occupations | | 371 | 371 | 504 | 509 |

Source Data: British Labour Force Survey and New Earnings Survey; and IPUMS US Census data.

One factor affecting the size of the vertical component is the prevalence of part-time employment for low-paid women. The hourly returns to part-time work tend to be lower than those for full-time work; this appears to be a universal pattern. Comparing just part-time women with all men, in Table 4, overall segregation increases due entirely to the much higher vertical dimension. In the USA the vertical values in1990 and 2000 are respectively 72% and 95% higher than in the entire labor force. Overall segregation values are just 9% greater in each year, while horizontal segregation is a little over 13% lower. Similarly in Britain, vertical segregation is substantially higher:68% in 1991 and 76% in 1996. In each year overall segregation was just 10% greater, while horizontal segregation (-1% and -5%) was little changed.

The disadvantage of part-time work for women is clear, and is not primarily due to part-time women working in different occupations from other women (in the US the segregation of full-time and part-time women is only .105). While the majority of part-time workers are women [11], men working part-time are also low-paid. Among part-time workers in the US in 2000 the vertical segregation advantage of men was just .125, compared to .228 among full-time workers. In Canada the part-time men tend to be slightly less well paid than the women, with a vertical component of -.094 in 1996, though the familiar pattern of male advantage was clearly there for full-time workers

In the contemporary industrialised countries most women working part-time are mothers. While this provides the opportunity to combine domestic and market work, it is at a significant financial cost in the form of low pay. The proportion of women working part-time in the US, at about 24%, is comparatively low, presumably because the high costs of child-care mean that many women can only afford to take the better-paying full-time jobs.

When we look at the differences across these countries in relation to their ordering on the GDI, GEM and HDI the result is not entirely what we might have predicted from our earlier findings. It will be recalled that there is a tendency for segregation level and gender equality to vary together (rho ranging from 0.143 on HDI to 0.618 on GDI). On all three UN measures the order is Canada, USA, Britain, indicating Canada has the highest level of women's empowerment etc. On overall and horizontal segregation Canada is higher than the USA, as predicted, but contrary to expectation Britain has higher levels than either of the North American countries. On vertical segregation Britain has the highest level, as expected, while Canada and the US are very similar, though an interpolated 1996 value for the US would fit the pattern. However, the changes over time *do* fit the general argument as in all three countries horizontal and vertical segregation moved in opposite directions. In the USA and Canada vertical segregation declined while horizontal segregation increased, and in Britain the reverse was the pattern. Bearing in mind that the tendency observed in Table 2 is far from complete, leaving considerable scope for variation, these findings within and between countries do fit the predicted pattern at least as well as, if not better than, expected.

### *Inequality in Social Stratification*

Analysis in terms of pay gives us a view of economic inequalities between men and women. To get a more social analysis we turn to social stratification as measured by CAMSIS, an internationally comparative assessment of the structures of social interaction and stratification[12]. Table 5 presents results for Britain in 1991 and 1996 and the USA for 1990[13].

**Table 5: Segregation in Britain, 1971 -1996, and USA 1990**
**Vertical Dimension Measured by CAMSIS**

| | Britain | | USA |
|---|---|---|---|
| **Segregation** | **1991** | **1996** | **1990** |
| Overall ($G_{200}$) | -.778 | -.768 | -.686 |
| Vertical ($V_{200}$) | -.124 | -.118 | -.140 |
| Horizontal ($H_{200}$) | .768 | .759 | .671 |
| N of occupations | 371 | 371 | 504 |

Source: British census 1991and the 1996 Labour Force Survey adjusted by the ratio of values for the 1991census to the1991 Labour Force Survey; IPUMS for US census data, and CAMSIS website at Cardiff University.
Overall segregation is shown as negative as it lies below the horizontal in Figure 1 like the vertical segregation which is negative. Horizontal segregation is a scalar quantity, showing no advantage to either sex, and so can only be positive.

