"Birds of a Feather Flock Together": The Impact of Choice of Spouse on Family Labor Income Inequality

by

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Abstract:

This paper analyzes to what extent the rise in women's labor force participation has led to "flocking together", i.e. whether women with high labor income tend to be married to men with high labor income, or vice versa. Based on the decomposition of the Gini coefficient and a related index for the extent of "flocking together" applied to labor income data for Norway for the period 1973-1997 we find a tendency of "flocking together" for all married couples and married couples with two labor incomes.

JEL classification: D31

Keywords: Family income distribution, decomposition of the Gini coefficient, summary measure for the extent of "flocking together".

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1. Introduction

A common approach to analyze whether the rise in women's labor force participation has decreased or increased family labor income inequality is to compare the distribution of family income with and without women's labor income, see e.g. Danziger (1980), Horvath (1980), Gronau (1982), Betson and van der Gaag (1984), Björklund (1992) and Cancian and Reed (1998). However, this counterfactual method has several problems and may lead to misleading results, see Lerman and Yitzhaki (1985) for a critical discussion. For example, by adding women's income to men's income, inequality in the distribution of family income will normally decrease, and likewise, by adding men's income to women's income, inequality in the distribution of family income will also decrease. Thus, this approach yields results that depend on the ordering of income components, and moreover, presupposes that wife's (husband's) labor supply decisions are made conditional on husband's (wife's) earnings.

Empirical analyses of labor supply show, however, that husband's and wife's decisions concerning hours of paid work are made simultaneously, which suggests that these two income components should be treated symmetrically, see Dickens and Lundberg (1993), Aaberge, Dagsvik and Strøm (1995) and Aaberge, Colombino and Strøm (1999). As opposed to a counterfactual comparison of inequality with and without wife's earnings, the decomposition of a summary measure of inequality provides an analysis of the contributions to inequality in family income from wife's and husband's incomes which acknowledges the simultaneous aspects of economic behavior. In this case the (squared) coefficient of variation may appear to be a particularly attractive measure of inequality due to the neat decomposition of the variance. However, the coefficient of variation is considered controversial when used as a measure of inequality. See e.g. Sen (1997) who argues that an important shortcoming of the coefficient of variation is that it captures only the difference of each income level from the mean and does not have a clear ethical basis.

The Gini coefficient, on the other hand, which is the most widely used measure of inequality, gives a more direct measure of income inequality since it is defined as a simple functional of the Lorenz curve. Moreover, the Gini coefficient satisfies the Pigou-Dalton principle of transfers, which means that a given transfer of money from a richer to a poorer person is considered to be equalizing as long as the ranks of the donor and the recipient in the distribution of total income do not change. In order to place more emphasis on a transfer between persons with a given income difference if these incomes are lower than if they are higher, Kolm (1976) introduced the principle of diminishing transfers. For a fixed difference in income this principle requires a given transfer of money from a richer to a poorer person to be more equalizing the lower it occurs in the income distribution. As demonstrated by Aaberge (2000) the Gini coefficient satisfies the principle of diminishing transfers for all strictly concave distribution functions, i.e. distribution functions that are strongly skew to the right. For

unimodal distributions which are neither strongly skew to the right nor to the left, the Gini coefficient assigns more weight to transfers at the central part (around the mode) of the distributions than at the tails. For alternative normative motivations of the Gini coefficient we refer to Sen (1974), Donaldson and Weymark (1980, 1983), Weymark (1981), Yaari (1988), Ben Porath and Gilboa (1994) and Aaberge (2001). Our analysis of the effects of the increase in married women's labor income on the inequality in the distribution of family labor income is based on the Gini coefficient.

The effect on family income inequality of the rise in women's labor income strongly depends on the correlation between wives' and husbands' earnings. Gronau (1982) explicitly addresses the effect of this correlation on family income inequality and notices that the effect on inequality depends on a number of factors. However, Gronau's analysis relies on the counterfactual approach, and with a data set of only one year, he is unable to empirically assess the trend in family income inequality over time. Del Boca and Pasqua (2003) combine the counterfactual method with a decomposition of the squared coefficient of variation, an approach that explicitly enables them to analyze the effect of the correlation between wives' and husbands' earnings on family income inequality.

In this paper we analyze to what extent the combination of the male and female labor income component contributes to higher inequality in the distribution of pre-tax labor income of the married couple, a situation that we denote by "birds of a feather flock together". A main motivation of this paper is to analyze the issue of "flocking together" within the framework of the decomposition of the Gini coefficient. To this end we introduce an index of the extent of "flocking together" that is derived from the Gini coefficient.

Whereas this paper focuses on the effect of spouse selection on inequality in pre-tax family income distribution, the literature on assortative mating typically focuses on the socio-economic factors determining the marital choice, i.e. the process of spouse selection, see e.g. Boulier and Rosenzweig (1984), Lam (1988), Rosenzweig (1999) and Pencavel (1999). We introduce the term "flocking together" in order to characterize the disequalizing effect of assortative mating on family income inequality. The effect of assortative mating on labor supply is analyzed by Lundberg (1988), and the effect on family income inequality is analyzed by Smith (1979) and Gronau (1982). While Smith finds a compensatory function of wives' earnings on family income inequality, our approach indicates a tendency of "flocking together" in spouses' labor income.

We analyze the extent of "flocking together" in light of the rapid increase in married women's labor force participation over the last decades. In Norway the employment rates for married women increased from 19.6 percent in 1970 to 30 percent in 1980 and 61.2 percent in 1990, see Ellingsæter and Rønsen (1996). In view of this development, we illustrate the effect of the rise in women's labor

market participation on family labor income inequality and on the extent of “flocking together” by applying Norwegian data.

