

Labour Market Participation of Women and Fertility: the Effect of Social Policies

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Introduction

Over the last several decades the labour market participation rates of married women have increased and fertility rates have declined in most developed countries. The growth of women's participation in the labour market carries with it some positive and negative implications for the ability of countries and the European Union itself to meet a variety of social and economic targets. On one hand, the increased number of workers helps to pay pension obligations to current retirees, while on the other the declining population levels make it less likely that the current form of European pension systems can be sustained.

In Italy, as well as in other Southern European countries where we observe both low participation and low fertility rates, these issues are particularly crucial. In this report we analyse labour supply and fertility decisions in order to understand what type of social and fiscal policies can be designed to allow women to work and have children. In the first part of the report we investigate the relationship between female participation *and* fertility, both intertemporally and a cross-sectionally (at the country level), in order to determine empirically the extent to which different combinations of currently existing social and labour market policies (e.g., part-time employment opportunities, subsidised child care provision, parental leave) designed to reconcile work and child rearing simultaneously have performed (Session 1). This

type of empirical knowledge is crucial if we are to design other policy mechanisms that will better attain these common goals of most Western European countries.

In the second part of the report we consider the impact of mothers' employment during childhood on the child's well-being, focusing on the trade-offs between her time spent in nurturing the child and household income. While we find some empirical evidence that the loss of the mother's child-care time has a negative effect on the child's well-being (e.g., socio-emotional adjustment and cognitive outcomes), it is also the case that there is evidence that the additional income from mother's employment has positive implications for expenditures on goods consumed by the child. These effects vary across countries and across family types, so the net impact of mother's employment on child's welfare can be expected to vary across national environments as well (Session 2).

We next consider the relationship between women's work and the interhousehold distribution of income, as well as the intergenerational income distribution, in several European countries. Women's work has an important impact on household income distribution as well as the intrahousehold income distribution, of course. Public policies directed to encourage female employment may also have the positive effect of reducing inequality in household income distribution and also may result in a more equitable distribution of resources and welfare within the household (Session 3).

We conclude by focusing on the decision-making process within the household in order to analyze and simulate the effect of different taxation policies on household welfare and income distribution (Session 4). Using all of the results we have obtained, it is possible to begin to discuss the formulation of public policies that can simultaneously promote increased labour market participation of married women, without discouraging fertility, and reduce intrahousehold and interhousehold income and welfare inequality.

1. Labour supply and fertility in Europe and the U.S.

1.1 What is the relationship between fertility and labour supply?

Over the last decades labour market participation of women increased, while fertility declined in most advanced countries. This pattern is consistent with microeconomic predictions: economic models of fertility behaviour predict in fact that an increase in women's schooling levels and wage rates leads to an increase in their labour supply and to a reduction in fertility. The existence of an inverse relationship between fertility and participation was theoretically established by Becker and Lewis (1973) and Willis (1973) and empirically documented by Butz and Ward (1979) for the U.S. and Mincer (1985) on a cross-country basis.

A negative relationship between women's labour market participation and fertility is a cause of concern for several reasons. In most European countries the current working generation finances the pension benefits of the previous working generations. Low fertility reduces the potential sustainability of the pension system, while a high female labour force participation rate increases its sustainability. An understanding of this relationship is therefore relevant to policy makers in ways which go beyond theoretical speculation.

Recent analyses focusing on the temporal pattern of fertility and female participation show that as early as the mid-1980s, the sign of the cross-country correlation changed from negative to positive and became more volatile (Figure 1). After 1985, the participation of women in the labour market continued to increase in all countries, but fertility rates started to decline at a lower rate or, in some countries, began to grow again.

The countries that currently have the lowest levels of fertility (Spain, Italy and Greece) are those with relatively low levels of female labour force participation while the countries with higher fertility levels (Denmark, France) have relatively high female labour force participation rates (Figure 2).

Various authors (Ahn and Mira 2002, Esping-Andersen 1999, Brewster and Rindfuss 2000, Billari *et al.* 2002) empirically analyzed the cross-country correlation between the total fertility rate and the female labour market

participation, confirming the change in sign and in the significance of the coefficient. The interpretation of the temporal change in the relationship between participation and fertility has mainly been found in the changes in social norms towards working mothers and in the effects of policies that diminish incompatibilities between childrearing and female employment: more generous parental leave, greater availability of childcare, and greater opportunities for flexible hours and part-time employment (Ermisch 1989, Hotz and Miller 1988, Del Boca 2002, Brewster and Rindfuss 2000, Benjamin 2001). The empirical evidence indicating a positive relationship between women's participation and fertility is certainly encouraging in view of pension system sustainability. Boosting female employment, if supported by such policies, will not necessarily lead to significant declines in fertility as was experienced in the past.

Other studies of this phenomenon have shown different results, revealing a weaker and less significant correlation, but not a change from a negative to a positive sign. These analyses, pooling cross country and time series data, allow for country-effects and show that only in Mediterranean countries is there a negative correlation between fertility and female employment (Engelhardt, Kogel and Prskawetz 2001). This result implies that it is important in these countries for female participation and fertility to be considered a joint decision and that policies encouraging fertility may have an adverse effect on female employment and vice versa (Del Boca 2002).

Social policies have been implemented in most European countries to make childrearing less difficult to be reconciled with employment. In some countries the view in favour of pro-natalist actions has prevailed, and government intervention has been directed towards promoting higher fertility. In others, the view that, independently of the possible consequences on fertility levels, governments are not justified in interfering with intact families' decision and in particular with how many children to have, which is essentially a private decision, has prevailed.

In this session, we will examine the effect of several aspects of the different institutional and social factors (related to the welfare systems and labour markets) on women's labour market participation and fertility taking as a starting point the relevant literature and then analyzing a cross-country analysis using the European Community Household Panel Data (ECHP) dataset and taking into account country specific factors.

1.2. Temporal patterns and cross-country differences

Several important changes over the last decades have characterized the temporal pattern of both women's labour market participation and fertility, increasing the differences across countries.

The temporal changes in fertility are determined by the combined effects of a *tempo* and a *quantum* effect: on the one hand, the total fertility has declined over the last decades (the *quantum* effect), on the other hand the age at first child has increased (the *tempo* effect). As a consequence, the number of children per family has decreased over the years, while new mothers in 1970 were older than in 1960 and again older in 1980 than in 1970 for most European countries (Gustafsson 2002, Billari *et al.* 2002).

An explanation for this fact is likely the increased educational levels of women. Looking at fertility behavior, a relevant source of heterogeneity is, in fact, education level. More highly educated women are more likely not to have children or to have the first child at a much later age than women with lower levels of education.

The *quantum* and *tempo* effects have had different impacts across countries, implying a rapid ageing of the population in long lasting low fertility countries (with related problems for social security and transfer programs), especially in the South of Europe. Some studies argue that very low fertility will eventually disappear when the deferral of the first birth ends (Bongaarts and Feeney 1998), but less optimistic results have come out of later studies which use different methods (Lesthaeghe and Willems 1999).

Although the increasing long-term trend in female participation rate is similar for most countries, persistent differences in levels suggest that different countries are constrained by country-specific institutional and social factors. Analyzing the behavior of OECD countries, Ahn and Mira (2002) and Engelhardt *et al.* (2001) have divided the 21 OECD countries into three groups. The high participation group, in which the participation rate (FLP) is higher than 60%, includes the U.S., Canada, the U.K., Sweden, Norway, Denmark, Finland and Switzerland. The medium participation group includes countries where the participation rate is in the 50-60% range. The low participation countries are where the female participation rate is less than 50% (Italy, Spain and Greece). The two values of each of the three trends shown

in Figure 1.3 represent the differences between the studies of Ahn and Mira (2002) and Engelhardt *et al.* (2001).

Figure 1.4 shows that in those countries characterized by high participation the total fertility rate starts at 2.19 in 1970, declines to 1.65 in 1980 and then returns to 1.6 at the end of 2000. On the contrary, in countries characterized by low participation, the fertility rate starts at 2.72 in 1970 and continues to decline to 1.4.

Figure 1.5 illustrates the *tempo* effect. It shows the growth of women's mean age at first birth in the three groups of countries, indicating the significance of postponement of the fertility decision. The average age in the 1960's was in the 24-26 range and grew to around 28 in the year 2000. The phenomenon of postponement has implied a reduction of completed fertility and a large number of women who remain childless. In countries where fertility has declined more, a higher number of women, especially of educated women, has remained childless.

Because of these different temporal patterns, more and more empirical research focusing on the relationship between women's participation and fertility is being done, especially in Southern European countries, where it still seems hard for women to reconcile work and motherhood, while in Northern European countries more attention is being given to the effects of the high participation of mothers on wages, careers, and child outcomes (see Ermisch and Francesconi in this volume).

In Northern European countries, in fact, the employment rates of mothers with young children increased quite significantly over the last decades, while the increase was much smaller in Southern Europe. The low employment rate among young women with children and the low fertility rate symbolise the difficulties encountered by women in Southern Europe. Figure 6 shows the significant differences and the growth between 1989 and 1999 between the employment rates of mothers with children under six in Europe. Italy, Greece, and Spain are ranked at the lowest level.

Several studies have questioned whether low fertility rates represent a voluntary choice by the household to free the women from family obligations rather than being the effect of economic constraints. Bongaarts (2001) provides data on desired and realized fertility for several European countries showing that preferences fall short of achievement. This study also reports that when fertility is low, desired fertility is usually above realized fertility.

1.3. The characteristics of the labour market

The regulations of the labour market have an important impact on participation rates. In spite of recent institutional changes, Southern European labour markets are still highly regulated: strict rules apply regarding the hiring and firing of workers and permissible types of employment arrangements. The hiring system and the high entry wage as well as very strict firing rules severely restrict employment opportunities for labor market entrants. These labor market regulations have been largely responsible for the high unemployment rates of women and youth.

If we look at unemployment among youth, in those countries where high percentages of youth are unemployed (Italy, Greece, Spain) women participation rate is lower (Figure 1.8). Moreover, when the unemployment rate is high, fewer women leave the labour market during the childbearing years because it is more difficult to re-enter later.

Empirical evidence also shows the strong difference in fertility rates between countries characterized by high unemployment rates (Spain, Italy, Greece) and countries characterized by low unemployment rates. Figure 1.9 shows that where youth unemployment is higher (Spain, Italy, Greece) the fertility rates are lower.

In countries where the unemployment rate is higher, young couples tend to postpone household formation and fertility. Young people, both men and women, wait to be well established in their jobs before getting married and having children. The lack of stable jobs among Spanish men is an important factor that forces many young people to delay marriage and childbearing: between 1987 and 1995 the proportion of employed Spanish men aged 25-39 years who held permanent work contracts fell from 55 to 37 per cent. The low level of confidence among young workers about their future employment prospects is an important determinant of the low fertility (Ahn and Mira 2001).

A negative relationship between unemployment and fertility also emerges for Italy. On the one hand women tend to participate more in the labour market to protect household income from negative shocks to the partners' wage and employment, on the other hand they do not leave work during childbearing years to protect their own labour market prospects (Bettio and Villa 1998).

