

Female Labour Supply and Income Inequality in Ireland

Tim Callan, Brian Nolan, Donal O'Neill and Olive Sweetman¹

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Abstract

Over the last 10-15 years female labour force participation rates have increased substantially in Ireland. At the same time there has been a large increase in wage inequality but a decline in total household income inequality. In this paper we examine the relationship between the trends in female labour force participation, wage inequality and household income inequality in order to develop a better understanding of the processes governing inequality in Ireland. Our findings suggest that despite an increased correlation in the earnings of spouses the recent increases in female labour force participation and female wage rates account for between 20% and 50% of the recent fall in income inequality in Ireland. The remainder of the reduction is attributed to factors not directly related to wives' earnings.

¹ Callan and Nolan are economists at the Economic and Social Research Institute in Dublin, while O'Neill and Sweetman are members of the Economics Dept. at NUI Maynooth. An earlier version of this paper was presented at the 1998 Irish Economic Association Annual Meeting in Limavady.

1. Introduction

The last 15-20 years have seen a significant growth in inequality in many developed countries (Gottschalk and Smeeding 1997). Two countries which have been singled out as having experienced especially large increases in earnings inequality over this period have been the U.S and the U.K (Freeman and Katz 1994). However, a recent study by Barrett et al (1997) suggests that earnings inequality in Ireland may be higher than in either of these countries and furthermore that Ireland may have experienced larger increases in wage inequality than either of these countries over the last 10 years. In contrast to these trends in wage inequality, work by Callan and Nolan (1998) shows that the household income dispersion in Ireland, although relatively high in 1987, has remained relatively stable since then and may have even fallen slightly. They conclude by noting that while the distribution of income in Ireland in 1987 was something of an outlier (on the high side), by 1994 this was no longer the case.

In this paper we examine one possible explanation for why, despite experiencing significant increases in wage inequality, the distribution of household income in Ireland actually fell slightly between 1987-1994. The explanation which we focus on looks at trends in female employment rates and in particular the relationship between the employment rate of a woman and the economic status of her husband.

Table 1 shows female participation rates in both 1984 and 1994 for the sample of OECD countries. In 1984 the female labour force participation in Ireland was 36.9%. In contrast many of the other developed countries had female participation rates of over 50%. For instance, the participation rate in the U.S was approximately 63%, 59.1% in the U.K, 53% in Germany and 77% in Sweden. Of the OECD countries presented in the Table, only Spain had a lower participation rate than Ireland's. By 1994 the participation rate in Ireland had increased to 47%, an increase of

nearly 28%. Indeed the fourth column of Table 1 shows that of the OECD countries for which data are available only four, Luxembourg, Netherlands, New Zealand and Spain experienced increases in the female participation rate which were larger than the increase in Ireland. The increase in participation rates has continued in the 1990's, with the employment increases among Irish women between 1991 and 1997 exceeding the combined employment increases over the previous 20 years.

It has been argued that this increase in female participation has played a significant role in explaining Ireland's impressive growth record since the early 1990's (Walsh 1997). The purpose of our paper, however is not to examine the impact of increased female participation rates on total income but rather its effect on the distribution of income across households. To do this we take a more detailed look at the recent trends in female labour force participation. In particular, we examine the extent to which changes in the labour supply of women can explain the reduction to household inequality at a time of increasing wage inequality. The aggregate numbers presented in Table 1 are of little help in answering this. What is needed is information showing where in the income distribution these changes have been occurring and also information showing what has been happening to female wages as their participation and employment has increased. To do this we use information taken from two large nationally representative household surveys conducted by the ESRI. These data are described in more detail in section 2. Section 3 provides a detailed description of changes in female participation rates in a household setting and section 4 estimates the contribution these changes have had on household income inequality. Our findings suggest that the although the correlation in spouses earnings has increased over this period trends in female labour force participation and wage rates account for between 25% and 50% of the reduction in total household income inequality in Ireland. The remainder of the fall in household income inequality is explained by changes in incomes not directly associated with the wife in the family.