The paper is organized as follows. In Section 2 we briefly describe the data and the trend in the level of family labor income, while Section 3 provides estimates of the trend in family labor income inequality. In Section 4 we outline the decomposition of the Gini coefficients on which our analysis of men’s and women’s contribution to family labor income inequality relies. Finally, in Section 5 we introduce a summary measure of the extent of “flocking together” derived from the Gini coefficient and analyze to what extent a tendency of “flocking together” can be found in our data.

2. The trend in families' labor force participation and labor income

This analysis is based on income tax returns data from the Income Distribution Survey of Statistics Norway, for the years 1973, 1979, 1982, 1985, 1988, 1991, 1994 and 1997, i.e. a period with a substantial increase in married women’s labor force participation. Our population consists of all married couples where at least one spouse has labor income, that is, we disregard couples where both spouses are retired, since our focus is on employment and inequality. In this paper, the term “all married couples” from now on refers to all married couples excluding the retired population.

As our income data do not include information about hours worked, we have related the criterion for having labor income to income level rather than work hours. Our definition of having labor income is that labor income exceeds the minimum social security benefit. A person whose labor income is less than this level is classified as not having labor income. This definition is consistent with the definition of having labor income in the income statistics. In this paper we divide the population of all married couples into two groups, married couples where only one spouse has labor income, and married couples where both spouses have labor income.

Labor income is defined as the sum of income from employment and self-employment. Note, however, that the assignment of income from family business self-employment to each of the spouses is somewhat arbitrary. This is a source of uncertainty in the estimation of wives’ and husbands’ contributions to inequality. Income from self-employment represents, however, on average only 10 percent of total labor income. Labor income does not include transfers, e.g. social security. Note that family labor income in this study means labor income of the married couple. We have not considered the labor income of other family members. Moreover, throughout this paper the income concept is labor income, so that family income means family labor income.

This study focuses on inequality in the distributions of reported incomes, i.e. we do not explicitly address the more complex issue of how women's increased labor market participation has influenced the division between market work and household work and the distribution of extended income, defined as the sum of money income and imputed value of unpaid household work, see Bryant and Zick (1985), Bonke (1992), Jenkins and O'Leary (1996) and Aslaksen and Koren (1996). Neither have we taken into account the consequences of augmenting the income concept by consumption of housing or consumption of publicly provided services. Moreover, we have not considered the issue of equivalence scales, as the focus of this paper is on inequality in the sources of pre-tax family labor income, rather than on inequality in post-tax income and consumption expenditure. The results nonetheless indicate inequality in consumption possibilities and thus in economic welfare. We will now briefly report some main trends of our data, as a basis for the following analysis of income inequality.

The prevalence of the two-income family has increased considerably from 1973 to 1997. Table 1 shows that the proportion of two-income families increased from 30 percent in 1973 to 69 percent in 1997. This change is largely a reflection of the rapid increase in married women's labor force participation, in particular during the late 1970s and early 1980s, and is a consequence of the changes in possibilities and preferences for education and work patterns for women through the 1960s and 1970s. The proportion of one-income couples decreased sharply from 70 percent in 1973 to 49 percent in 1982, and continued to fall over the 1980s and 1990s. In 1997 the proportion of one-income families was 31 percent, less than half the proportion in 1973.

Table 1. Distribution of married couples, for couples where at least one spouse has labor income, by labor market status, over the period 1973 to 1997. Percent

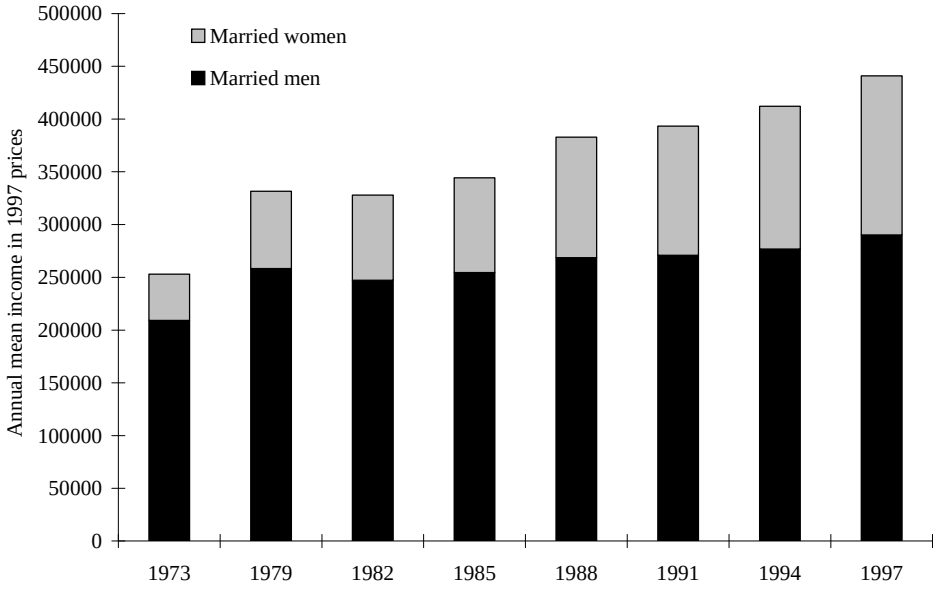
	Only one spouse has labor income	Both spouses have labor income	Number of observations
1973	70	30	2 708
1979	56	44	4 003
1982	49	51	4 626
1985	47	53	1 154
1988	35	65	1 848
1991	35	65	4 899
1994	33	67	5 969
1997	31	69	7 379

Moreover, couples with children (16 years and younger living in the household) have followed the same pattern in the shift from the one-income family to the two-income family as most prevalent family type. The proportion of two-income families with children increased from 27 percent in 1973 to 75 percent in 1997, while the proportion of one-income families with children decreased from 73

percent to 25 percent over the same period. This development is closely related to the changes in education and work patterns for women, as well as the introduction of generous family policies in Norway, such as paid parental leave and subsidized child care.