The first thing to note is the set of negative values, indicating that occupational advantage lies with women. This may not fit conventional views of segregation, and some may even find it surprising, yet it should not surprise. Long ago England (1979) and Fox and Suschnigg (1989) found similar results using prestige scales for the USA and Canada.. Admittedly England and Fox and Suschnigg were simply comparing gender scores on the scales, rather than measuring a vertical dimension of segregation, but the implication for segregation is there. Reluctance to accept such a result led Fox and Suschnigg (1989: 358) to reject the value of prestige scales, remarking 'We believe (with England 1979) ... that the concept should be removed from its central role in research on stratification'. While we would not particularly wish to defend prestige scales, our findings do indicate that this pattern of inequality is real and needs to be taken seriously. At the same time we must not lose sight of the fact that this is only one aspect of gender inequality, and as we have seen, the complete picture of gender segregation shows a real (if less than often believed) disadvantage for women. One aspect not directly covered by either of our measures is power, which is hard to measure but, as we would expect, does tend to favour men (Wright et al 1995).

The vertical components are quite small. Also, the change in Britain is small. If we look back to 1971, overall (ignoring sign) and horizontal segregation have declined steadily (from 0.809 and 0.800 respectively), but this has not meant gains for women. The vertical component has changed little, being -0.123 in 1971. Women's advantage was declining from 1971 to 1981, then the trend was reversed from 1981 to 1991. This was probably due to the equal opportunities legislation that was introduced in the mid '70s taking effect with a short time lag.[14] From 1991 the decline started again. It appears, therefore, that we again see a general trend of women losing ground as overall segregation declined, while political action temporally reversed the trend.

Even if we assume the negative element is measurement error and the vertical values should be zero, they are still much less than the values for income. In fact, as CAMSIS is positively correlated with income, it appears that in so far as aspects of CAMSIS inequality are unrelated to income, they give a clear advantage to women.

To understand this negative finding we need to see how men and women are distributed through the occupational structure. Men may dominate the best occupations, particularly the most highly paid ones as we noted earlier, and this has received plenty of attention. However, at the other end of the scale, manual work, and particularly unskilled heavy labouring (which may be moderately well compensated in pay) is also more likely to be done by men. Women tend to be concentrated towards the middle of the scale, in non-manual work, though disproportionately at the lower levels. Thus, at least in Britain, the vertical dimension is negative for manual work and positive for non-manual work (Blackburn et al 2001a: 525). The net result is the slight advantage to women which we have observed.

Turning to the relation between the horizontal and vertical dimensions, we face a difficulty. How are we to interpret negative values? We have argued that greater overall segregation tends to reduce the vertical dimension, but this was based on the situation of women’s disadvantage. Does it mean improve the situation for women or reduce gender inequality? The latter would imply that we ignore the sign and hypothesise that horizontal segregation tends to vary inversely with the numerical magnitude of the vertical component. In fact differences in the vertical measures are so small as to make any conclusion difficult. The clearest difference is between the USA and Britain; this fits the second interpretation - ignoring sign - which we are inclined to accept. On the other hand, the small vertical change in Britain fits the alternative interpretation. In any case the findings do not contradict our argument of two opposite tendencies, but they do not lend strong support either.

The only firm conclusions we can draw from the CAMSIS data is that overall segregation is clearly not a measure of gender inequality (in either direction) and - in keeping with our general argument - differences in vertical segregation, over time or across countries, do not necessarily follow the same pattern as differences in overall segregation.

## Why is there gender segregation?

Most discussions of gender segregation treat the existence of overall segregation as a form of gender inequality. Sometimes it is presented as a cause of inequality (Anker 1998) and particularly as the basis of the pay gap (Nelson and Bridges 1999; Jacobs 1995; Stone 1995), but this has little practical effect on the understanding of segregation.