2. Data

The data used in this analysis are taken from two household surveys carried out by the ESRI. The first survey was carried out in 1987 and contains detailed information on labour force activity for 3,294 households. The second survey was taken in 1994 and represents the first wave of the Irish component of the European Community Household Panel. This survey obtained information on 4,048 households. In both cases the samples have been reweighted to correct for non-response using external information from the Labour Force Survey. These surveys are discussed in more detail in Callan et al (1989) and Callan et al (1996).

As in the earlier work on income inequality in Ireland the unit of analysis is the household. However to focus on the relationship between female participation rates and their partner's economic status we restrict our sample to households containing a married couple. Furthermore we focus on households in which both spouses are aged between 24 and 55.² These restrictions reduced our samples to 1546 and 1855 households in 1987 and 1994 respectively. In this analysis we distinguish between four sources of income: husband's earnings (excluding self-employed income), wife's earnings, all other earnings and all other income (including self-employed income). Tables 2 and 3 provides summary statistics for the data used in the analysis. Looking at table 2 we see that while husbands employment rates have increased slightly over this period, there has been a significant increase in the percentage of married women who are employees. In 1987 approximately 22% of wives were classified as employees, by 1994 this had increased 34%, an increase of almost 60%. This increase in employment rates for women is also reflected in the share of household income accounted for by the wives earnings, which are provided in table 3. In 1987 11.7% of total

² While these restrictions limit our ability to analyze changes in retirement or marriage decisions over this period we feel that our sample is still sufficiently rich to analyze the questions in which we are directly interested in.

gross household income came from wives' earnings. By 1994 this had risen by over 3 percentage points to 15%. In the remainder of this paper we examine these trends in more detail and in particular the impact such changes have had on household inequality.

Section 3. Changes in Female Earnings and Employment

In this section we document the trends in inequality and employment in Ireland between 1987 and 1994. Table 4 presents changes in male wage inequality for the full sample of workers, as well as documenting the changes in household total income inequality and male wage inequality for our restricted sample. Looking at the first two rows we see that inequality is higher among the full sample of males than in our sample of married male head of households and also that the increase in earnings inequality is greater in the former sample. This is to be expected given that our restrictions on marital status and age reduce the heterogeneity in the sample. Nevertheless for both samples we see a significant increase in earnings inequality over this period.³ This is in contrast to the trend in total household income inequality which has fallen slightly over this period. The finding that dispersion in total household income fell slightly for our sample of married households is consistent with earlier findings for broader populations (Callan and Nolan 1998).

The purpose of our analysis is to examine the extent to which the reversal in inequality trends on moving from individual earnings to household income can be explained by differences in the behaviour of female labour supply across households. To answer this question we a more detailed description of the recent changes in female participation rates. Figure 1 shows changes in female employment rates conditional on their partner's position in the wage distribution. In

³ Although the results are presented here for the ratio of the top decile to the bottom decile of the earnings distribution the same conclusions hold when we use alternative measures such as the Gini coefficient or Atkinson's measure of inequality.

particular it plots female employment rates by percentile of the male wage distribution. The solid bars indicate female employment rates for 1987 while the striped bars denote 1994 female employment rates. For example the bars corresponding to the 10th percentile of the wage distribution tell us that the employment rate of women married to husbands located in the 10th percentile of the male wage distribution was just under 25% in 1987 but had risen to just over 30% by 1994.

There are several important features which emerge from this graph. Firstly, the solid bars indicate that in 1987 employment rates of married women were highest among women whose husbands were located at the top of the male wage distribution. In this year, the employment rate among females married to males with earnings above the median was 26% compared to 19% for women married to men with earnings below the median. The employment rate for women married to unemployed men was 20% in 1987.