The experience of unemployment not only reduces current income, but also affects the level of income that the families consider necessary for the well being of

their children. Tests of the hypothesis that expectations of future labour market outcomes affect current fertility decisions show that unemployment is one of the variables that most significantly affects the expectations of future wages and job opportunities and therefore may be responsible for the decline in fertility (Del Bono 2001).

The possibility to combine work and child rearing depends strongly on the occupational structure and working arrangements. Changes in the occupational structure, especially for part-time employment, have expanded employment opportunities for women (O'Reilly and Fagan 1998). However, the development of the service sector and the part-time opportunities have not increased equally in all advanced countries. While in the North European countries, a high proportion of women work in the tertiary sector and are employed part-time, in the South of Europe the tertiary sector is less developed and part-time employment is very limited. In countries where part-time opportunities are scarce, married women are forced to choose between not working or working full-time, neither of which is necessarily their preferred option. Married women who choose to work tend to have full-time work commitments, which is not compatible with having large numbers of children.

Part-time jobs opportunities are very limited in Southern European countries when compared to Northern and Central European countries (Appendix Figure 1.1). The positive link between part-time jobs and women's participation in the labour market has been shown in studies based on cross-country analyses. Empirical analyses of several countries show that being a mother (compared with being childless) decreases the probability of choosing full-time work and increases the probability both of not working or working part-time. The availability of part-time jobs increases the probability that women are employed in all European countries (Bardasi and Gornick 2000, Tanda 2001). Greater opportunities for part-time employment also reduces the opportunity costs of having children with a positive impact on fertility rates. Figure 1.11 shows that in countries where part-time opportunities are higher, fertility rates are also higher (Netherlands, Denmark, U.K., Sweden).

The availability of part-time opportunities has a positive impact on both the probability of women participating in the labour market and the probability of having children in Italy (Del Boca 2002). However part-time work may have also negative effects on wages and career prospects (especially in countries where it is widespread). Part-time jobs tend to be more frequent in low-qualified occupations with a negative

impact on women's career opportunities. U.K. and U.S. mothers are more likely to work in part-time jobs and earn lower wages compared with women without children. Mothers working part-time also have significantly lower hourly wages in Germany and Sweden (Ermisch and Wright 1993, Gustafsson *et al.* 2002).

When we look at the employment conditions of women before and after childbirth we see that after the first birth, mothers either become unemployed or inactive or experience downward occupational mobility. That is, even if a woman remains employed she may end up in an occupation that is inferior to the one held before the birth in terms of quality, payment and responsibility (Guettierrez-Domènech 2002). This may stem from the fact that mothers might sometimes be willing to supply labour that involves fewer responsibilities during the child-rearing years and/or because employers may be reluctant to hire mothers for high profile positions since they believe that their family role may absorb most of their energy and interfere with their productivity.

A comparison across European countries show that that only in The Netherlands, Belgium and Ireland the probability to change from a full-time activity to a part-time activity after the first childbirth is higher than the probability to leave the labor market. In Southern European countries a smaller number of women change their status after childbirth. As we have discussed above, the proportion of women working in these countries is much lower than in the rest of Europe, and they are prevalently employed in full time permanent jobs.

1.4. From maternity to parental leave

It is usually claimed that maternity leave increases female participation because women are not forced to exit from the labour market after childbirth to take care of their newborn children. Therefore, maternity leave is an important policy to help women to reconcile household responsibilities with work activities.

In 1992 a European Union directive mandated a paid maternity leave of 14 weeks and in 1998 a directive mandating a 3-months parental leave was also approved. However, maternity leave policies are still quite different across Europe both for duration and benefits of compulsory and optional leave. Maternity leave coverage for working mothers in European countries at the end of the 1990s.

Denmark, Finland and Italy are the most generous country in terms of duration of base maternity leave, while France, Spain and Portugal have longer optional parental leave periods (see Appendix Table 2.1).

The benefits received during the base period are particularly low for Greece, where also no benefits are paid during the optional period. Spain, Portugal, the Netherlands and the U.K. also give no benefits during the optional period. In the U.S. maternity leave has only recently been introduced with the FMLA, Family and Medical Leave Act (1993) and its coverage is still quite limited: only 12 weeks of unpaid leave for women working full-time in firms with at least fifty employees. Before 1994, however, many employers created maternity leave programs as a response to the growing presence of women in the workforce (Sundström 1994, Kelly and Dobbin 1999).

Maternity leave is likely to have a positive impact on women's employment rate since more women would enter employment if they knew they had access to leave. A relatively strong correspondence between the generosity of child-related policies of maternal employment (including maternity leave) and women's employment profiles emerges from cross-country comparison. In Northern European countries, where policies are more generous, female participation in the labour market is higher (Gornick *et al.* 1997).

Quite different results, however, have been reported for the U.S. During the period 1980-1990 the labour supply of new mothers did not increase more in States where maternity laws were enacted. After 1993, when the FMLA Act was introduced, the effect of maternity leave appears limited probably because a 12-weeks is such a short period, the coverage is not universal and in many cases leave is unpaid (Klerman and Leibowitz 1999).

The expected effect of the duration of leave is in fact ambiguous: in theory, the longer women stay out of the labour force, the greater the loss they incur in terms of skill deterioration and lost opportunities for promotion and training. A negative relation between maternity leave and female employment is therefore expected. However a longer leave may also be seen in a positive light since it gives mothers more time to recover while retaining job security. Therefore, the positive effect of maternity leave on fertility and female employment seems to depend strongly on the length of leave and on the generosity of the benefits that women receive during the leave. A comparison of the effect of compulsory and optional maternity leave

regulations in European countries shows that a long compulsory maternity leave period seems to have a negative impact on the probability of women working, possibly increasing the costs of hiring women. In contrast, the length of the optional maternity leave has a positive effect on women's employment rate.

France is an example of the negative effect on female employment of long maternity leave. In France, in fact, parental leave has been associated with a benefit called the Allocation Parentale d'Education (APE). The full-rate APE can be considered as a kind of mother's wage, but it is only temporary in that it only applies until the youngest child reaches the age of 3. This is a strong incentive for mothers to leave the labour market, especially when they have relatively low wages or precarious jobs. Périvier and O'Dorchai (2001) argue that:

[t]he APE has had positive consequences for most women who have taken it up at a partial rate or who have chosen the full-rate but could fall back on a secure job. Usually, these women are skilled. However, it has had the strong perverse effect of removing from the labour market those women who, generally speaking, were unskilled. Once the three years of entitlement to the APE had expired, these women were generally no longer able to find a job because of the training opportunities foregone and their inactivity during too long a period. In conclusion, it has encouraged unskilled women to return home and has strengthened the disparity and inequality, that were already strong to start with, between skilled and unskilled women. (p. 117)

Looking at the labour demand side, maternity leave policies, by imposing additional costs to the employers, may have a negative impact on women's job opportunities, careers and wages or, more precisely, on what is defined as the "family gap", which is the wage difference between women with and without children (Waldfogel 1998). Employers, in fact, may find it risky to hire young women who may be absent from work for long periods. Moreover, they also prefer to employ women in jobs with fewer responsibilities, where they can easily be replaced during maternity leave. Again, the effects on wages and career depend on the length of the leave.

In fact, in the 1980s and 1990s the gender gap in pay decreased in the U.S. because of equal pay and equal opportunity policies, while the "family gap" increased because of the lack of family friendly policies, including maternity leave and childcare. The results show that a short period of maternity leave does not affect

human capital accumulation and therefore does not affect negatively new mothers' wages. On the contrary, the possibility to return to the same job after the leave period has a positive effect on women's pay, because of gains in firm-specific work experience and job tenure. Similar results were found for Europe (Ruhm 1998).

Looking more closely at the Nordic countries, we see that formal parental leave has no effect on Swedish women's wages, probably because most women in Sweden work in the public sector. Instead, interruptions due to unemployment prove to cause greater losses than interruptions due to maternity leave and childcare. Longer leaves have a negative impact on wages, likely because of the signalling effect: employers tend to penalize those who take longer leave because this is a signal of lower job commitment (Albrecht *et al.* 1999). A negative impact of interruptions is also found for young women in Germany, but in this case the effect for interruptions due to maternity leave is greater than the effect of interruptions due to unemployment (Kunze 2001).

Further, in a comparative analysis of Finland and Norway, some evidence was found for the hypothesis that the extension of parental leave may have positively influenced fertility. The effect is most significant for Finland where more extensions were available during the period of analysis (about 1960-1990), and is mainly limited to the probability of a second or third birth (Rønsen 1998). If the studies mentioned above mainly concentrate their attention on the effects of maternity leave regulation for women workers, it is also interesting to consider the impact on decisions made when parental leave is also available.

Table 1.1 reports paternity and parental leave legislation in European countries. Paternity leave is explicitly directed to the fathers of newborns children, while parental leave can be used either by the mother or the father. As we can see, only Northern European countries offer fathers the opportunity to stay at home for some days following the birth of the child, while in most South European countries extremely limited paternity leave is provided, if at all.

On the contrary, all European countries give fathers the possibility of parental leave, but in 1995 only 5% of the fathers in the European Union took the advantage of this opportunity. Usually this is interpreted as indication of the secondary role of fathers in child rearing, while a possible income constraint could be an important cause. Since on average men have a higher labour income than women and parental leave benefit is a portion of the wage, it is less costly, in terms of household income

loss, for women than for men to take the optional parental leave. In fact, a higher percentage of fathers taking parental leave is found in Northern Europe where benefits during the optional period represent a higher percentage of the average wage: 58% of fathers in Denmark, 64% in Sweden and 80% in Norway.

While parental leave has relatively limited no negative effects on women's wages, it has a significant negative effect on men's earnings. Moreover, mothers who contribute more to the household income are less likely to leave their jobs both before and after the birth and they tend to return earlier to their jobs (Wenk and Garret 1992). Swedish families are more likely to have a second baby in cases where the father took parental leave for the first child, suggesting that policies encouraging an active participation of the father in childcare may stimulate fertility (Oláh 1996).

Another relevant aspect to be considered is that maternity/parental leave regulation usually guarantees only entitlement to permanent workers, while the extension of the benefit to part-timers and temporary workers is still quite limited. In Europe, and in particular in Southern European countries, employment has traditionally been based on permanent jobs. Only recently some elements of flexibility have been introduced into Southern European labour markets, with the introduction of temporary jobs, especially for young people. The growth of the proportion of youth with temporary and unstable jobs has increased uncertainty, causing delays in marriages (or cohabitation) and postponement of fertility due to lower coverage in terms of parental leave and benefits (De la Rica and Iza 2003).

As a consequence, young women may wait for a stable and protected job before deciding to have a child, especially in areas where the unemployment rate is high. Postponement may result in a lower fertility rate. Figure 1.12 shows the negative relation between the percentage of temporary contracts and total fertility rate

1.5. Do childcare characteristics affect women's labour supply and fertility?

The presence of children affects mothers' preferences with respect to non-market time versus market time. Social policies directed at reducing the costs of children by increasing the availability, quality and affordability of childcare may affect fertility and participation rates, reducing the cost of children. Studies on

temporal patterns have shown that the increased availability of market childcare is one possible explanation for the change in fertility over time and for the observed changes in the relation between women's participation and fertility (Ahn and Mira 2001, Englehardt and Prskawetz 2002).