For all married couples, Figure 1 shows that the increase in women's labor incomes has contributed substantially to the growth in real family labor income (deflated with the consumer price index) over the period 1973-97. The ratio between women's and men's average labor income has increased steadily over the period to 52 percent in 1997. More detailed data are reported in Aslaksen et al. (2000).

Figure 1. Annual mean labor income for married men, married women and married couples. All married couples. 1997-NOK



For couples where only one spouse has labor income, growth in real family labor income has been lower than for the other groups, but women have contributed more than men to growth in real family labor income over the period. For this group the ratio between women's and men's labor income has increased steadily over the period. Women's labor income was only about 5 percent of men's labor income in 1973, and increased to 28 percent in 1997. This is a mainly result of increased part time employment for women at income levels below the statistical definition of labor income. The wife was the income earner in 28 percent of the one income families in 1997. The husband received social security in 87 percent of these couples. On average the age of the husband is somewhat higher than the age of the wife, and hence, couples in this category may have a low labor income from the wife, while the husband is retired with pension not included in labor income. In this case the consumption possibilities can be considerably better than indicated by the labor income.

For couples with two labor incomes both men and women have contributed to growth in real family labor income over the period. In this group there are many couples where both spouses have high education and full-time employment. The ratio between women's and men's average labor incomes has been fairly stable, at about 55 percent over the period and 60 percent in 1997. The large gap between the average levels of men's and women's labor income, however, is a consequence both of overrepresentation of women in lower paid vocations and jobs, the large number of women holding part time jobs, and women having career interruptions that slow down promotion and income growth.

Married couples with children have, in general, somewhat higher labor income than the average couple although the statistical uncertainty, reported in our background material in Aslaksen et al. (2000), indicates that the differences should be interpreted cautiously. The relatively high income of families with children reflects the high labor force participation of mothers in Norway, as well as the fact that the years with children growing up often coincide with the most productive years, with a large work capacity for both career and family, and particularly high housing expenditures.

3. The trend in family labor income inequality

Figures 2 and 3 display the Lorenz-curves for all married couples, one-income couples and two-income couples, in 1973 and 1997. Note that the graph for all couples in 1973 is more similar to the graph for one-income couples, whereas the graph for all couples in 1997 is more similar to the graph for two-income couples. This clearly reflects the shift from the one-income family to the two-income family as the most prevalent family type.

For all couples and couples with only one labor income, family labor income for the average household in 1973 almost completely consisted of the husband's labor income. There was a substantial inequality in the distribution of married women's labor income in 1973, but these incomes were fairly small for most women with labor income. For couples with two labor incomes the Lorenz-curve for married women in 1973 was much closer to the Lorenz-curves for married men and for family labor income. Moreover, our data show that among the poor households, the wife contributed somewhat more to family labor income. This fact emerges more clearly from the plot of the scaled conditional mean curves, reported in Aslaksen et al. (2000).

Figure 2a. Lorenz-curves for distribution of labor income for married men, married women and married couples, for all married couples. 1973

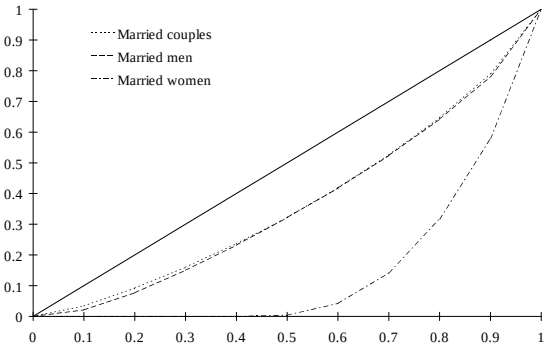


Figure 2b. Lorenz-curves for distribution of labor income for married men, married women and married couples, for couples where only one spouse has labor income. 1973

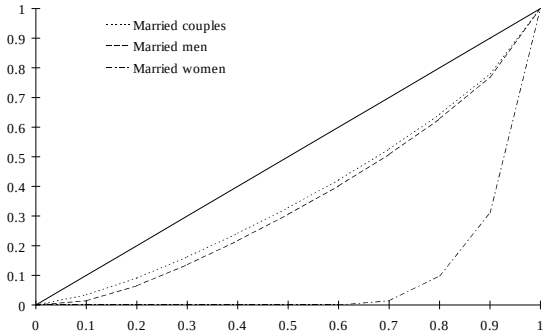


Figure 2c. Lorenz-curves for distribution of labor income for married men, married women and married couples, for couples where both spouses have labor income. 1973

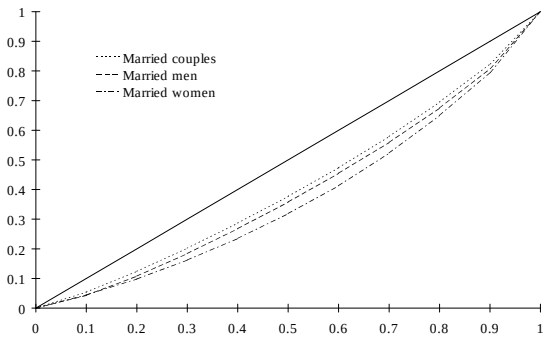


Figure 3a. Lorenz-curves for distribution of labor income for married men, married women and married couples, for all married couples. 1997

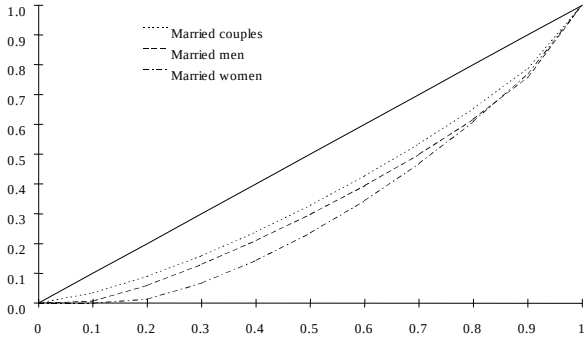


Figure 3b. Lorenz-curves for distribution of labor income for married men, married women and married couples, for couples where only one spouse has labor income. 1997