The second feature which emerges from this graph is the nature of the increase in female employment which has occurred over this period. With the exception of women married to unemployed men every group of female workers experienced an increase in employment rates over this period. The result was that employment rates among women in our sample increased from 22% in 1987 to 34% in 1994.⁴ However, the important feature of these changes in terms of the likely impact on household inequality is that the increased employment rates were not uniform throughout the male wage distribution. The largest increases in employment rates were among women married to low earning males. While the employment rate of women married to men with above average earnings increased from 26% to 40%, an increase of fourteen percentage points,

⁴The failure of employment rates to increase among women married to unemployed men may be a reflect high withdrawal rates in the benefit system. For an examination of this for English workers see Doris (1998).

employment rates among women married to low earning husbands increased from 19% to 42%, an increase of twenty three percentage points. While employment rates in 1987 were highest among females married to high earning men the non-neutral changes which occurred since then has resulted in the highest employment rates now being recorded for women married to men with below average income.⁵ The impact of this increase in in employment rates among relatively low paid women has been to reduce the coefficient of variation in earnings among all women (including nonparticipants) from 2.32 in 1987 to 1.88 in 1994.

The changing pattern of female employment throughout the wage distribution might be expected to reduce household income inequality other things held constant. However to get a complete picture of the contribution of female earnings to household income inequality we also need to know what was happening to female wages over this period. Figure 2 graphs the change in average weekly wages among working women, by husbands economic status (due to small sample sizes we report wage information for women married to men above the median male earnings, below the median male earnings and women married to unemployed men). The trend in wage changes presented in this figure is the reverse of what we observed for participation rates. There the largest increases were observed for women married to men with below average earnings. When we look at wage changes however we see that the largest wage changes for women has occurred among women married to high earning husbands. These women experienced an 18% increase in their wage over this period compared to just a 2% increase for women married to men with below average earnings. Women married to unemployed men actually saw their real weekly wage fall

⁵ Since we know that male earnings inequality has increased over this period with the largest wage gains for male workers occurring at the upper end of the wage distribution it may be tempting to infer that the changes in female employment rates are a response to the relative performance of their partner. However, to properly evaluate this assertion we would need to develop a structural model of female labour supply which we do not do in this paper.

over this period though this estimate is imprecise as it is based on relatively few observations.⁶ Thus while the dispersion in earnings among all women fell substantially as a result of the participation effects, the coefficient of variation among working women actually *increased* from .62 to .69. As a result of these wage changes the correlation in spouses earnings over this period increased from .05 to .124.

We have examined the extent to which the changes in weekly wage changes presented above reflect differences in hours worked over time. For instance, it may be the case that the growth in part-time work was more prevalent among workers at the lower end of the distribution, including workers married unemployed men. To the extent that this was so the fall in the weekly wage for women married to unemployed men may simply reflect a change in the composition of this group, with relatively more of these workers working shorter weeks. However, this does not seem to be the case. The same pattern emerges when we look at hourly wages, with the change in the hourly wage of women married to unemployed men being -10% (but statistically insignificant), +9% for women married to low earning husbands and +30% for women married to high earning husbands. The impact of these changes of the female wage distribution was that the ratio of the top to bottom decile of the female wage distribution increased from 9.3 to 10.4.⁷

This analysis of female wages provides two possible explanations as to why recent trends in female labour supply and wages may actually increase household income inequality. The first is

⁶ One needs to be careful in interpreting the wage figure for women married to unemployed men as the estimates are imprecise. This reflects the small sample sizes on which the wage changes for this category of worker are calculated.

⁷ A possible explanation for the faster increase in earnings among women married to men with above average earnings is the increase in returns to skill such as education which have occurred over this period in Ireland (Barrett et al 1997). Given that the tendency for couples of similar education levels to marry we might expect the rise in return to skill to be reflected in faster earnings growth for women married to high income men.

that the wage growth among females has been most pronounced among women married to high earning husbands. As a result the correlation between male and female wages has increased. This increased correlation would tend to increase income dispersion, other things fixed. Secondly the distribution of female wages tends to be much more dispersed than that of male workers. As female earnings becomes a more important part of household income the greater dispersion exhibited within the distribution of female earnings will tend to feed into the distribution of household income.