However childcare systems have not evolved in the same way in all developed countries. In some countries the view that the choice of having children is a private one prevails and government support is targeted only to poor families with children (as in Anglo-Saxon countries). In other countries, children are considered to be public goods and public policies cover the costs of children independently of family income (as in Northern countries). The different types of organization and financing of childcare for children in different age groups in different countries (see Appendix). In the U.K., a model of private provision and financing of childcare prevails, while in Sweden, public organization and financing prevails, and in Southern Europe (Italy and Spain), there is a mixture of private and public childcare. Coverage for younger children is higher in Sweden while coverage for older children is higher in Italy. The different characteristics of childcare services have different implications on the labour supply of mothers.

Figure 1.13 shows the availability of childcare in several countries (proportion of children under 3 and from 3 up to the mandatory school-enrolment who benefit formal childcare arrangements). For children under 3, the supply of childcare varies across countries considerably. Nordic countries have the highest proportion (40%) while in Southern Europe it is much lower (5-6%). For older children the coverage tends to be much higher and tends to be more uniformly distributed across countries.

Childcare availability also has important effects on fertility, while childcare costs do not seem to be an important factor. Figure 1.14 shows that in the Northern countries where childcare availability is relatively high, fertility is also generally high. In contrast, in Southern European countries where childcare availability is very low (Italy, Spain, Greece) fertility is also low.

In Southern European countries, childcare does not seem to be designed to accommodate market work of both parents, especially given that part-time opportunities are scarce. Public childcare is only available in some areas of these countries, and with limited hours. These constraints have resulted in lower growth in the participation of Southern European mothers with younger children than in other countries.

The decision to work and to have a child are, in fact, both positively influenced by the availability of childcare. Given the low availability of childcare and the limitation in daily hours, a large proportion of Italian mothers, for example, have to rely on family support systems, mainly on the help of grandparents. The role of the extended family on women's decisions to work and to have children is relevant, and the substitutability between formal childcare and informal help by the family is fundamental (Del Boca 2002). These results indicate, in fact, that the labour force participation of women with children is affected by childcare availability as well as the availability of informal childcare. Family support, both in the form of transfers and in the form of help with the children, increases the probability of women's participation as well as their probability of having children. Similar results also emerge for Spain (where a high opportunity cost is associated with childbearing because of the lack of 'social care services' and is compensated by a strong family support network (Del Boca 2002, Del Boca, Locatelli, Vuri 2003, Baizan, Michielin and Billari 2002).

Another important issue concerns the quality of childcare. If high quality childcare is available, the preferences of mothers for time spent at home relative to time spent at work become weaker. This is particularly true for older children (3-5 years of age) and in families where only one child is present and childcare use responds to the child's needs for socialization in addition to education and care (Del Boca 2002).

On average, in countries where childcare is publicly provided, childcare quality is higher and more homogeneous. The problem of quality is more relevant in systems where childcare is mostly privately provided (and where a wider variety of types of services are supplied) because private services are less subject to monitoring.

Quality is related to cost. The ratio of specialized personnel to the number of children and higher levels of training are positively related to quality care, but high quality care costs more. Childcare costs are part of the family decision making in two ways. First, childcare costs can be thought of as a part of the cost of rearing a child and thus influence those decisions for which the cost of children is a relevant factor. In addition, in families where the mother is the principal caregiver, the cost of childcare can be considered as a tax on the mother's net wage and will result in a decrease of mothers' employment and working hours. The higher the cost of childcare, the higher the cost of each additional child. This leads to the prediction that

higher childcare costs will also tend to lower fertility (Cigno 1991, Del Boca 2002, Ermisch 1989).

The results of several studies for the U.S., the U.K. and Canada show that childcare cost is a very important variable with significant effects on participation of mothers (Blau and Robins 1988, Ribar 1992, Connelly 1992, Jenkins and Symons 1995, Kimmel 1998, Powell 2002). In Northern European countries, instead, where public childcare is readily available, the cost of childcare is less influential on the mother's decision to work (Gustafsson and Stafford 1992). Similar results emerge for Italy: childcare costs are significant only in those areas where there are several childcare places available (Del Boca 2003).

1.6. Child benefits

As we have discussed above any governmental measure aimed at reducing the cost of children can be expected to have a positive effect on the demand for children. A theoretical distinction is drawn, however, between measures aimed at reducing the direct costs of children (direct expenditures) and measures reducing the opportunity cost of children (foregone earnings) (Cigno 1991).

The magnitude of these effects may depend on the work status of the beneficiary. Higher cash benefits have a greater effect on unemployed women than highly paid executives. On the other hand higher cash benefits may lead to an increased demand for children but also to demand for higher quality. Child benefits may also be expected to have distinct effects on women with different numbers of children. If the same benefits are paid for each child regardless of birth order, benefits can have an increasing influence on the decision to have a greater number of children since their cost would be lower with each additional child (economies of scale).

Studies based on time series found a positive relation between fertility and cash policies. Family benefits were found to result in increased fertility of 0.2-0.3 children per woman (Blanchet and Eckert Jaffe' 1994 using French data). Other studies suggest the existence of a timing effect; higher family benefits would encourage early entry into motherhood but not necessarily a large family size (Barmby and Cigno 1990, and Ermisch 1989). A cross-country comparison, which considers benefits for one-child, two-child and three-child families separately,

indicated a positive but very limited effect of child benefits on fertility (Gauthier and Hatzius 1997). These results vary widely across countries and by birth order. The cross-country comparison shows that while cash benefits do not affect fertility in Anglo-Saxon countries, they have a positive effect in Scandinavian countries, since they are likely to be correlated with other family support policies. In Southern European countries the effect is significant only for the first child, while in other countries (France and Sweden for example) it is significant for the third child. These differences reflect important differences in family support policies across countries. Studies based on macro data reveal a number of methodological pitfalls, since it is difficult to measure the incentive effects of transfers to a population which, in any case, would have had several children.

The influence of child transfers on fertility has not been widely studied on individual data. Studies on the role of financial incentives on fertility at the individual level (Lefebvre *et al.* 1994 and Laroque and Salanie 2003 for Canada and France respectively) report very weak effects.

The analysis of cash benefits must take into account two important factors. First, child benefit effects may be greater for lower income households, *i.e.* fertility would increase in households where the average number of children is higher. The second aspect concerns the potential discouraging effects on mothers' labour supply. Given the low participation rates of mothers in several countries and the greater response of low income women to changes in tax-transfer systems (see Aaberge, Colombino and Strom this volume) these effects are likely to be significant and raise crucial policy questions. These conclusions underline the importance of estimating fertility and participations decisions simultaneously (Francesconi 2002, Del Boca 2002, Laroque and Salanie 2003, Colombino and Di Tommaso 1996, Colombino 2000).

1.7. Comparing the effects of social policies

As we have discussed above, the compatibility between labour market participation and fertility can be outcome of several factors: the changes in education levels and wages, as well as the changes in labour market regulations and in the service sector. In Northern countries governments have developed policies with the

objective of simultaneously encouraging the labour force participation of women and fertility. These programs support dual earner families and the burden of childrearing is shifted to the state. Public childcare availability, generous optional maternity leave as well as part-time opportunities have allowed women to choose either to remain in the labour market during their childbearing years and to maintain a continuous and stable relationship with the labour market or to take care of their children themselves by taking advantage of long optional maternity leaves.

In Anglo-Saxon countries, governments have implemented programs only for the poor and they have allowed the market to produce services which respond to families' needs for childcare during working hours. In this context where long optional parental leave is not available mothers have less choice: they may choose between the use of part-time combined with private child care or to leave the labour market.

The Southern European countries, on the contrary, have targeted programs mainly to working mothers (employment protection, public childcare mainly for dual earner families) leaving the burden of childrearing to the family. The development of private services has been constrained in several ways by competition with the public sector and by strict regulation. The outcome has been employment protection for those already employed at the cost of low employment and low fertility. In areas where childcare availability is higher, women can combine work and child rearing without leaving the labour market, while in areas where childcare is not available mothers can continue working through their childbearing years only with the support of the family.

Examination of policies to assist women with children from 0 to 3, such as childcare and optional paternal leave, reveals that we notice that different combinations characterize different countries (Figure 15).

For example, in countries with longer optional maternity leave, but low levels of childcare availability, as well as very few part-time opportunities, women may take time out of work to take care of their children. These interruptions imply negative effects on wages and career prospects and also low participation.

Northern Europe (Denmark and Sweden), instead, is characterized by shorter optional maternity leave (although paid at a higher percentage of wages), but wide availability of childcare, as well as part-time opportunities. More women in these countries have the option to use childcare, managing not to take time out of their jobs

during child-rearing. The negative impact on wages and career prospects is less relevant.

Finally, in most Southern European countries (particularly Italy and Greece) characterized by low optional maternity leave and low child-care and very limited part-time options, women do not have the option to use childcare, and need to rely on family support in order to continue work when their children are young. The outcome is very low participation, but high continuity in the labour market attachment.

1.8. Participation and fertility decisions: empirical results from ECHP

The analysis in the previous sections has suggested the importance of labour market and social policies in a woman's decision to work and/or to have children. However, empirical analysis of participation and fertility is quite complex since these decisions are affected both by individual characteristics (for which we need data at the individual level) and by policies (which are the same across individuals living in the same country

We use the European Community Household Panel (ECHP) and select all women aged 21-45, married (or cohabitant) from Italy, Spain, Denmark, the Netherlands available for the years 1994-1999 (see Del Boca, Pasqua and Pronzato 2003). The dependent variables are: whether the wife is working at the time of the interview and whether or not she had a child in the last two years. The variables considered include: Personal characteristics (Wife age, Wife non labor income), Family characteristics (Husband income, number of children), Environmental variables (unemployment, part time, child care). A detailed description of the variables and the characteristics of the ECHP data set is in Del Boca, Pasqua, Pronzato 2003. Table 1 reports the logit estimates of the variables of interest on the probability of working and the probability of having a child.

The results show indicate that the effect of the personal characteristics of the wives (age, education) on the dependent variables have the expected sign, except for schooling which has a positive effect on fertility. This effect can be interpreted in part as a permanent income effect given that fathers' education is not included in the analysis (assortative mating). Wife's non labor income and husband's income have a negative effect on participation and a positive one on fertility (standard income

effect). The number of children in a family has a negative effect on participation and a positive on fertility (non significant).

We next consider the effects of the institutional characteristics. The length of maternity leave has a negative impact on participation, which is coherent with the potential negative impact discussed above and a positive one on fertility. The estimate of the parameter of childcare availability is positive and significant in both participation and fertility equations, but it is only significant in the participation equation, confirming previous results (Del Boca 2002). The estimates of the part time coefficients are positive and significant in both, even if more significant for participation. The unemployment rate reduce the probability of working and having children.

One of the limitations of the economic analysis of fertility is the omission of factors such as fecundity, tastes, and other marriage-specific traits which are unobservable to the researcher. To take into account and isolate these effects, we use a fixed effect model with panel data. Unfortunately there not data available to estimate the effects of all social policies across different European countries overtime (optional parental leave for example).

We estimate also a random effect model for comparison and compare the coefficients associated with time varying variables.