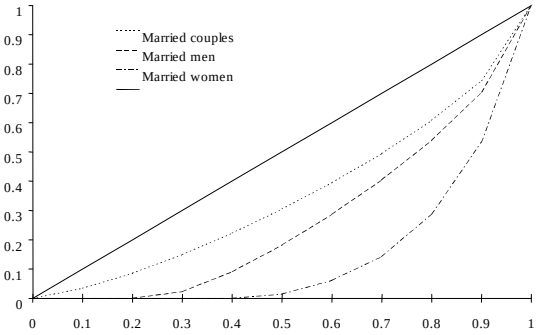
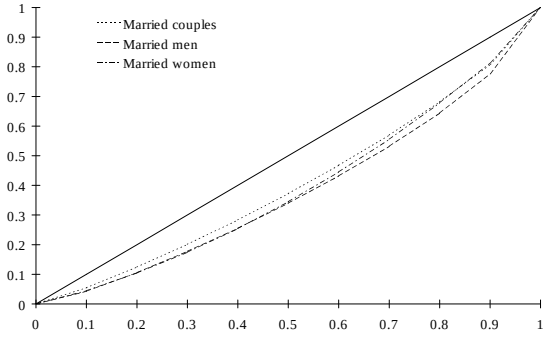
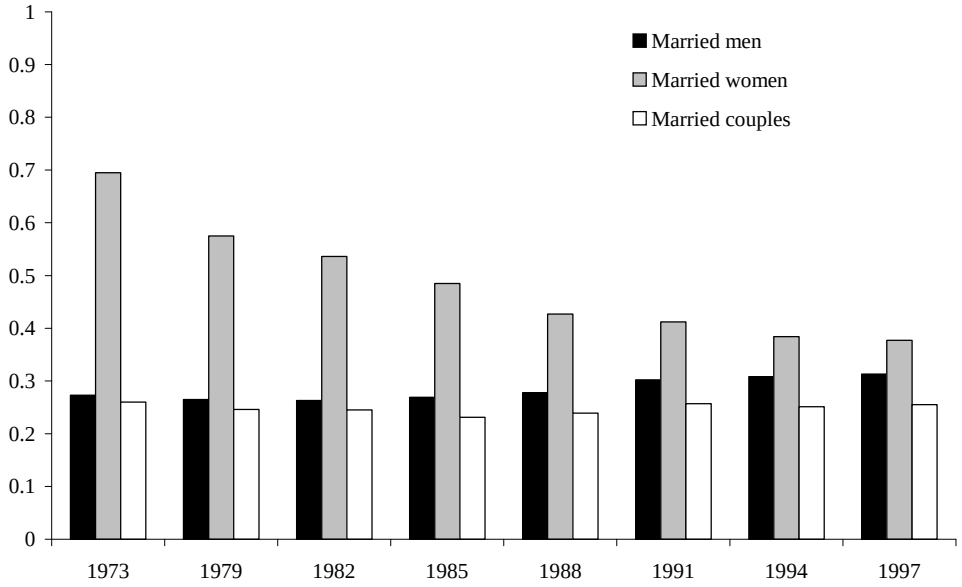


Figure 3c. Lorenz-curves for distribution of labor income for married men, married women and married couples, for couples where both spouses have labor income. 1997



For all married couples, Figure 4 shows that inequality in the distribution of women's labor income, measured by the Gini coefficient, has decreased considerably over the period 1973-97. This reflects the transition from the one-income family, with high inequality in the distribution of women's labor income, to the two-income family, with lower inequality in the distribution of women's labor income. The reduction in inequality in women's labor income over time corresponds to the result for Sweden found by Björklund (1992). Inequality in the distribution of men's labor income has increased slightly over the period. Inequality in the distribution of family labor income has been fairly stable over the period, with a small reduction in the Gini coefficient from 0.260 in 1973 to 0.255 in 1997. However, application of a simultaneous test procedure shows that the differences between the Gini coefficients are too small to be claimed statistically significant at a 5 percent level of significance.

Figure 4. The Gini-coefficient in distributions of labor income for married men, married women and married couples. All married couples



For married couples where only one spouse has labor income, inequality in the distribution of women's labor income has decreased somewhat over the period, but it is much higher than inequality in the distribution of men's labor income that, moreover, has increased over the period 1973-97. Families with only one labor income are a highly heterogeneous group with a large variation in women's actual labor force participation, ranging from full-time homemakers with no income, and those with part-time jobs yielding incomes just below the threshold for being classified as having labor income, to those with high labor incomes, classified in this category because their spouse has no labor income. Since the age of the husband on average is higher than the age of the wife, this group will typically comprise couples where the wife has labor income and the husband is retired. Hence, this group contains both couples who actively have chosen a low level of labor supply and couples who

have low labor supply due to age, health or other exogenous factors. Inequality in the distribution of family income for one-income families has increased from 0.261 in 1973 to 0.302 in 1997. However, the difference must be interpreted cautiously in light of the high standard deviations.

For married couples with two labor incomes the data clearly indicate that inequality in the distributions of men's labor income, women's labor income and family labor income has been fairly stable over the period. The two-income families are much more homogenous with respect to labor market choices than the one-income families. For the early years in this period, inequality in the distribution of women's labor income was somewhat larger than inequality in the distribution of men's labor income. After 1985 inequality in the distribution of women's labor income has been lower than the inequality in the distribution of men's labor income. Inequality, as measured by the Gini coefficient, in the distribution of family labor income was 0.181 in 1973 and 0.192 in 1997.

Our data indicate that inequality in the distribution of family income for couples with children in general is somewhat smaller. This reflects that the category married couples with children is a more homogenous group with respect to income, age, wealth, debt, time constraints for child care obligations, and other relevant characteristics, as compared to the average for all married couples.