A more formal structure for distinguishing between the differing effects of changes in female employment rates and wages on household income inequality is presented in the next section. Before we do this however, it may be interesting to contrast the Irish experience, as documented above, with what has been happening elsewhere. Work by Juhn and Murphy (1997) examines changes in female earnings and employment between 1969 and 1989 using U.S. data. Their analysis shows that the trend in female wage behaviour in the U.S is similar to that in Ireland, with the largest gains being experienced by women married to high earning husbands. However, the employment behaviour over the period they examine is the opposite of what we have shown to be the case for Ireland. In contrast to what we find they show that for the U.S the largest employment rates were initially found among women married to low income men but that over time the largest increases in employment have been among women married to high earning husbands. Thus, in the U.S both the wage effects and the participation effects for females seem to operate in such a way as to result in an increase in household income inequality. As we have shown for Ireland these forces operate in opposite directions and we must turn to a more detailed analysis of inequality in order to determine which of the two forces has the greater bearing on inequality.

4. Decomposition of Total Household Income Inequality by Factor Components

In this section of the paper we disaggregate total household income into its individual components in order to determine their individual impacts on inequality. This approach allows us to identify the effect of wives earnings and employment on inequality. Shorrocks (1982a, 1982b) discusses in detail the issues associated with decomposing total inequality by income component. He shows that by appropriate choice of a weighting function one can find alternative decompositions of a given inequality index which yield vastly different conclusions concerning the importance of a given component. In fact, the contribution of any factor expressed as a proportion of total inequality can be made to take any value between plus and minus infinity. Furthermore, he shows that there are no strong statistical reasons for choosing any one of these decompositions over the other. In the same paper Shorrocks argues that a potential means of choosing between the multiplicity of outcomes is to focus on what is normally meant by statements of the form "factor X contributes Z percent of total inequality". In a recent paper Canican and Reed (1998) develop this idea further by comparing two common inequality indices, the coefficient of variation and the Gini coefficient. They argue that the standard decomposition of the Gini coefficient has no implicit reference distribution and therefore should not be interpreted as a measure of the effect of an income source on inequality. Furthermore they argue that decompositions based on the Gini coefficient are not suitable to analysing changes in inequality over time. To examine the contribution of an income component to inequality over time they use the coefficient of variation to carry out two thought experiments. We analyze the contribution of wives' earnings to inequality using these same thought experiments, both of which make use of the fact that the squared coefficient of variation for total income can be written in terms of the individual income components in the following way :

$$(1) CV^2 = s_h^2 C_h^2 + s_w^2 C_w^2 + s_{op}^2 C_{op}^2 + s_{nl}^2 C_{nl}^2 + 2\rho_{hw} s_h s_w C_h C_w + 2\rho_{hop} s_h s_{op} C_h C_{op} + 2\rho_{hnl} s_h s_{nl} C_h C_{nl} \\ + 2\rho_{wop} s_w s_{op} C_w C_{op} + 2\rho_{wnl} s_w s_{nl} C_w C_{nl} + 2\rho_{op,nl} s_{op} s_{nl} C_{op} C_{nl}$$

where

s_h = average share of husband's income in total household income = $(\mu_h / (\mu_h + \mu_w + \mu_{op} + \mu_{nl}))$

μ_j = average income from source j

ρ_{ij} = correlation coefficient between income source i and income source j

C_j = the coefficient of variation of income source j.

The first experiment we conduct is to compare the observed inequality in the earlier year to the inequality in the distribution that would have occurred if the distribution of wives' earnings had changed but all other income components had stayed fixed at their 1987 levels. To calculate this reference distribution we substitute the 1994 values CV_w and μ_w into equation (1) keeping all other variables at their 1987 level. We call this measure of dispersion $CV_{1,94}$. The difference between CV_{89} and $CV_{1,94}$ is the change inequality attributed to wives earnings. If $CV_{1,94}$ is lower than CV_{87} we would argue that changes in wives earnings resulted in a reduction in inequality over this period.

Since it is difficult to determine whether changes in the correlation terms are due to changes in wives earnings or the other income source involved we examine these terms separately. To examine their contribution to changing inequality we construct a new reference distribution by changing not only the CV_w and μ_w terms to their 1994 values but also each of the correlations involving wives earnings. We call the coefficient of variation from this new distribution $CV_{2,94}$.⁸ We then attribute the difference between $CV_{2,94}$ and $CV_{1,94}$ to the correlations terms involving wives' earnings. If one attributes all of the changes in these correlation terms to wives' earnings then the

⁸ The inability to identify the contributions of the correlation terms to a particular income component is true of all decompositions (see Shorrocks 1982a and Jenkins 1995).

total effect of wives' earnings on inequality is the sum of the two effects outlined above. If on the other hand one attributes none of the correlation changes to wives' earnings then the contribution of wives' earnings to changes in inequality is simply the first term discussed earlier. The impact of other income sources on inequality is calculated by comparing CV_{94} and $CV_{2,94}$.