Whether seen as a cause or the actual inequality, the analysts then look for explanations in terms of gender relations. Some main lines of argument have been that men dominate the labor market. The basis of their power is variously presented as biological (Goldberg 1993, 1979), human capital and rational choice (Polacheck 1975; Mincer and Polacheck 1974) or patriarchy (Delphy 1977; Jenson and Laufer 1999; Anderson and Tomaskovic-Devey 1995; Reskin and Hartmann 1986) or the three in combination (Hakim 2000). However, there has been much criticism of these explanations (e.g. Anderson and Shapiro 1996; Browne 2000; Blackburn et al. 2002).[15] A basic problem with these kinds of explanations is that they rest in essentialized understandings of gender. They over-emphasize male agency, under-emphasize women's ability both to resist but also at times to support a status quo in which they have an unequal status, and overlook the interactions of gender and class that place limitations on working class men's power to control their environments. They also tend to underestimate the impact of expansion and contraction of the labor supply and its effects on opportunities, (or lack thereof), for new entrants to the labor force.

Explanations of gender segregation have usually started from the assumption that the segregation is itself a form of inequality or is strongly related to inequality, and the inequality is unquestionedly taken to be to the advantage of men. Therefore the explanations focus on the existence and persistence of this inequality. However, we have seen that the actual situation is more complicated than this. To be sure, all segregation entails an element of inequality, and on the whole the assumption of women's disadvantage is correct. Yet, considering what are probably the two most important measures of labor market gender inequality, we have seen that the male advantage is decidedly limited - the male labor force is polarized with some men dominating the top of the occupational structure while a greater number of men occupy middle or even very inferior positions.[16] Indeed, one of the newer debates about trends in labor markets takes as a starting point the relative fall in men's employment worldwide and the "feminization" of male jobs, with feminization meaning the growth of precarious and insecure employment as distinct from the creation of more desirably flexible jobs from the perspective of workers, male or female (Standing 1989, 1999).

To understand the reasons for gender segregation we have to look beyond gender relations to processes and developments in the wider society (Blackburn et al. 2002). We need to consider the changing nature of work and the changes in the available work forces. Significant technical and social developments have transformed the situation. In particular the developments have completely changed the involvement of women in the work of contemporary industrial societies

In North America and Europe there has been a substantial decline in employment in agriculture and in traditional industries, particularly the heavy industries where men predominated. At the same time there has been an expansion of non-manual employment, particularly in office and professional work. This has created a demand, and indeed a need for an educated work force, and in all industrial societies and many others there has been a huge expansion of the education system (Shavit and Blosfeld 1993).

The effect of the education system on the composition of the labor force has been profound in the economically developed countries. A hundred years ago it was usual for boys and girls to start work in their early teens, or earlier; now this teenage source of employees has largely disappeared, with many young people staying on in education into their twenties or sometimes even longer. This change has eliminated a large portion or the traditional labor force, including the majority of female workers. It is true that in many countries, including the USA and Britain, students often undertake part-time work, but their net contribution to employment is appreciably less than in the past. To maintain the size of the labor force employers were forced to recruit elsewhere, and the available source was older women and particularly married women. In so far as they have been recruited to work part-time the actual number of women workers has had to increase. Immigrants may provide extra labor but they also create additional jobs, whereas women provided a new resource from within the existing population.

The development of more reliable contraception has made the limitation of family size much easier. Improved health has reduced the risk of infant and child mortality and so the need to have more children than actually desired. Expanding education has tended to postpone, and so reduce the childbearing period, while children in education are an expense at ages when they used to be a source or income, and involvement in employment has probably had a limiting effect on the number of children. All these factors have tended to reduce the physical demands and time devoted to child-bearing. At the same time, improved health has meant both that women live longer and that they tend to be fitter. Thus women now have a considerable number of years when they are available for employment. This is reinforced by changes in social provision and practice, making it easier for women to keep their jobs while bearing and caring for babies. The new source of workers that employers needed became available.