For each family category, inequality in the distribution of family labor income is less than the inequality in the distribution of labor income for each spouse. At first glance this result apparently suggests that there is an "equalizing" effect of family formation. However, this interpretation relies on a counterfactual method that is considered both controversial and little informative. As an alternative approach we will use the decomposition of the Gini coefficient for the distribution of family labor income with respect to labor income of each spouse.

4. Decomposition of family labor income inequality

In this section we provide decomposition results of the Gini coefficient for the distribution of labor income of married couples in Norway in 1973 and 1997. The purpose of the decomposition of the Gini coefficient is to identify the contribution from each income source to inequality in total labor income. Inequality in the distribution of family labor income is here decomposed into inequality contributions from labor income of married men and labor income of married women. For a discussion of the decomposition framework we refer to Rao (1969) and Kakwani (1977, 1980). In the following we outline a brief summary of the decomposition approach.

Assume that income X is the labor income of married couples, i.e.

$$X = X_1 + X_2 \tag{1}$$

where X_1 is the labor income of the husband and X_2 is the labor income of the wife. As was demonstrated by Rao (1969) we have that G admits the following decomposition

$$G = \sum_{i=1}^{2} \frac{\mu_i}{\mu} \gamma_i = \sum_{i=1}^{2} u_i(G) \tag{2}$$

where μ_i/μ is the ratio between the means of X_i and X respectively, and the concentration coefficient γ_i can be interpreted as the Gini coefficient of the conditional distribution of X_i given the unit's (individual's) rank order in total income X. The ratio μ_i/μ is denoted the income share of component i in total income. The product of the income share and the concentration coefficient is denoted the inequality contribution $u_i(G)$. The relative inequality contribution $u_i(G)/G$ is denoted the inequality share.

Note that γ_i can be considered a measure of "correlation" between income component X_i and total income X. A negative value of γ_i expresses negative correlation, which means that income component i gives an equalizing contribution to total inequality, i.e. income component i contributes to less inequality in the distribution of X. A positive value of γ_i expresses positive correlation, which means that income component i gives a disequalizing contribution to total inequality, i.e. income component i contributes to higher inequality in the distribution of X. The case of $\gamma_i = 0$ corresponds to a situation where every household receives an equal amount of income component i. In this case income component i does neither give an equalizing nor a disequalizing contribution to total inequality. We say that income component i gives a neutral contribution to total inequality.

The decomposition of the Gini coefficients for the distribution of labor income of married couples in Norway in 1973 and 1997 is given in Tables 2, 3 and 4. Standard deviations are reported in Aslaksen et al. (2000). Note that the contribution to inequality from each income component is measured by the inequality share, defined as the product of the income share and the concentration coefficient, divided by the Gini coefficient.

Table 2. Decomposition of the Gini coefficient in distributions of labor income for married couples with respect to labor income for married men and labor income for married women, for all married couples. 1973 and 1997

Year	Gini coefficient	Income component	Inequality share	Income share	Concentration coefficient
1973	0.260	Men	0.755	0.827	0.237
		Women	0.245	0.173	0.367
1997	0.255	Men	0.700	0.658	0.271
		Women	0.300	0.342	0.224

Table 2 shows the decomposition of the Gini coefficient in the distributions of labor income in 1973 and 1997 for all married couples. Note that the positive concentration coefficients imply that women's labor income gives a disequalizing contribution to total inequality. In 1973 the concentration coefficient for women's labor income was larger than the concentration coefficient for men's labor income, whereas in 1997 the concentration coefficient for men's labor income was larger than the concentration coefficient for women's labor income. Although the concentration coefficient for women's labor income has declined from 1973 to 1997, the income share of women's labor income has doubled over the period, and the net result is seen as an increase in the inequality share for women's labor income. Hence, for all married couples, the contribution to inequality from women's labor income was larger in 1997 than in 1973.

Table 3. Decomposition of the Gini coefficient in distributions of labor income for married couples with respect to labor income for married men and labor income for married women, for couples where only one spouse has labor income. 1973 and 1997

Year	Gini coefficient	Income component	Inequality share	Income share	Concentration coefficient
1973	0.261	Men	1.032	0.943	0.285
		Women	-0.032	0.057	-0.147
1997	0.302	Men	1.049	0.778	0.407
		Women	-0.049	0.222	-0.067

Table 3 shows the decomposition of the Gini coefficient for couples where only one spouse has labor income. The striking result in Table 3 is that the concentration coefficients for women's labor income are negative, both in 1973 and 1997. This means that for families with only one labor income, women's labor income represents an equalizing contribution to inequality in family income. The negative concentration coefficients reflect, roughly speaking, that families in lower deciles have a larger share of women's labor income than families in higher deciles. This group is strongly heterogeneous with respect to labor market activity. Some couples in this group have only one labor

income by choice, e.g. if they devote more time to child care, whereas other couples have only one labor income as a consequence of old age, health or other factors beyond their labor market choices.

For one-income families, women's income share in family labor income was 6 percent in 1973 and 22 percent in 1997, the large increase reflecting the growth in part-time employment at income levels below the statistical definition of labor income. The concentration coefficient for women's labor income has increased over the period. However, the substantial increase in income share counteracts the weakening of the equalizing effect of the negative concentration coefficients, and the net result is seen as a small decline in the inequality share for women's labor income, from -3 percent in 1973 to -5 percent in 1997. In other words, the reduction in the inequality share implies that the equalizing contribution from women's labor income for one-income families has increased from 1973 to 1997.