The fixed effect and random effect estimates of the wife's age are both positive and significant in the participation equation. This is not true in the fertility equation where the fixed effect estimate is positive and the random effect is negative and significant. The fixed and random effect estimate of the wife's labor income and are both negative and significant in the participation equation and fertility equation. Similar results for the husband's income. The number of children in the household have a negative effect on participation and fertility and there is no variation across estimation methods. The fixed effect and random effect estimates of the coefficient of the regional unemployment rate are both negative in the participation equation. In the fertility equation, the fixed effect estimate is negative while the random estimate is positive. The different sign of the fixed effect and random effect estimates can be rationalized by looking the regional level data: where the unemployment rate is high fertility rate is also higher (such as in the Southern regions of Italy and Spain).

The fixed effect and random effect coefficient of the regional part time are both positive in the participation equation and fertility equation while the random

estimate is negative in the latter but not significant. The fixed and random effect estimates of child care are all positive (however only the fixed effect estimate in the fertility equation is significant). These results are coherent with the predictions of our modelling framework developed in Del Boca (2002).

The year dummies capture the effect of changes in macroeconomic conditions. The omitted year is 1994. The year dummies are positive and non significant in the participation equation and negative and marginally significant in the fertility equation. The country variables indicate the effect of coming from a sample from France Italy Spain and Netherlands relative to Denmark (the omitted category), conditional on personal family and environmental characteristics. The effects are all positive but non significant in the fertility equation while negative and significant in the employment equation. This means that in spite of the different characteristics of households and environments there are country specific effects (cultural attitudes for example) that have important impacts on the probability of working .

Which set of estimates is to be preferred? The tests statistics reported indicate over-whelming rejection of the null hypothesis of independence between the unobserved individual effect and the covariates.

1.9. Conclusions

The analysis of the temporal and cross-country patterns of women's labour market participation shows how several factors affect the compatibility between childrearing and work (labour market characteristics, social services, and family wealth). The most significant factors which facilitate reconciliation of child-rearing and work are the opportunities for part-time arrangements, the availability of childcare and parental leave options.

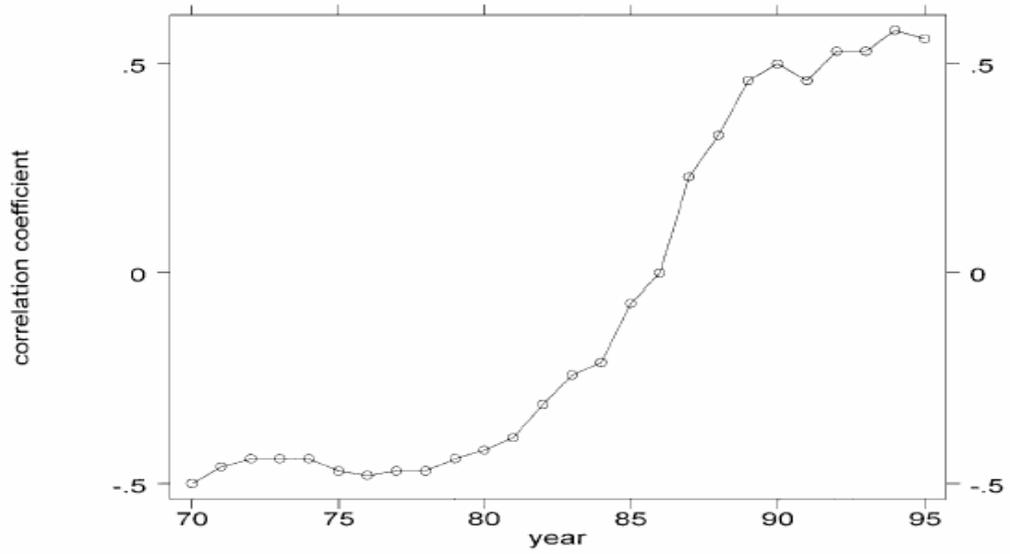
The combination of these options seems to allow different solutions for combining work with having children. Empirical evidence and comparative results show that it is more difficult to combine work and having children in Southern Europe than in the rest of Europe. The primary reason for low participation and fertility in these areas seems to be the mismatch between the types of jobs sought by married women with children (part-time) and the types of job available (full-time) in a

situation of lack of affordable child care. Married women who choose to work tend to have full-time commitments and this is not conducive to having a large number of children. Thus the labour market structure imposes large fertility costs.

This imbalance could be addressed by increasing the provision for childcare which would simultaneously increase job opportunities for women and reduce the costs of taking full-time jobs. By creating more flexible employment opportunities, more women would be able to continue working during their childbearing years. The fixed effect estimates of the impact of some of these variables (part time child care, unemployment) on household behavior are consistent with our predictions and reasonably precisely estimated. While part time and child care have positive impact on fertility and participation, unemployment has a negative impact.

Figure 1.1

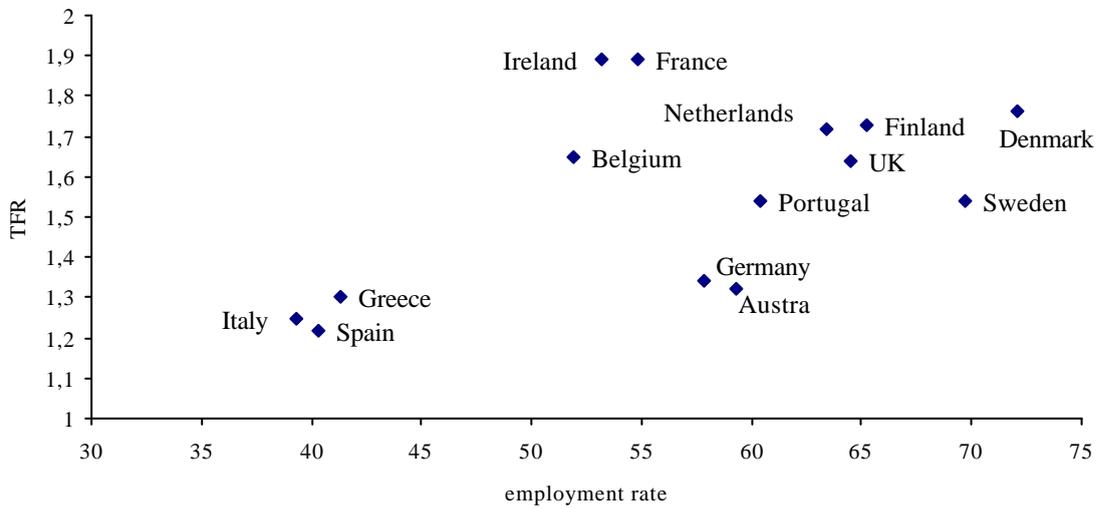
Cross-country correlation between total fertility rate and female participation



Source: Brewster and Rindfuss (2000)

Figure 1.2

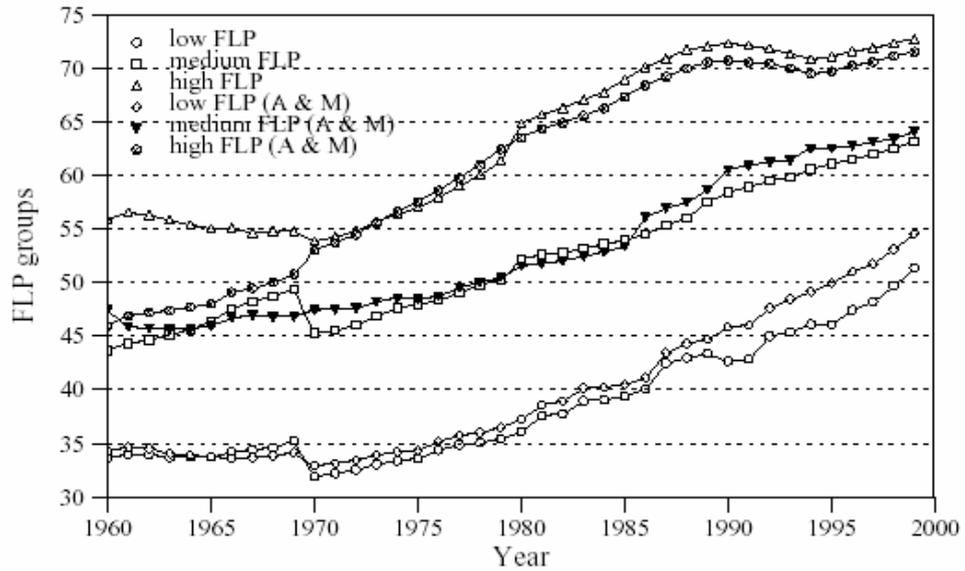
Women's employment rates and fertility (2000)



Source: Eurostat (2001), *Statistics in Focus*

Figure 1.3

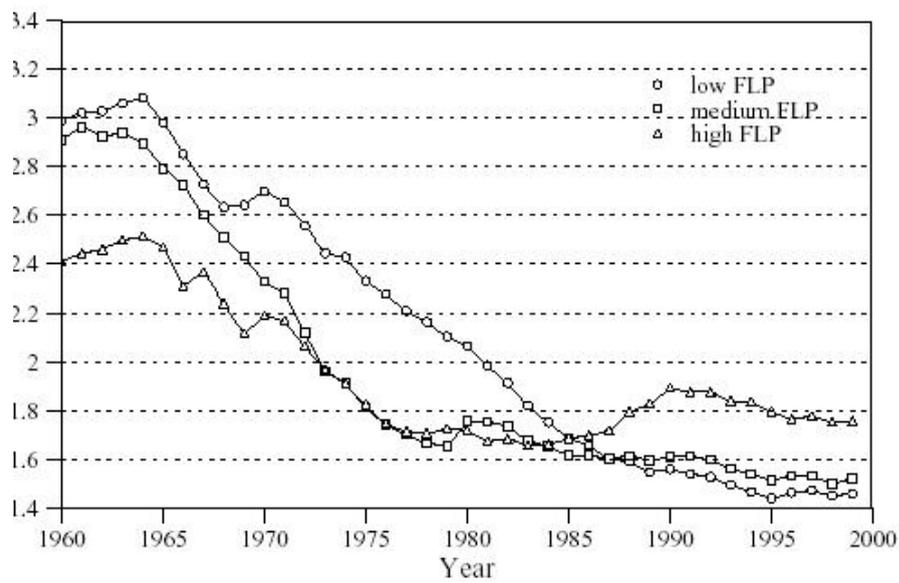
Figure 3: Average level of female labor participation rates in low, medium and high participation countries



Source: Engelhardt and Prskawetz (2002)