The second experiment we conduct is to compare the actual distribution in 1994 with what the level of inequality would have been if wives earnings had stayed at their 1989 levels. To calculate the reference distribution for wives' earnings in this case we construct a measure of inequality using equation (1) with CV_w and μ_w at their 1987 values and all other components at their 1994 levels. We then compare this distribution to the actual level of inequality in 1994. In this case we would argue that wives earnings' resulted in a reduction in inequality if the inequality measure based on our reference distribution is higher than that which was actually observed in 1994. The contribution of the other components are constructed in a fashion analogous to that described above.⁹ The results using these two alternative counterfactual distributions may differ because the base year values differ between the two experiments. The results for both decompositions are given in Table 5.

The top panel of Table 5 shows the results when the initial year, 1987, is used as the base year, while the lower panel shows the results using 1994 as the base year. The results are qualitatively similar in both cases. The second row of the top panel shows the contribution of changes in CV_w and μ_w to inequality using 1987 as the base year. We see from this that the coefficient of variation would have fallen from .678 to .671 had CV_w and u_w taken on their 1994 values, keeping all other components fixed at their 1987 levels. The third row of this panel shows that changing the wives' correlation terms (ρ_{hw} , $\rho_{w,op}$, $\rho_{w,nl}$) as well as CV_w and μ_w would have

⁹ For other studies which use a similar approach to examining income inequality see Layard and Zabalza (1979), Canican, Danzinger and Gottschalk (1993) and Machin and Waldfogel (1994).

resulted in the coefficient of variation falling further to .663. Thus we calculate the marginal contribution of the correlation terms to be -.008. However, in interpreting this latter figure one must be careful and realise that it represents the net effect of three correlation terms some of which are moving in opposite directions. As discussed in the previous section the correlation in spouses earnings increased substantially over this period. By itself we would expect this to increase household income inequality. In fact this is what we find. When we compare the actual distribution in 1987 with what it would have been if only the correlation between spouses earnings had changed (not in the table) we find that changing this one component alone would have resulted in the coefficient of variation actually increasing from .678 to .696. The fact that the net contribution of the correlation terms is inequality reducing implies that the movements in the other correlation terms must have been such to offset this significant increase.¹⁰ The final row in this panel suggests that changes in income sources not directly related to wives earnings resulted in inequality falling by -.019.

These results imply that when we attribute none of the correlation terms to wives' earnings, wives' earnings would account for approximately 21% of the reduction in income inequality. If all of the impact of the correlation terms involving wives' earnings are attributed to wives' earnings the total contribution of this component rises to 44% of the total fall. The corresponding figures from experiment 2 are 30% and 45% respectively. Thus despite the fact that the correlation in spouses earnings has increased substantially over this period our findings show that the reduction in dispersion in wives' earnings driven by nonneutral changes in participation rates and by the reduction in correlation between wives' earnings and nonlabour income were large enough to lead

¹⁰ When we look at the contribution of the other correlation terms it appears that the major driving force behind the reduction in inequality resulting from these terms comes from the reduction in the correlation between wives' earnings and sources of nonlabour income. We have not yet explored the causes of this fall.

to wives' earnings having an equalising effect on the distribution of household income.¹¹

5. Conclusion

Between 1987 and 1994 wage inequality in Ireland increased substantially yet household income inequality actually fell. In this paper we examine a possible explanation for this, namely the increased contribution of female wages to total household income. In the first section of the paper we document the changes in wives' employment rates and earnings over this period, paying particular attention to the extent to which these changes were associated with the economic status of the husband. We show that while increases in female employment rates have been greatest among wives married to low earning husbands, these women have experienced only modest wage gains when compared to the wives of husbands without above average husbands. These changes have resulted in a reduction in the dispersion of wives' earnings among all wives' (participation effect) but an increase in dispersion among working wives and an increase in the correlation between spouses earnings (both wage effects). We use these data to examine the contribution of wives' earnings to changes in household income inequality. Our estimates suggest that the tendency for the higher correlation in spouses earnings to increase inequality is dominated by the inequality equalising other trends associated with wives' earnings with the final result being that changes in wives' earnings account for between 20% and 50% of the total fall in household income inequality. The remainder of the fall is associated with income sources not directly related to wives' earnings.