Table 4. Decomposition of the Gini coefficient in distributions of labor income for married couples with respect to labor income for married men and labor income for married women, for couples where both spouses have labor income. 1973 and 1997

Year	Gini coefficient	Income component	Inequality share	Income share	Concentration coefficient
1973	0.181	Men	0.665	0.648	0.185
		Women	0.335	0.352	0.172
1997	0.192	Men	0.721	0.626	0.221
		Women	0.279	0.374	0.143

Table 4 shows the decomposition of the Gini coefficient for couples where both spouses have labor income. The positive concentration coefficients imply that women's labor income gives a disequalizing contribution to total inequality. The concentration coefficient for women's labor income was higher in 1973 than in 1997. Women's income share in family labor income increased slightly from 35 percent in 1973 to 37 percent in 1997. However, the decline in the concentration coefficient is larger than the increase in the income share, and the result is that the inequality share for women's labor income decreased from 34 percent in 1973 to 28 percent in 1997. Hence, for families with two labor incomes, women's labor income contributed less to inequality in family labor income in 1997 than in 1973.

Although the decomposition results provide information on the issue of "flocking together", an alternative framework is required in order to determine the extent of "flocking together" and changes in this pattern over time. For families with two labor incomes we found that the concentration coefficients for women's labor income are positive, which indicates that women's labor income gives a disequalizing contribution to family income inequality. However, the concentration coefficient of women's labor income does not constitute an appropriate measure of the extent of "flocking together"

since it captures the association between women's and couples' labor income rather than the association between women's and men's labor income. Thus, supplementary information on the association between the male and female income components is needed in order to measure the extent of "flocking together", i.e. a situation where high-income women generally tend to be married to high-income men, and low-income women generally tend to be married to low-income men.

5. The extent of "flocking together"

As suggested above, a complete analysis of "flocking together" calls for a measure of the association between women's labor income and men's labor income, relative to a reference distribution that represents a pattern of "no flocking together". To obtain such a reference distribution, we introduce a hypothetical distribution where the observed labor incomes of married men and married women are randomly matched. In such a random matching one would expect no systematic pattern of "flocking together". The deviation between the observed Gini coefficient G of family labor income and the Gini coefficient G_r of the hypothetical distribution of the randomly matched labor incomes emerges as a relevant basis for defining a summary measure of the extent of "flocking together". If $G > G_r$, the observed matching pattern contains a stronger element of "flocking together" than the reference situation of random matching. If $G < G_r$, the observed matching pattern is more equalizing than the random matching.

It might be argued that the procedure of building a hypothetical "no flocking together" reference distribution suffers from the same shortcomings as the counterfactual approach that we criticize on the basis that household incomes arise from simultaneous decisions: husbands' labor supply decisions and incomes would be different, depending on wives' incomes being there or not. Hence, spouses' observed incomes also depend on the assortative mating, and those incomes would in general be different if partners were randomly matched from the very start. The idea of assortative mating is that partners match according to their preferences and productivities, at home and in the labor market. In the context of a labor supply model, the correct way to derive the hypothetical "no flocking together" income distribution would consist in first, randomly matching the partners' productivities, i.e. potential wages, and secondly, simulate their income producing choices, given the random match. While this is beyond the scope of the present paper, a simulation approach will be considered in future research. In the present context, the hypothetical reference distribution is a starting point for evaluating the effect of "flocking together" with a Gini-based measure.

The same considerations apply to the two other hypothetical reference distributions that we introduce in order to derive a summary measure of "flocking together". It appears natural to limit its range of variation, and if $G > G_r$, we normalize by the distance between $G_{\max}$ and G_r, where $G_{\max}$ denotes the

Gini coefficient in the hypothetical income distribution of the most disequalizing matching of individual labor incomes. This extreme case of "flocking together" occurs when the observed labor incomes are hypothetically rearranged in order to match the woman with the highest labor income with the man with the highest labor income, and so on down the income ranking.

If $G < G_r$, we normalize by the distance between G_r and $G_{\min}$, where $G_{\min}$ denotes the Gini coefficient in the hypothetical income distribution of the most equalizing matching of individual labor incomes, where the highest male labor income is matched with the lowest female labor income, and so on, assuming that the combination of the highest male labor income and the lowest female labor income represents the highest family labor income.

The formal definition of the summary measure $\nu(G)$ of the extent of "flocking together" is given by

$$\nu(G) = \begin{cases} \dfrac{G - G_r}{G_{\max} - G_r} & \text{if} \quad G > G_r \\ \dfrac{G - G_r}{G_r - G_{\min}} & \text{if} \quad G < G_r . \end{cases} \tag{3}$$

The index ν has range $[-1,1]$, where $\nu = 1$ represents the extreme case of "flocking together", $\nu = -1$ represents the most equalizing matching pattern, and $\nu = 0$ describes the situation where the labor incomes of the spouses are stochastically independent. A special case of $\nu = 0$ occurs if the labor incomes of all married women are equal.

The case of $\nu > 0$ reflects that $G > G_r$, i.e. inequality in the observed distribution of family labor income is larger than in the distribution of randomly matched labor incomes, which is taken as an indicator of "flocking together". The case of $\nu < 0$ reflects that $G < G_r$, i.e. inequality in the observed distribution of family labor income is less than inequality in the distribution of randomly matched labor incomes, which characterizes a more equalizing matching pattern than random matching. Hence, ν is symmetric with respect to the sign of the association between the labor incomes of the husband and the wife. The definition of $\nu(G)$ suggests that $\nu(G)$ also can be interpreted as a measure of association or correlation between two stochastic variables. This interpretation emerges even more clearly when $\nu(G)$ is compared with the summary measure of the extent of "flocking together" derived from the squared coefficient of variation rather than from the Gini coefficient. In the appendix we show that replacing the Gini coefficient with the squared coefficient of variation, the index of "flocking together" equals the correlation coefficient, provided that individual incomes are not influenced by the hypothetical matching.

The hypothetical Gini coefficient G_r is estimated from the data set by random matching of male and female labor incomes. For each year, G_r is estimated as the average of five simulations. The simulation variance is small, for all years the largest deviation between the simulated Gini coefficients is 0.006.