Figure 1.4

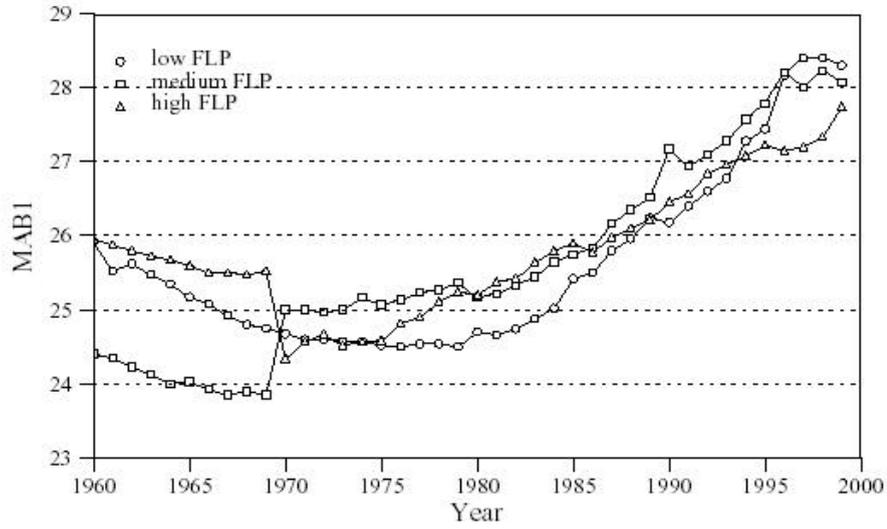
Average total fertility rates in low, medium and high participation



Source Engelhardt *et* Prskawetz (2002)

Figure 1.5

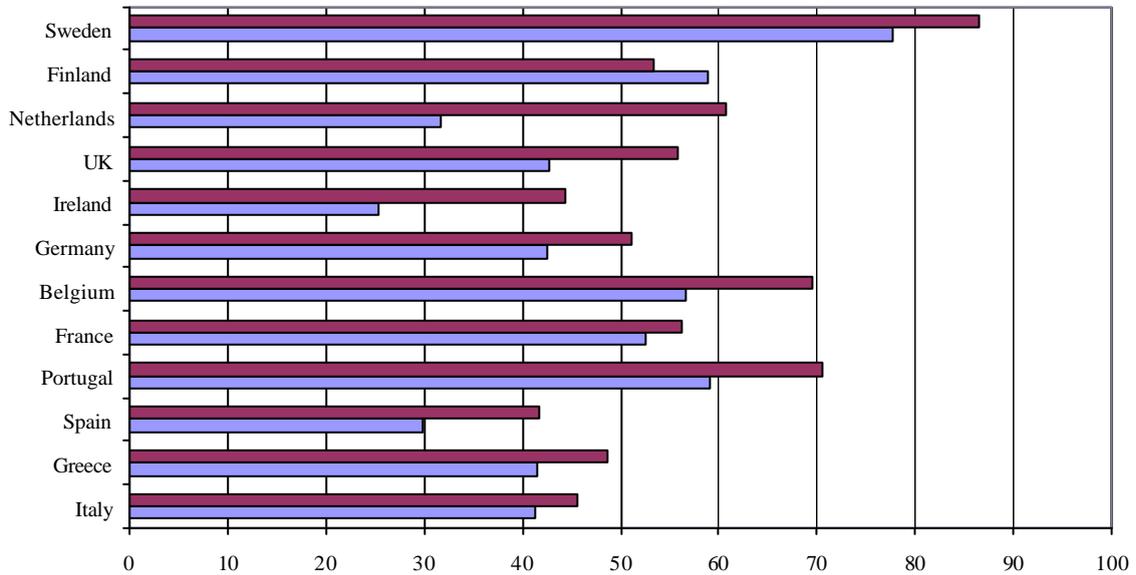
Figure 15: Mean age at first birth in low, medium and high participation countries



Source Engelhardt *et* Prskawetz (2002)

Figure 1.6

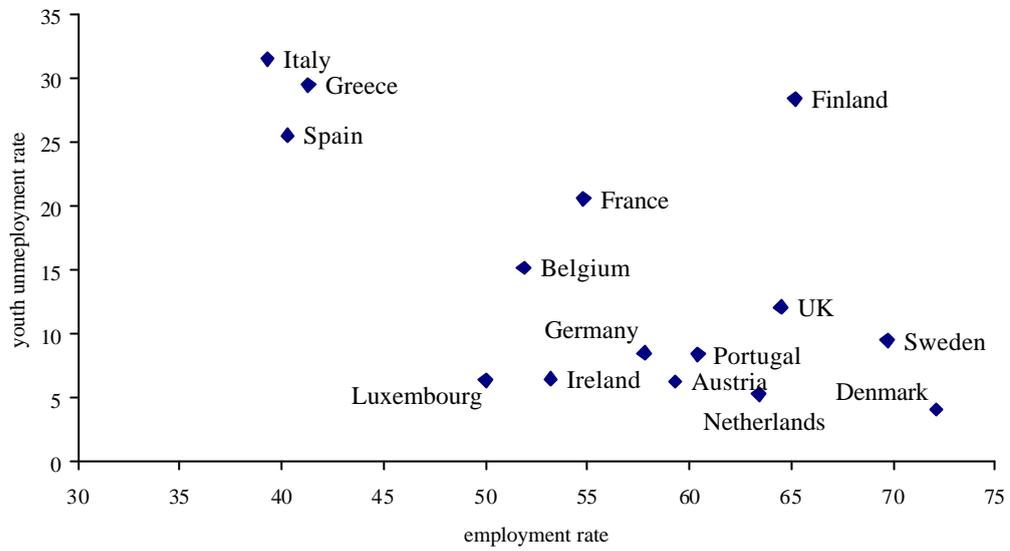
Employment rates of mothers with child(ren) under 6



Source: OECD, *Employment Outlook*, 2001

Figure 1.7

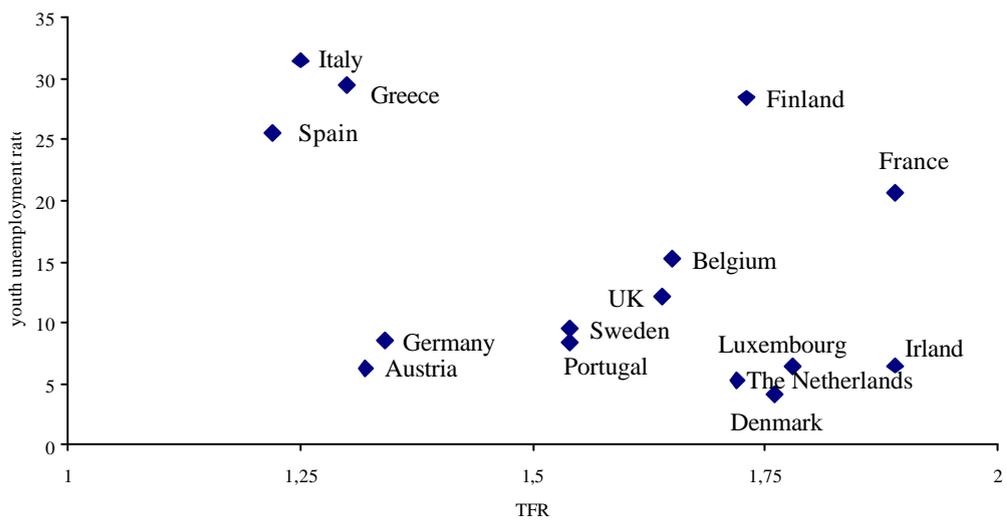
Youth unemployment and women's employment rates (2000)



Source: Eurostat (2001), *Statistics in Focus*

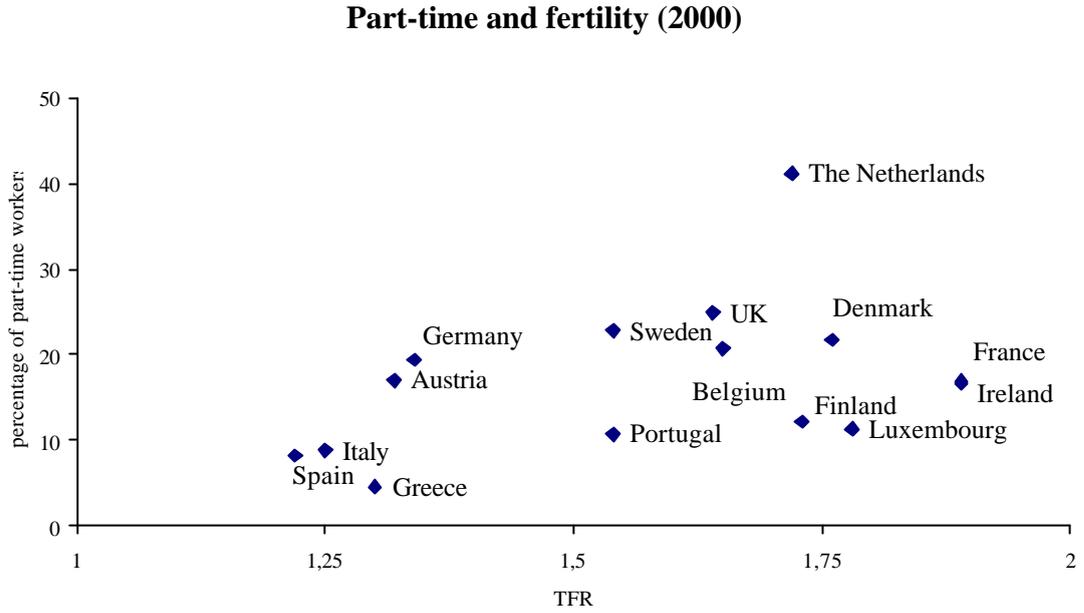
Figure 1.8

Youth unemployment and fertility (2000)



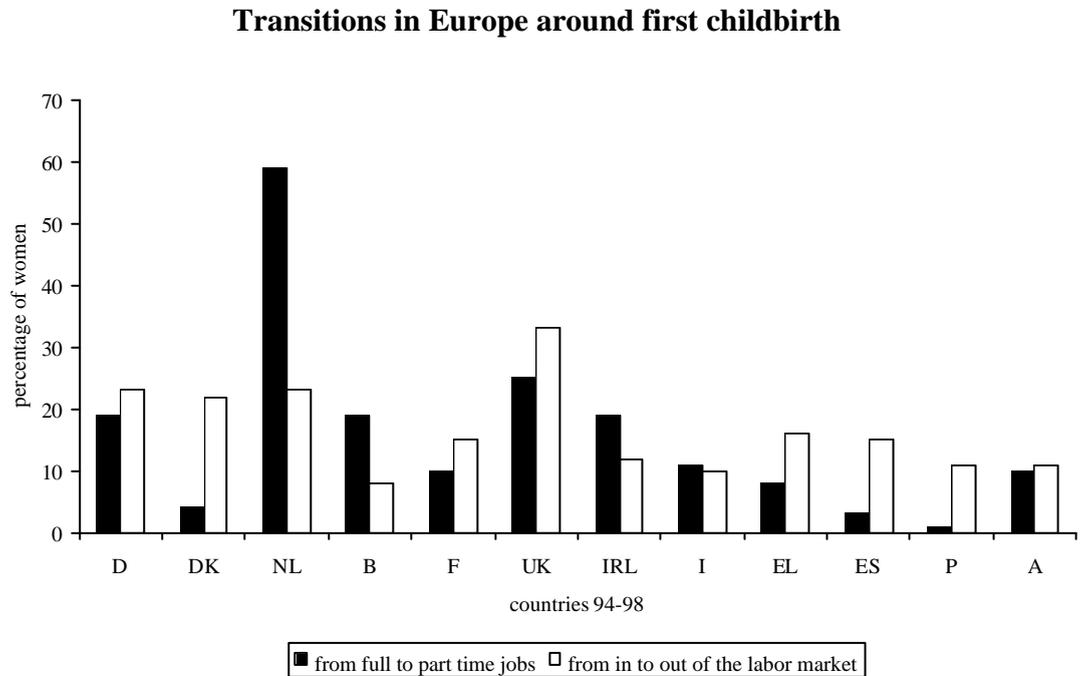
Source: Eurostat (2001), *Statistics in Focus*