¹¹ A potential drawback of this type of decomposition is that the estimated effects may differ depending on the order in which the factors are changed. To examine the robustness of our findings to changes in the ordering we reestimated the effects using all possible orderings of the three groupings. We obtained very similar results in all cases, with changes in CV_w and s_w leading to a slight increase in inequality, changes in ρ_{hw} , $\rho_{w,op}$ and $\rho_{w,nl}$ reducing inequality slightly and changes in other components accounting for almost all of the reduction in household inequality over this period.

Although we have shown that trends in female participation rates have reduced income inequality over the last 10 years one must be careful if extrapolating our findings to future trends. Despite the rapid increases in female participation female earnings still accounted for only 15% of total household income in 1994. If the participation and earnings trends that we observed in the past continue this share will grow in importance and as it does one would expect the relative importance of female-specific factors on household inequality will also increase.

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Table 1
Female Participation Rates in the OECD

Country	Female Participation Rate 1984 (percent)	Female Participation Rate 1994	Change in participation Rate
Australia	52.8	63.4	+20%
Austria	51.5	62.1	+20%
Belgium	48.7	55.1	+13%
Canada	63.5	67.8	+7%
Denmark	73.8	73.8	0
Finland	72.9	69.9	-5%
France	54.7	59.6	+8%
Germany	52.3	61.8	+18%
Greece	40.9	44.6	+9%
Iceland	62.7	80	+28%
Ireland	36.9	47.2	+28%
Italy	40.7	42.9	+6%
Japan	57.2	62.1	+9%
Korea	43.8	52.7	+20%
Luxembourg	42.2	56.5	+34%
Netherlands	40.7	57.4	+41%
New Zealand	46	65	+41%
Norway	66.3	71.1	+7%
Portugal	56	62	+11%
Spain	33.2	44.1	+33%
Sweden	77.3	74.4	-4%
Switzerland	55.7	67.5	+21%
U.K	59.1	66.2	+12%
U.S.A	62.8	70.5	+12%

Table 2
Labour Force Status of head of household couples 1987-1994

Labour Force Status	1987 Husband	1994 Husband	1987 Wife	1994 Wife
Employees	57.7%	59.4%	21.7%	34%
Farmers	9.1%	7.1%	-----	-----
Self-Employed	11.5%	13.7%	1.8%	2.3%
Home-Duties	-----	-----	67.6%	59.2%

Table 3
Components of household income^a 1987-1994

Income Source	1987	1994
Average Total Gross Household Income	£367.24	£474.58
Average weekly Male Earnings and Share of total household income	£184.91 (50.3%)	£230.03 (48.5%)
Average weekly Female Earnings and Share of total household income	£43.05 (11.7%)	£71.97 (15.1%)
Average Earnings of others and share of total household income	£27.78 (7.6%)	£39.08 (8.2%)
Average Non-Labour and self-employment Income and share of total household income	£111.43 (30.3%)	£133.50 (28.1%)

^a All amounts are expressed in 1996 prices.