As the nature of work changed in the industrial world, the new and expanding occupations had to be staffed by available workers, who were predominantly women. Some men sought to exclude women from their occupations, and certainly there was concern to stop women coming in as cheap labor and undercutting the men's wage rates. Thus traditional male occupations have remained male dominated. However, these are mainly in declining industries such as ship-building, railroads and mining. One area where men have maintained their advantage is in directorships of medium and large companies.[17] As incomes in this area far exceed incomes elsewhere, this contributes to the size of the gender pay gap. On the other hand, women have made substantial gains in the professions, which are also high status though without the extreme pay, thus contributing to women's greater achievements in terms of stratification. However, as high-status occupations expand they lose their exclusiveness and the level of pay goes down. It is sometimes suggested that the pay goes down because women enter an occupation, but it is more plausible that the pay goes down with the expansion.

These general developments, which are all inter-related, give a clear indication of why there are high levels of overall segregation in the industrial societies. Long term trends seem to have entailed a modest reduction in overall segregation (even in Canada if we look back to 1971[18]) though there are fluctuations. As women, with the help of education, continue to enter some male occupations (e.g. engineering) and men enter some female occupations (e.g. nursing) we may see further declines in overall segregation.

The position with regard to vertical segregation is less straightforward. It is reasonably clear why income gives a positive dimension and stratification gives a lower value, but less clear why we should have found a negative value (advantage to women). Yet this has been the finding for Britain, Canada and the USA, and the evidence of Semyonov and Jones (1999) on status and segregation suggests this is a more general situation. The main reason behind this is that women are more likely to be in non-manual occupations while men tend to fill the low level manual jobs as well as the high level managerial ones. Considering just the non-manual sector, the male domination of the top non-professional positions (company directors etc.) gives a positive advantage to men - the vertical dimension is positive, though less than the dimension on pay. As the male-dominated positions are achieved towards the end of careers, it remains to be seen how far women will close this gap in future The general picture is clearly one of male advantage, but at a rather lower level than is generally believed. As women are, to a considerable extent, comparative newcomers to the adult labor market, entering the occupations which lose social advantage as they expand, it is to be expected that vertical segregation should be to their disadvantage.

## Conclusion

We have seen the importance of conceptualizing segregation in term of its two dimensions: a vertical dimension of inequality and a horizontal dimension of difference without inequality. This does not replace the interest in overall segregation but is essential to understand its significance. It provides a crucial way forward for the analysis of the consequences - particularly in terms of inequality - of different levels and kinds of segregation patterns.

Our cross-national analysis presented a quandary: situations in which women’s levels of disadvantage are lower, rather than being found in countries where gender segregation levels are lower, as has been generally expected, actually tend to be found with high levels of gender segregation. Using the UN measures of GDI, GEM and HDI showed that there is a tendency for overall segregation to be positively related to women’s advantage. Since vertical segregation must, logically, be negatively related to measures of equality, the only possible explanation is that vertical segregation (inequality) tends to be negatively related to overall segregation, and so even more clearly to horizontal segregation. Our preliminary analyses of the USA, Britain and Canada are consistent with this general tendency.

We found women were less highly paid, as all the literature would lead us to expect. However, the degree of inequality was less than might have been expected, with the vertical dimension substantially smaller than the horizontal. More striking was the finding that women were advantaged in terms of social stratification. The small negative values on the CAMSIS vertical dimension indicated some social advantage in terms of the desirability of their occupations, as typically defined as status and class. This illustrates the importance of considering the vertical dimension, as a conventional consideration of only overall segregation would lead to a typical assumption of disadvantage for women. However, the fact that this aspect of inequality favors women should not mislead us into thinking women have gained an advantage or even equality in the public sphere. It is an important aspect of the situation to be aware of, but the UN measures reflect the reality that in all countries any progress towards gender equality still has some way to go.

We have noted the pattern of relationships among vertical and horizontal segregation, as they combine in overall segregation, but the interesting question is why it occurs. Why does high overall segregation go with low vertical and high horizontal components? In the first place we should recognize that the tendency is not absolute, and cannot be so. Since vertical and horizontal segregation are components of overall segregation there is always a tendency for them all to vary together; as vertical segregation increases or decreases, overall segregation will tend to change correspondingly, and similarly with regard to changes in horizontal segregation. At the same time there is an inverse relation between horizontal and vertical segregation, so that as vertical segregation increases or decreases, then horizontal segregation - and sometimes overall segregation - changes in the opposite direction.