Figure 1.9



Source: Eurostat (2001), *Statistics in Focus*

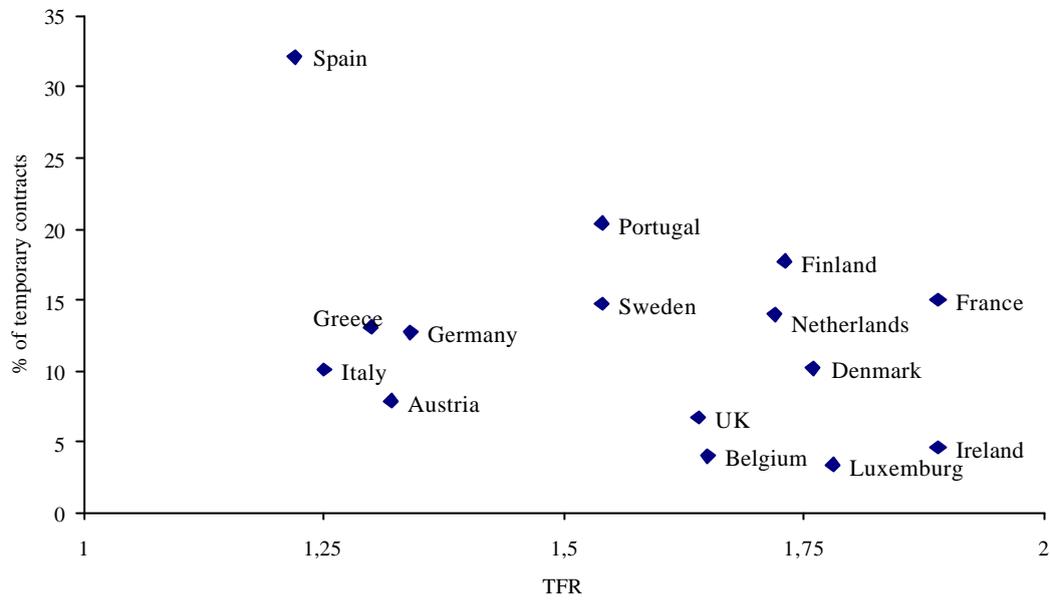
Figure 1.10



Source: Del Boca, Pasqua, Pronzato 2003.

Figure 1.11

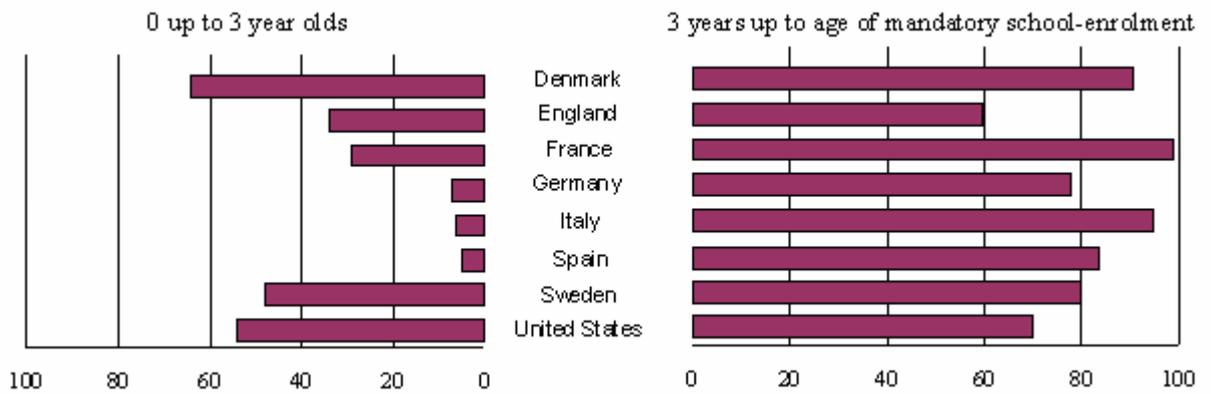
Temporary contracts and fertility in the European countries (2000)



Source: Eurostat (2001), *Statistics in Focus*

Figure 1.12

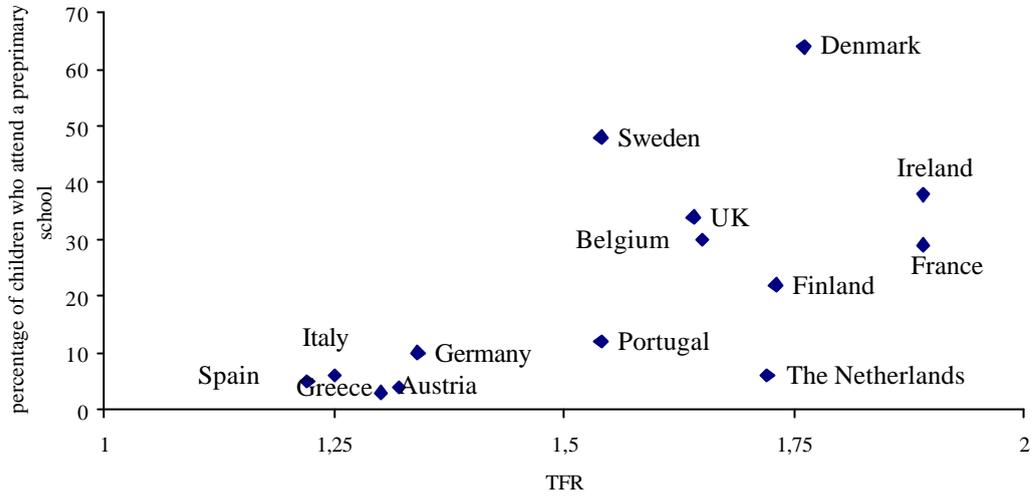
Proportion of children using childcare



Source: OECD (2001)

Figure 1.13

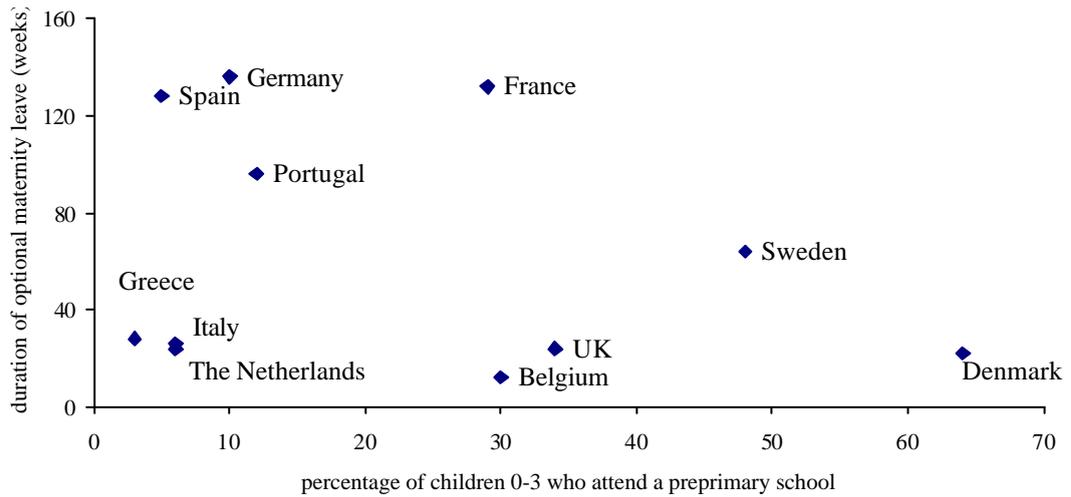
Childcare availability and fertility



Source: Eurostat (2001), *Statistics in Focus*

Figure 1.14

Childcare availability and optional maternity leave (2000)



Source: Eurostat (2001), *Statistics in Focus*

Table 1.1 Logit estimates ECHP 1999

	<i>Participation</i>	<i>Fertility</i>
Age	-.042**	-.122**
Education	.634**	.301**
Wife non labour income	-.075**	.100*
Husband total income	-.006**	.003
Children in the HH	-.596*	.018
Length of optional maternity leave	-.001*	.002
Part-time (regional)	.008*	.080*
Childcare (regional)	.056*	.007
Unemployment (regional)	-.025*	-.080*

**=significant at 95%; *=significant at 90%

Table 1.2 Employment equation

	<i>Fixed effects</i>	<i>Random effects</i>
Age	.040**	.035**
Schooling	-	1.251**
Wife non labour income	-.081**	-.140**
Husband total income	-.003	-.009**
Children in the HH	-.454**	-.868**
Unemployment (regional)	-.086**	-.076**
Part time (regional)	.095**	.001
Childcare (regional)	.020	.011
The Netherlands	-	-1.750**
France	-	-.498**
Italy	-	-1.154**
Spain	-	-1.119**
1995	-	-.023
1996	-	-.043*
1997	-	-.041
1998	-	-.042
1999	-	-.055
Constant	-	1.612**
Hausman specification test	168.55	
Obs.	12,466	49,299

**=significant at 95%; *=significant at 90%

Table 1.3 Fertility equation

	<i>Fixed effects</i>	<i>Random effects</i>
Age	.002	-.135**
Schooling		.470**
Wife non labour income	.124**	.116**
Husband total income	-.000	.007**
Children in the HH	-1.920**	-.025
Unemployment (regional)	-.011	.018**
Part time (regional)	.005	-.010
Childcare (regional)	.037**	.009
The Netherlands	-	.275
France	-	.121
Italy	-	.246
Spain	-	-.071
1995	-	-.042
1996	-	-.054
1997	-	-.004
1998	-	.117**
1999	-	.158**
Constant	-	2.471**
Hausman specification test	950.57	
Obs.	16,764	49,585

**=significant at 95%; *=significant at 90%

2. Parental employment and children's welfare

2.1. Why do we care about the relationship between parental employment and children's wellbeing?

The last thirty years have witnessed a formidable growth in the body of social science research that investigates the effects of children on parents' behaviour, and especially on mothers' labour market behaviour. The previous session has explicitly dealt with some of the processes that explain such relationships. Comparatively much less attention has been devoted to the opposite type of effects, those of parental behaviour on children's outcomes. This session aims at reviewing some of the most recent empirical research in this field. In particular, we will be concerned with the effect that parental employment has on different aspects of children's wellbeing.

The level of most nations' investments in children is massive. Government expenditures on elementary, secondary and post-secondary schooling are enormous. Among industrialised countries at the end of the 1990s, the proportion of GDP per capita devoted to primary and secondary schooling was on average about 3.6 percent (Hanushek, 2002). In the United States, the expenditures per primary-school student were approximately \$6,000 a year, while the expenditures per secondary-school student were nearly \$7,800 a year. These figures were respectively \$5,700 and \$6,500 in Italy, \$5,800 and \$7,300 in Norway, and \$3,300 and \$5,200 in the United Kingdom. In addition, huge resources are spent by governments and parents for housing, feeding, clothing, and transporting children, for providing nonparental care services, and for assuring provision of health care services. Another cost (and perhaps one of the most important and difficult to assess) refers to the implicit value of the time that parents spend monitoring, teaching, and caring for their children.