The hypothetical Gini coefficients $G_{\max}$ and $G_{\min}$ can be derived from the observed income distribution under certain assumptions. We compute $G_{\max}$ for the two-income families as explained in the following. If the woman with the highest labor income had been married to the man with the highest labor income, and so on, the ranking of women's labor income in the distribution of family labor income would have coincided with the ranking in the marginal distribution of women's labor income. In this case, the concentration coefficients would have been equal to the marginal inequalities, $\gamma_1 = G_1$ and $\gamma_2 = G_2$. In the following we assume that the marginal distributions of male and female labor incomes are constant. Hence, we can compute $G_{\max}$ for hypothetically matched couples, from observed income shares and hypothetical concentration coefficients coinciding with the marginal inequalities. From Table 4 we have that the income shares for men and women in 1997 were 0.626 and 0.374, respectively. Moreover, in our data for 1997 the marginal inequalities for men and women were $G_1 = 0.246$ and $G_2 = 0.221$. Hence, the concentration coefficients in the hypothetical distribution of family labor income would have been $\gamma_1 = G_1 = 0.246$ and $\gamma_2 = G_2 = 0.221$ in 1997. We thus get

$$G_{\max} = \frac{\mu_1}{\mu} G_1 + \frac{\mu_2}{\mu} G_2 = 0.626 \cdot 0.246 + 0.374 \cdot 0.221 = 0.237. \qquad (4)$$

The Gini coefficient $G_{\max}$ in the hypothetical income distribution corresponding to the most disequalizing matching of women's and men's labor income would have been 0.237 in 1997. The actual Gini coefficient in the distribution of labor income for two-income couples was 0.192 in 1997. Measured by the Gini coefficient, inequality would have been about 23 percent higher if the observed distribution of family labor income had been replaced by the most disequalizing matching pattern.

As demonstrated by Aaberge (1997) this fairly substantial increase in inequality corresponds to introducing a lump-sum tax of 23 percent of mean labor income in 1997 and redistributing the tax revenue as proportional transfers where each unit receives 23 percent of its pre-reform labor income. Mean labor income for two-income couples in 1997 was NOK 502 126, and a lump-sum tax revenue of 23 percent is about NOK 115 000. In this hypothetical policy experiment, we find from a decile table, reported in Aslaksen et al. (2000), that the 10 percent poorest couples would lose about NOK 52 000, while the 10 percent richest couples would gain about NOK 106 000.

The case of $\nu = -1$, the other extreme reference distribution, occurs when $G = G_{\min}$. Under certain restrictions on the difference between the male and female income component, $G_{\min}$ can in principle be

computed from the observed income distribution. In practice, however, we have simulated $G_{\min}$ from the data material. The case where $G_{\min}$ can be derived exactly from the parameter values provides an intuitive interpretation of $G_{\min}$ as explained in the following. The largest equalizing effect of the matching of high male labor incomes with low female labor incomes occurs if the ranking of men's labor income in the distribution of family labor income coincides with the ranking in the marginal distribution of men's labor income, so that $\gamma_1 = G_1$, and the ranking of women's labor income in the distribution of family labor income is the reverse of the ranking in the marginal distribution of women's labor income, so that $\gamma_2 = -G_2$. We thus get for the two-income families in 1997

$$G_{\min} = 0.626 \cdot 0.246 - 0.374 \cdot 0.221 = 0.071, \tag{5}$$

which is considerably lower than the observed Gini coefficient of 0.192. In this case the Gini coefficient would have been 63 percent less if the observed distribution of family labor income had been replaced by the distribution of family labor income corresponding to the most equalizing matching pattern. This corresponds to a policy experiment where a lump-sum transfer of 63 percent of mean labor income, or about NOK 316 000 in 1997, is financed by proportional tax payments. In this case the 10 percent poorest couples would gain about NOK 143 000, whereas the 10 percent richest couples would lose about NOK 290 000.

Let us also consider the effect on inequality in family labor income if there had been no tendency of "flocking together". In 1997 the hypothetical Gini coefficient G_r in the distribution of randomly matched family labor income was 0.183, i.e. 5 percent lower that the observed Gini coefficient of 0.192. This reduction in the Gini coefficient corresponds to a policy experiment where a lump-sum transfer of 5 percent of mean labor income, or about NOK 25 000 in 1997, is financed by proportional tax payments where each unit pays 5 percent of its pre-reform labor income. In this case the 10 percent poorest couples would gain about NOK 11 000, whereas the 10 percent richest couples would lose about NOK 23 000.

Figure 5. The extent of "flocking together" measured by the index $\nu(G)$

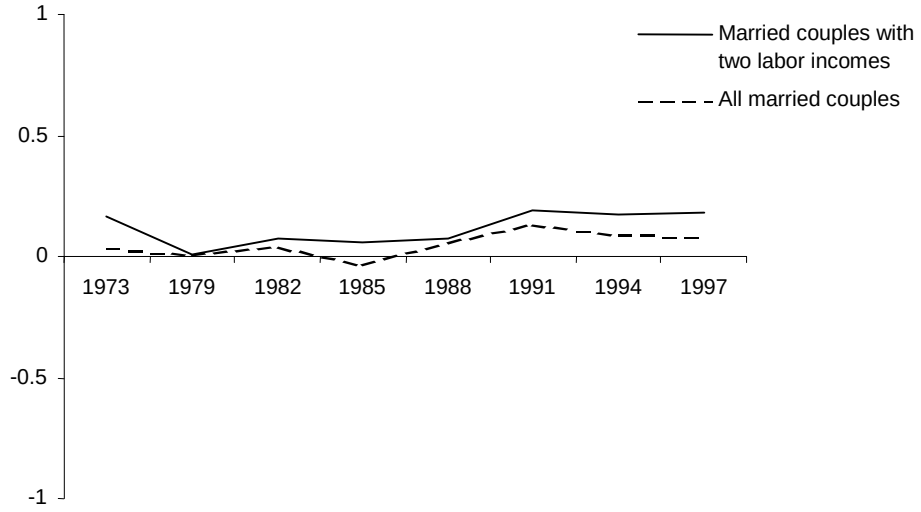


Figure 5 shows the development of $\nu(G)$ from 1973 to 1997 for two-income couples and all couples. For couples with two labor incomes, the index ν has been above zero throughout the period. The low estimates for ν in the 1980s suggest a rather weak tendency of "flocking together", while there has been a more clear tendency of "flocking together" during the 1990s. As women and men have obtained more equal opportunities with respect to education, labor supply and income, the potential for "flocking together" has increased, as reflected by the positive trend of ν. Note, however, that the current extent of "flocking together" is far below the extreme case of "flocking together" where $G = G_{\max}$ and $\nu = 1$.