Different types of employment policies have different consequences for segregation levels. Affirmative action policies, which are designed to eliminate barriers to employment based on gender, are likely to have an impact primarily on horizontal segregation. To the extent that the barriers are reduced for women to enter higher-paid male occupations, they also have an impact on vertical segregation. "Comparable worth" policies which are designed to raise the pay of female occupations to similar male occupations may possibly lead to horizontal segregation patterns rising a little, as the pay of female occupations is raised making them more attractive to women, though they may also attract more men. However, their most direct effects will be, as intended, to reduce vertical segregation. The combined effect of both types of policy is intended to reduce overall segregation by reducing both components.

It is striking, therefore, that the net tendency is for the two components to move in opposite directions. This happens because horizontal segregation reduces the chances of discrimination. The more an occupational career is confined to women, the greater the women's chances of reaching high levels. In predominantly female occupations, such as nursing, the senior positions may be disproportionately held by men. However, the fewer the men available for promotion, the more women must fill the promoted positions. With total segregation women would occupy all the senior positions in their occupations, and the more closely this extreme is approached, the higher will be the proportion of senior positions held by women. In this sense high overall segregation favors women. There is, nevertheless, a cost to both women and men in that occupational choices are restricted. A more attractive approach to equality would entail low overall segregation and minimal vertical dimensions in all sections of the labor force - unrestricted occupational choice and equal opportunities for women and men. But this is not the situation we have observed. It seems probable that the long-term effects of legislation are also reducing vertical segregation, with the decline greater than the increase in the horizontal component, yet this is not the dominant trend.

The aims of the 1960s and later are certainly sound, in offering fairer and more varied opportunities for women and men. The focus may have been on women's opportunities, which is fully understandable with regard to pay, but men would also benefit from increased opportunities. However, at least in terms of fairness for women, it seems the earlier strategy is more effective, with greater overall segregation accompanied with less inequality. It is actually greater horizontal segregation that increases equality, but that can only be pursued by increasing overall segregation and as a consequence reducing the vertical aspect. At least in the industrial societies, the increasing importance of educational qualifications and the growing numbers or well qualified women in the older age ranges, together with policies of gender equality, may lead to declines in vertical segregation without the disadvantage of increases in horizontal segregation.

Finally, a significant concern in any movement towards gender equality is the nature and direction of change. Our analysis has focused on inequalities that exist between women and men, but narrowing the gender gap has been achieved by widening the inequalities among women. As more women have moved into higher level positions, and less concentrated in low level jobs, the decline in gender inequality has meant the occupational distribution of women has become more like that of men. Furthermore, reducing the inequalities can be achieved by reducing men's pay as well as increasing women's. Given the amount of economic restructuring that has been taking place, with traditional 'male' industries in decline, the outcome is unclear. Trade union men and women have always been concerned that women's equality should not come at the expense of men's wages. The goal was always for women's wages to reach the levels of the higher-paid men; the fear was and is the undercutting of the position of men in the economy so that firms can bring in lower-paid women. As the industrial nations get richer, there is a real danger of more men joining women on 'poverty' wages.

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**Notes**

1. For examples of concentration analysis see Siltanen et al. (1995, ch. 2), Jarman et al. (1999).

2. It is generally claimed that ID has marginal independence with respect to the marginal totals of men and women (though not those of gendered jobs). However, this only gives independence in the exceptional circumstances where either or both gender columns are multiplied by constants, for instance where an increase in the number of women is distributed between 'male' and 'female' occupations in exactly the existing proportions (Blackburn et al. 1993; Siltanen et al. 1995). There is also a limiting case where changes in the numbers of workers in 'male' and/or 'female' occupations does not alter the value of ID, but this is even more exceptional.

It is often argued that the odds ratio has marginal independence for all marginals, but this too is only so in the unlikely circumstances where a row or column is multiplied by a constant. This is one of the reasons why log-linear analysis is not really appropriate for segregation analysis; for some further reasons see Watts (1998).