Related to these parental time investments are the employment patterns that parents go through during their offspring's childhood. Mothers' paid work in particular could be seen as a key factor in the process that shapes children's welfare. This is because, on one hand, it represents a direct reduction of the time that mothers spend with their children and on the other hand, by increasing family income, it potentially expands the resources that can be devoted to children. To document the

importance of this trade-off at an aggregate level, Figure 1 shows the correlation between average child poverty rates (one measure of *ill-being*) and average female employment rates for a total of 22 countries.¹ Panel (a) suggests that this correlation is negative, but small and not significantly different from zero. But if the four Scandinavian countries (Norway, Sweden, Finland, and Denmark), Italy, Spain and Ireland are excluded from the analysis (panel (b)), the correlation becomes strongly positive: a increase in the female employment rate by 1 percent leads to a 0.46 percent *increase* in child poverty. Conversely, if the United States, the United Kingdom, Australia and Canada are excluded from the original pool of countries (panel (c)), a one-percent increase in the female employment rate is associated to a 0.3 percent *reduction* in the child poverty rate.

The relationship between child poverty and women's labour market involvement is thus not clear-cut. The negative relationship in Figure 2.1(c) is the result of high-child-poverty/low-female-employment in "familistic" welfare regimes (such as Spain, Italy and Ireland), and low-child-poverty/high-female-employment in the "social-democratic" welfare regimes that are prevalent in the Scandinavian countries. Conversely, the positive relationship in Figure 1(b) is driven by the strong positive correlation between child poverty and women's employment in countries with a "liberal" welfare regime (the United States, the United Kingdom, Australia and Canada). We should emphasise that most of the microeconomic evidence on the relationship between children's wellbeing and mothers' employment available to date comes from such countries, especially the US and the UK. Therefore, part of the results discussed in this session cannot be easily generalised to all countries, exactly because they are characterised by different institutions (labour markets, schools, government interventions, and so on) and different behaviours of parents (and, possibly, children's responses).

For our purposes parental employment will be taken to refer to mothers' and fathers' decisions on their labour supply, while children's *well-being* will cover a wide range of outcomes, including cognitive development in early childhood,

¹ The child poverty rates in this figure are taken from Bradbury and Jäntti (2001). Children are poor if their household has an equivalent disposable income less than 50 percent of the overall median household income. The female employment rates are taken from different sources (see the note to Figure 1) and refer to the group of women aged 15-64. Using published information on mothers' (rather than women's) employment rates would have been preferable for our purposes, but would have also restricted the analysis to a smaller number of countries.

educational attainment, and other outcomes that are measured when children are young adults (e.g., early childbearing and unemployment experiences).

Within the social sciences, the idea that the family plays an important role in shaping children's socio-economic outcomes is hardly a new one. As noted by Parsons (1975), Knight (1935) identified the family as the principal social institution that fosters income inequality through behaviour that forges intergenerational links between parents' and children's wealth. Likewise, empirical analyses of the determinants of socio-economic success date as far back as the 1920s (e.g., Ginsberg, 1929). The main objective of these early contributions was to study the relationship between father's occupation and son's occupation, using cross-tabulations known as occupational mobility tables that were meant to summarise the relationship of interest. Indeed, a huge body of sociological research on intergenerational social mobility has stemmed from this approach, continually refining its econometric estimation and deepening its theoretical underpinnings.² These, however, are topics that we shall not be covering here, principally because there are already a number of studies that have reviewed the pertinent strands of literature, their main findings and the questions they have left open (e.g., Solon, 1999; Bjorklund and Jantti, 2000).

Haveman and Wolfe (1995) provide us with a comprehensive survey of the empirical research on the links between investments in children and children's attainments.³ Their review included studies which analysed the relationship of a wide range of family and neighbourhood characteristics with several measures of children's outcomes (e.g., high school graduation, years of schooling, out-of-wedlock fertility and earnings). Although our study is more limited than theirs in that it focuses only on parents' employment decisions as a form of parental investment in children, it is intended to expand the coverage offered by Haveman and Wolfe (1995) in two important directions. First, we discuss a number of more recent contributions, some of which are based on data from countries other than the United States and others use statistical techniques that were not employed by most of the studies surveyed in

² See, among others, Glass (1963) for Britain, and Blau and Duncan (1967) for the United States. For more recent contributions, reference should be made to the studies of Hauser and Featherman (1977), Featherman and Hauser (1978), Halsey, Heath and Ridge (1980), Goldthorpe (1980), Erikson and Goldthorpe (1992), and Breen and Goldthorpe (2001).

³ The seminal work by Becker, and in particular that summarised in Becker (1981/1991), has provided (and continues to provide) researchers with the framework within which such links have been analysed across the social sciences.

Haveman and Wolfe. This will allow us to check whether the results are or not broadly consistent across countries as well as across statistical methods. Second, we pay special attention to the specific mechanisms that lie behind the estimated relationship between parental employment patterns during childhood and children's wellbeing. This focus will, in turn, allow us to gain a more solid interpretation of the estimates that are currently available in the literature and, consequently, we will have a better understanding of the links of interest.

Section 2.2 outlines the theoretical perspective and the statistical framework within which we discuss the impact of parental work on children's welfare. These are important because they tell us how to measure such impact and how to interpret the results that try to identify it. Section 2.3 contains a review of some of the most recent empirical studies that have analysed this impact. The children's outcomes that we emphasise include cognitive development, educational attainment, health and other outcomes (such as unemployment and early childbearing). Any attempt to measure the relationship between parental employment patterns and children's wellbeing must take account of the ways other parental factors and decisions during childhood might influence children's long-term development. For that reason, we also ought to consider how far outcomes are affected by processes such as children's experience of life in a single-parent family (or step-family), childhood family income, and parental education. Section 2.4 contains a review of findings relating to such processes. Section 2.5 summarises the main results of this research, puts them into the context of the female labour supply literature, and offers some alternative ideas for future analyses in this area.

2.2. How do we measure the impact of parental employment on children's wellbeing? And what does it mean?

In explaining the determinants of children's wellbeing, economists and other social researchers have emphasised the role of parental (or family) circumstances and decisions, while often downplaying the role of other factors and institutions (see Haveman and Wolfe, 1995). These include the society at large (or the state) that influences the opportunities faced by parents and children, and the choices that

children themselves make.⁴ In what follows we will be liable of the same omissions. In addition, we will only focus on some of the salient aspects of the framework that analysts may want to use in investigating the relationship between parental employment and children's welfare, to the neglect of other (potentially even more important) decisions and investments, such as child care, school quality and peer interactions.

A convenient way of organising a coherent interpretation of the determinants of children's wellbeing and guiding analysts in their choice of variables has been provided by a production function framework (Todd and Wolpin, 2003). Within this framework, researchers draw an analogy between the knowledge acquisition process of individuals and the production process of firms. Indeed, most of the existing studies of the determinants of children's outcomes are based on the assumption that the inputs into the child outcome production process are subject to choices made by parents (and possibly other institutions, such as schools).

It has long been emphasised that a problem in estimating a (household, health, or education) production function is given by the fact that nonexperimental data on all relevant inputs and on child endowments are never readily available (Rosenzweig and Schultz, 1983). Only a limited number of contributions, however, have implemented a production function approach that accounts for such a problem. For instance, many have included family income as a proxy for missing data on family inputs, with the presumption that richer families purchase more of such (unobserved or unobservable) inputs (e.g., Baum, 2003; Brooks-Gunn, Han, and Waldfogel, 2002; McCulloch and Joshi, 2002; Ruhm, 2000).⁵ However, when income is held constant, an increase in the expenditures on a particular input (say, tutors' time) must imply a reduction in expenditures on other goods (e.g., educational trips, museum visits and theatres). To the extent that these other goods also influence children's attainments, the effect of an increase in tutors' time expenditures on attainment would be confounded with the

⁴ For example, at present the majority of studies that analyse the determinants of children's development and school attainments include either characteristics of the family of origin or characteristics of the schools that children attend that presumably shape children's opportunities, but not both. Exceptions are Goldhaber and Brewer (1997), Ludwig (1999), and Dustmann, Rajah and van Soest (2003). See also the discussion in Todd and Wolpin (2003).

⁵ Rosenzweig and Schultz (1983) define this type of models as "hybrid equations" to emphasise that the estimates obtained by such equations are generally biased estimates of the true technical relationship embodied in the production function. In general, the sign and magnitude of the bias depend on the properties of the utility functions which families and children are posited to optimise. We also

decreased purchases on these other inputs. The inclusion of this and other proxies, which are meant to compensate for missing data on parents' (or schools') inputs, makes the interpretation of the "effect" of observed inputs quite difficult and can lead to biased estimates for the inputs of interest here, namely parental employment patterns (Todd and Wolpin, 2003).

Another problem is the *interpretation* of the parental employment parameter. If educational toys or books available to the child can be unarguably seen as inputs in an education production function, parents' employment patterns (regardless of how or when in the child's life cycle these patterns are measured) are more problematic. This is because parents' employment patterns *per se* may have little to do with the actual inputs that parents use to invest in their children's cognitive development and human capital. We illustrate this point with a simple example. Consider the case of two families, *a* and *b*, with exactly the same number of members (i.e., one mother, one father and one child).⁶ Assume that the child's human capital *H* is produced through a bundle of educational goods and services that parents can only buy on the market, such as toys, books, schools and tutors (which we denote by *X*), and through time devoted to the child (which we denote by *t*). That is:

$$(1) \quad H = \mathbf{j}(X, t, \mathbf{m}),$$

where *m* represents family- and child-specific endowments ('ability') that are known to the child and parents but not controlled by them, for example, genetic traits or environmental factors.⁷ Suppose that families *a* and *b* are identical in all observable aspects (age structure, education, type of school attended, resources, and so on), except that the mother in *a* is in a full-time job, while the mother in *b* does not work. The time in employment is denoted by *h*, and thus, $h_a > 0$ while $h_b = 0$. Total maternal time (*T*) can then be allocated to child care, *t*, market time, *h*, and leisure, *l*, so that $T_i = t_i + h_i + l_i$, for $i = a, b$. If both families allocate the same level of expenditures on

will adopt this terminology in describing the estimation procedures of the studies reported in our review (see Section 3 below).

⁶ To make things easier in this example, we also consider only a static environment, assuming away any dynamic labour supply consideration.

⁷ The hybrid equations that we mentioned before and that are widely used take instead a different form, which could be summarised by:

$$(2) \quad H = \psi(X_s, h, Y, w, \mathbf{m}),$$

where X_s is a subset of the *X* inputs that are used to produce *H*, *Y* is money income of the household, and *w* denotes mother's earnings. That is, a subset of inputs, X_s , mother's employment, *h*, and the *determinants* of other inputs (through the reduced-form demand function for *H*) are regressed against *H*. Given X_s , the "effect" of *h* in (2) is interpreted as if it were the relevant production function relation.

educational goods and services to the child (i.e., $X_a=X_b$) — allocation that is driven by parental preferences, which have been assumed to be identical — we would expect the mother in family a to spend less time with her child compared to the mother in the other family ($t_a+l_a < t_b+l_b$). This is because the mother in a works. However, the time devoted to the market is only one component of the total time available to mothers, and it is not even the input required in the human capital production of children. Indeed, the mother in family a could devote as much (and, possibly, more) time to stimulate her child’s human capital than the mother in family b , that is, $t_a \geq t_b$ and $l_a \leq l_b - (t_a - t_b)$.