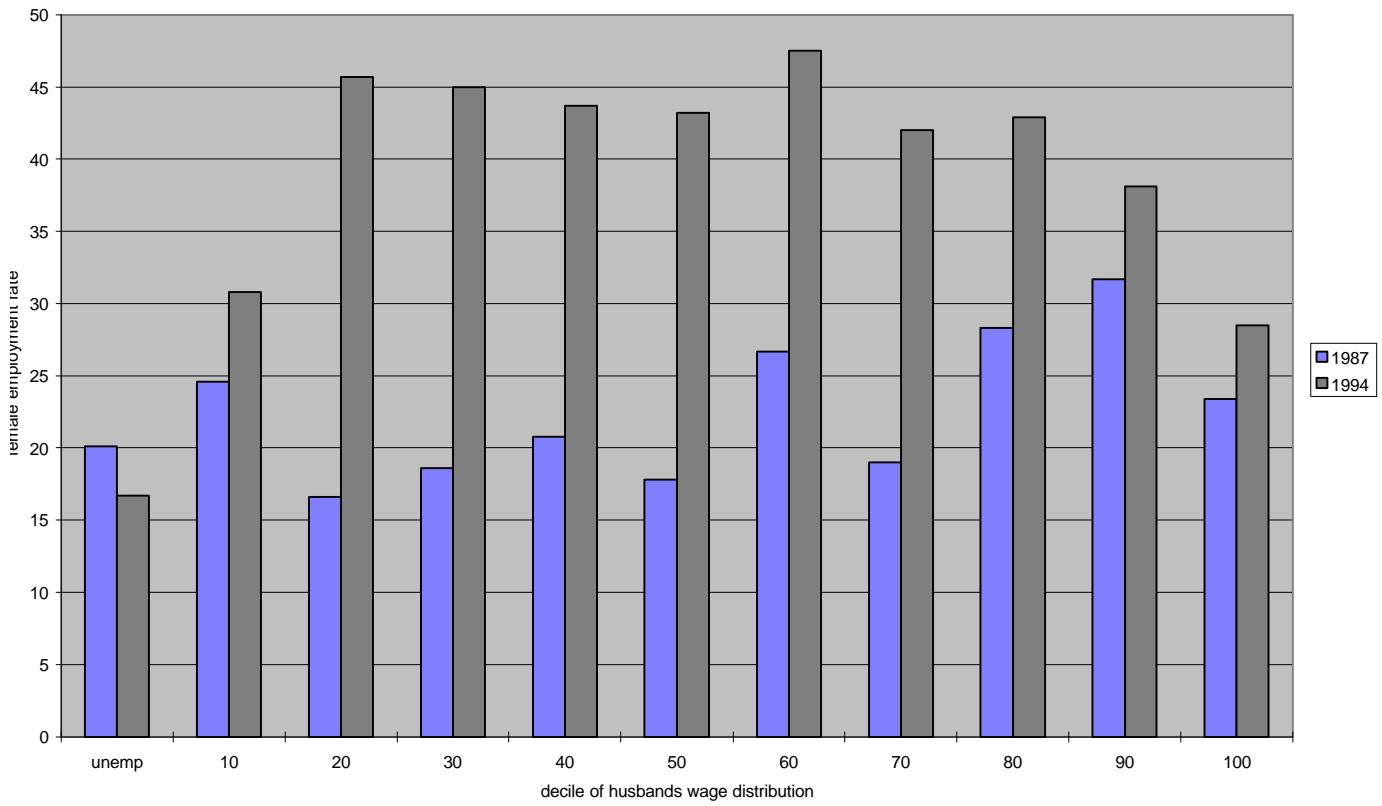
Table 4
Trends in Inequality in Ireland among household with married couples aged 24-55:
 Inequality measured by the ratio of the top decile of the distribution to the bottom decile

Income	1987 (P₉₀/P₁₀)	1994 (P₉₀/P₁₀)
Male Weekly Earnings (everybody)	3.6	4.5
Male Head of Household Weekly Earnings (married aged 24-55)	2.9	3.3
Total Household Income (married aged 24-55)	5.2	5.0

Table 5
Decomposition of changes in CV^2 for gross household income

<u>(1) Observed CV 1987</u>	.678	Change in Inequality
CV if (s_w, CV_w) at 1994 levels	.671	-.007
CV if (s_w, CV_w, ρ_w) at 1994 levels	.663	-.008
Observed CV 1994	.644	-.019
<u>(2) Observed CV 1994</u>	.644	
CV if (s_w, CV_w) at 1987 levels	.656	-.012
CV if (s_w, CV_w, ρ_w) at 1987 levels	.662	-.006
Observed CV 1987	.678	-.016

Figure 1:
Female Employment Rates by Decile of Husbands Wage distribution



**Figure 2:
Real Wage Growth for Females 1987-1994**