3. The cutting point dividing 'male' and 'female' occupations is chosen so that the totals match the gender totals - the number of workers in 'male' occupations is the same as the number of male workers and similarly the number in 'female' occupations equals the total number of women. Thus the totals are those that must exist for total segregation. Various statistics of association (including both differences of proportions) now coincide with MM.

4.The years vary from 1979 to1992 though mostly 1990-92.

5. Pearson product-moment correlations are not really appropriate in view of the data distribution, but would give quite similar results.

6. The countries are listed in descending order of $MM_{200}$. Those included in the 16 industrial countries are marked with *; those missing GDI measures are marked with $^{\perp}$, and those without GEM measures are marked with $^{<}$. Sweden*, Costa Rica, Angola$^{<}$, Kuwait, Finland*, Bahrain$^{<}$, Jordan $^{\perp<}$, Canada*, Norway*, Luxembourg $^{\perp}$, UK*, Australia*, Hungary*, Cyprus $^{\perp}$, Iran, Austria*, Switzerland*, France*, USA*, Tunisia, Spain*, Haiti, Hong Kong$^{<}$, Bulgaria $^{\perp}$, New Zealand*, Mauritius, Poland*, Egypt, Japan*, Italy*, Rep. of Korea, Malaysia.

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7. Charles 1992 observes '*sociological arguments* and *common wisdom* suggest that sex occupational segregation should be less pronounced in countries characterized by an ideology that emphasizes gender equality'(emphasis added).

8. The formula for standardized G for country i with n occupational categories is

$$G_{200i} = G_{200E} \times G_{ni} / G_{nE.}$$

Where $G_{nE}$, the expected value for n occupations, is given by

$$G_{nE} = 1 - \frac{1}{1 + 2(\log_{10}n)^{0.73}}$$

giving $G_{200E} = 0.78609$.

The formula for standardized V for country i with n occupational categories is

$$V_{200i} = V_{ni}[1 - d(V_{ni}/G_{ni})] , \quad \text{where } d = (G_{ni} - G_{200})/G_{ni}$$

The standardization of V is based on how it varies in relation to G, and the standardized H is calculated from the other two measures ($H^2 = G^2 - V^2$).

9. For stratification we are using Camsis (formerly the Cambridge Scale when applied only to Britain), which is generally better related to relevant variables than other measures of class or status. Camsis is now available for 20 countries; while the theoretical basis is the same in each case the scale is adapted to the national occupational coding scheme (See http:www.cfac.uk./socsi/CAMSIS/index.html for details).

10. Male pay rates were used to represent occupations for the USA and Britain, thus eliminating gender effects from discrimination, length of service or hours of work. For Canada the figures are appropriately weighted combinations of men's, women's, full-time and part-time rates; this might allow a small effect from discrimination.

11. For example, in the US, where about 10% of men work part-time, the sex segregation into full-time or part-time work is .418.

12. For information on CAMSIS see http://www.cf.ac.uk/socsi/CAMSIS.

13. 2000 values are not yet available.

14. Equal pay legislation had a similar effect on pay, with a slight decline in the vertical dimension for 1971 to 1981 followed by a substantial decline to 1991 and then a modest increase (values of $V_{200}$ being .463, .453, .279, and .291, based on census data). See also Zabalza and Tzannatos (1985).

15. For an extensive set of discussions of different approaches, with varying degrees of criticism, see Reskin (1984). See also Bradley (1989).

16. An illustration of the limited power of men in the labor market is provided by the decline in North American and European industrial societies of traditional heavy industries where the employees were predominantly men.

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[17] In egalitarian Norway women account for 7 per cent of the membership of boards of directors, compared to about 2 per cent in most countries. The government has just decreed that the proportion must be raised to 40 per cen in three years. Unless men are dismissed and replaced by women this will require a huge expansion of boards, up to 55 per cent more members, depending on how many men retire and are replaced by women in the three years.

[18] The inverse relation between horizontal and vertical components is still found, with horizontal increasing as vertical declined (Brooks et al. 2003).

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