For all married couples ν has been somewhat lower than for the two-income couples for all years except 1979. In fact, in 1985 the negative value of ν indicated no tendency of "flocking together". The category of all married couples contains the one-income couples that counteract the tendency of "flocking together" for the two-income families. For couples with only one labor income, the negative concentration coefficients indicate that women's labor income to a certain extent is meant to compensate for low spouse incomes.

Conclusion

The analysis of this paper shows a considerable difference between couples with one and two labor incomes in the effect of women's labor income on inequality in family labor income. The decomposition of the Gini coefficient shows that for all married couples and couples with two labor incomes, women's labor income gives a disequalizing contribution to inequality in family labor income. The disequalizing contribution from women's labor income, measured by the inequality

share, has decreased from 1973 to 1997 for two-income couples and increased for all married couples. For one-income couples we find that women's labor income gives an equalizing contribution to inequality in family labor income. The equalizing contribution from women's labor income has increased from 1973 to 1997. This striking difference illustrates the importance of distinguishing between one-income and two-income families in analysis of family income inequality.

The large difference between families with one and two labor incomes reflects their labor market choices. While the two-income families are more homogenous with respect to their actively chosen labor supply, due to more equal opportunities and preferences regarding education and work pattern, the one-income families are much more heterogeneous. Some of these have only one labor income by choice, e.g. if they prefer to devote more time to child care and less time to paid labor, whereas others have only one labor income as a consequence of age, health or other factors beyond the labor market choices of the individual.

In order to analyze whether "birds of a feather flock together" or not, we have considered the hypothetical reference distribution where the male and female labor incomes are randomly matched. For couples with two labor incomes the estimated summary measure indicates that there has been a pattern of "flocking together". The estimates suggest a rather weak tendency of "flocking together" in the 1980s, while there has been a more clear tendency of "flocking together" in the 1990s. As women and men have obtained more equal opportunities with respect to education, labor supply and income, the potential for "flocking together" has increased, as reflected by the positive trend of the summary measure. For all married couples the extent of "flocking together" has been somewhat lower than for the two-income couples, since the one-income couples counteract the tendency of flocking together for the two-income families.

Integrating the analysis of "flocking together" in a labor supply model has been beyond the scope of this paper. In future research, a simulation approach will be considered, where it is possible to randomly match the partners' productivities, i.e. potential wages, and then simulate their income producing choices.

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Appendix: The correlation coefficient as index of "flocking together"

Let X_1 and X_2 denote the income variables of the male and the female, ρ the correlation coefficient, C the squared coefficient of variation and let C_r, $C_{\max}$, $C_{\min}$ and $\nu(C)$ have similar meaning as G_r, $G_{\max}$, $G_{\min}$ and $\nu(G)$. By noting that $\operatorname{var}(X_1 + X_2)$ is attaining its maximum and minimum values when ρ is equal to 1 and -1, respectively, we get the following results

$$\begin{aligned}\nu(C) &= \frac{C - C_r}{C_{\max} - C_r} = \frac{\operatorname{var}(X_1 + X_2) - \operatorname{var}_r(X_1 + X_2)}{\operatorname{var}_{\max}(X_1 + X_2) - \operatorname{var}_r(X_1 + X_2)} \\ &= \frac{\operatorname{var} X_1 + \operatorname{var} X_2 + 2\operatorname{cov}(X_1, X_2) - \operatorname{var} X_1 - \operatorname{var} X_2}{\operatorname{var} X_1 + \operatorname{var} X_2 + 2\sqrt{\operatorname{var} X_1 \cdot \operatorname{var} X_2} - \operatorname{var} X_1 - \operatorname{var} X_2} \\ &= \frac{\operatorname{cov}(X_1, X_2)}{\sqrt{\operatorname{var} X_1 \cdot \operatorname{var} X_2}} = \rho \text{ if } C > C_r\end{aligned} \tag{A.1}$$

and

$$\begin{aligned}\nu(C) &= \frac{C - C_r}{C_r - C_{\min}} = \frac{2\operatorname{cov}(X_1, X_2)}{\operatorname{var} X_1 + \operatorname{var} X_2 - \operatorname{var} X_1 - \operatorname{var} X_2 + 2\sqrt{\operatorname{var} X_1 \cdot \operatorname{var} X_2}} \\ &= \frac{\operatorname{cov}(X_1, X_2)}{\sqrt{\operatorname{var} X_1 \cdot \operatorname{var} X_2}} = \rho \text{ if } C < C_r .\end{aligned} \tag{A.2}$$

Equations (A.1) and (A.2) demonstrate that the correlation coefficient may be used as a summary measure of the extent of "flocking together" when income inequality is judged on the basis of the coefficient of variation. Moreover, the above results suggest that the Gini-based measure of the extent of "flocking together" $(\nu(G))$ can be employed as an alternative to the correlation coefficient as a measure of the correlation between two stochastic variables. The absolute Gini coefficient (Gini mean difference) has been used as an (robust) alternative to the variance as a measure of spread, see e.g. David (1968).

Note that (A.1) and (A.2) are derived under the assumption that the variances of male and female labor income in the random matching equals the variances of observed male and female labor income. Hence, the result that the index of "flocking together" equals the correlation coefficient only holds in the truly hypothetical situation where actual incomes are not influenced by the random matching.