If we relax the assumption of equal resources across these two families, and allow family a to be better off than family b (as a result of the mother’s working in a), the picture becomes even more complicated. The nonworking mother in family b will have more time available to spend with her child but will have fewer financial resources to buy the educational goods and services needed for the child’s human capital production. Conversely, the working mother in family a could compensate the possibly lower time spent with her child with a greater amount of educational goods and services. So, we may have to compare situations in which we observe both $t_b+l_b > t_a+l_a$ and $X_b < X_a$. But once again, the mother in family a may still devote more time to her child than the mother in b (through a reduction in her leisure time) and magnify the positive income effect she enjoys through her paid work.

A further complication arises when we allow for preference heterogeneity or for unobserved family-specific endowments in the child’s human capital production function (Rosenzweig and Schultz, 1983; Currie and Cole, 1993; Rosenzweig and Wolpin 1995; Ermisch and Francesconi, 2002).⁸ In such cases, the interpretation of maternal (and paternal) employment in terms of a human-capital-production-function parameter is complicated by the limited availability of “events” that vary randomly between children with working mother and children with nonworking mothers.⁹

⁸ So far the term m in (1) has not played a role. But variations in m will generally affect (parental) decisions and, consequently, have important econometric implications. In particular, the notion that the human capital production inputs, X , are behavioural variables means that even if only information on the technology of human capital production were desired, having measures of all important behavioural inputs, X , and H in (1) would not be adequate to describe the human capital technology.

⁹ There are only a few studies that address endowment (or preference) heterogeneity in the estimation of the technology that produces children’s human capital. In the child health literature (where parental employment is however not of primary importance), early examples are Rosenzweig and Schultz (1983) and Grossman and Joyce (1990), which employ instrumental variables techniques. Other more recent examples are Rozenweig and Wolpin (1995), Strauss (1990), and Currie and Cole (1993), which

Unfortunately, time (and space) differences in mother's wages or other income components, which could be seen as potential instruments for mother's employment, will also be determinants of children's wellbeing. The application of a production-function approach is, therefore, at one end, problematic, and at the other end, invalid when the specification of the estimating models includes variables that are hard to justify in a human capital production function.

A second approach to modelling the relationship between childhood parental employment and subsequent child outcomes is given by conditional demand functions (Pollak, 1971). Ermisch and Francesconi (2002) show that, with separable parental utility,¹⁰ H can be expressed simply as a function of the endowments of all children in the household, denoted by the vector m , and the total resources devoted to human capital investment in children, R . That is,

$$(3) \quad H = \theta(R, m).$$

Clearly, mother's (and father's) employment will be subsumed in R . A problem with this approach is that, for econometric purposes, R is generally not independent of m . While Y (family income) and w (mother's wage rate) would appear to be natural instruments for R , these are problematic. In fact as Browning and Meghir (1991) point out, these variables are presumably endogenous. In particular, both Y and w are likely to reflect parents' endowments, which are correlated with their children's endowments m (for example, through genetic and cultural transmissions).

Finally, another approach to analysing the response of children's welfare to parental employment is based on the formulation and estimation of a dynamic structural model in which parents (and possibly children) make decisions on labour market and location behaviours, and child care and education choices. In this environment, child outcomes are the result of a production process in which inputs are optimally chosen by parents who maximise household utilities under a number of constraints. Mother's and father's employment patterns enter the problem through time and budget constraints, and their effect on child's welfare reflects the role played by the optimising choices of parents (and eventually other decision makers). This

employ data on siblings, half-siblings and cousins to examine how maternal choices and characteristics affect child health outcomes. The study by Ermisch and Francesconi (2002) employs sibling differences to analyse the effect of parental employment on educational outcomes.

¹⁰ This implies that parents have preferences characterised by a utility function which has future child outcomes of children separable from parents' "standard of living" (or consumption).

approach is still in its infancy, but its potentials are far-reaching. Input endogeneity is directly modelled, and the estimation techniques allow for heterogeneity in tastes and constraints. Two recent examples are Liu, Mroz and Van der Klaauw (2002) and Bernal (2002). The first investigates the interactions between parental inputs and school inputs as determinants of child cognitive development, with mothers making decisions not only on their labour market participation but also on household location (which, in turn, affects the child quality production function both directly and through the school environment). The second focuses on the effects of labour supply and child care decisions of women immediately following birth on children's cognitive development. They will be both reviewed in the next section.

2.3. A selected review of results

Efforts to identify the effect of parental employment on children's outcomes span the social sciences. Although the four conceptual frameworks outlined in the previous section (production function, conditional demand function, structural approach, and hybrid equations) have been primarily used by economists, many of the contributions by non-economists can be interpreted within one of such approaches. While we discuss studies from other disciplines (psychology, sociology and demography in particular), we will mainly focus on studies by economists. Most of the literature refers to the effect of maternal employment, and only very few studies have looked at the effect of father's employment patterns. We emphasise, where possible, the findings on this latter effect. Similarly, we try to distinguish the effect of mothers' full time work from that of mothers' part-time work.

We begin our review of recent contributions by discussing the relationship between parental employment patterns and early childhood outcomes (e.g., cognitive development). As reflected by the size of Table 1 in relation to the size of the subsequent tables, this is by and large the broadest literature. This may be because a greater number of researchers from different disciplines have engaged in analysing such outcomes. It may also be because many of the relevant outcomes can be observed fairly shortly after birth, thus imposing fewer data requirements than those imposed by outcomes that can be observed only a long period of time, such as earnings. Our review continues by presenting recent studies on education attainment,

and a set of other miscellaneous outcomes (e.g., unemployment and early childbearing).

In Tables 2.1-2.3, we provide information for each study on the data source, sample selection and timing issues, that is, when (or at what age of the child) the outcomes and the other conditioning variables have been measured. We then list the outcomes and define the estimation method.¹¹ Finally, the last two columns contain one the set of conditioning variables used in estimation, and the other the main results concerning the parental employment variables.

2.3.1 Cognitive development and early childhood outcomes

Studies largely informed by child developmental psychology have paid particular attention to socioemotional adjustment (primarily behaviour problems) and cognitive outcomes (primarily receptive verbal ability and early achievement scores). Research on such outcomes has focused on large samples of children, with the bulk of the studies analysing data from the National Longitudinal Survey of Youth (NLSY) for the United States. A smaller number of studies for Britain have used data from the 1958 National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS). Greater data availability (due, for example, to the fact that many outcomes here can be measured just a few years after birth, and therefore even short household panels can be used) and a long-standing psychological literature have led to a vast production of research in this area. Space limitations have urged us to include in our discussion only a small group of studies.¹² Table 1 lists such studies.

The lack of consensus that characterised the early cognitive development literature (see footnote 11) seems to have been replaced by a somewhat more

¹¹ For studies that adopt a production-function approach without accounting for child- and family-specific endowments (the term m in equation (1)), we label their estimation method as “reduced-form” to emphasise that they do not account for any particular source of unobserved heterogeneity.

¹² Some of the early psychological literature has been reviewed elsewhere (e.g., Harvey, 1999; Ruhm, 2000). Interestingly, there is a remarkable lack of consensus over which maternal employment affects children’s achievement (see, among others, Parcel and Menaghan, 1994, and Harvey, 1999). Even when studies are based on the same data source, estimates range from maternal employment being detrimental (Baydar and Brooks-Gunn, 1991; Desai, Chase-Lansdale, and Michael, 1989; Belsky and Eggebeen, 1991) to its having virtually no effect (Blau and Grossberg, 1992) to its being beneficial (Vandell and Ramanan, 1992). As noted by Todd and Wolpin (2003), given that these studies use standard regression models, differences in results are likely to be due to sample selection criteria and to the choice of conditioning variables.

consistent set of results. First, maternal employment in the first year of life has a different effect on later emotional and cognitive outcomes than does maternal employment begun thereafter. In particular, there is some systematic evidence that employment begun in the first year of life may have *negative* effects for some groups of children (especially White children in the United States), whereas employment after the first year of the child's life appears to have more positive effects (Baum, 2003; Han, Waldfogel and Brooks-Gunn, 2001; Waldfogel, Han and Brooks-Gunn, 2002).¹³ Second, a non-negligible number of studies finds that the negative effects on cognitive outcomes can be associated with maternal work over the first five years of the child's life and not just with work during the first year only (e.g., Joshi and Verropoulou, 2000; Bernal, 2002; Liu, Mroz and Van der Klaauw, 2002). This suggests that policy concern about the impact of early mother's work on later child outcomes (such as family leave legislation or job flexibility) should perhaps extend to all families with children of pre-school age.

Third, some of the negative effects of either first-year or first-five-years maternal employment seem to persist over time for some groups of children. Thus, early maternal employment is likely to have long-term consequences on children's wellbeing. This holds in studies that include an extensive set of controls, even though they are not easily interpretable because they estimate hybrid equations (Han, Waldfogel and Brooks-Gunn, 2001). It holds also in studies that estimate either reduced-form production functions (Joshi and Verropoulou, 2000) or structural models (Liu, Mroz and Van der Klaauw, 2002). Children's scores in cognitive and developmental tests (measured in childhood or early adolescence) are considered to be strong predictors of later outcomes by many psychologists (e.g., Harris, 1983). In interpreting the evidence on the relationship between family resources (e.g., income) and educational outcomes — such as college enrolment, delay of college entry, final graduation and length of time to complete school (which can be taken as “later” outcomes) — economists increasingly emphasise the importance of long-run factors associated with greater family resources or higher family income (e.g., Carneiro and

¹³ This is in line with the earlier evidence presented in Belsky and Eggebeen (1991) and Baydar and Brooks-Gunn (1991). Han, Waldfogel and Brooks-Gunn (2001) argue that these results are not found in Harvey's work (1999) because Harvey did not follow the same children over time and because she pooled Whites, African American and Hispanics together. Notice, however, that also Horwood and Fergusson (1999) find no significant effects of mother's labour supply on academic achievement for a large cohort of children born in New Zealand in 1977.

Heckman, 2002). Parental employment in general (and maternal employment in particular) could be one of such factors to the extent that it is systematically associated with greater family resources. In other words, childhood parental employment can provide one of the links between long-term factors that promote cognitive and noncognitive ability and child outcomes measured later in life. We will come back to this in the next subsection.

Fourth, among the studies listed in Table 1, only two of them report estimates of the relationship between children's early outcomes and father's employment (i.e., Harvey, 1999; Ruhm, 2000). In both studies, father's work choices do not appear to have any significant effect.

2.3.2 Educational attainment

Table 2.2 summarises the primary micro-data analyses of the effect of parental employment on children's educational achievements. Most of these studies are implicitly based on a production function framework, in which parental employment is seen as one of the inputs into the production of children's human capital. As explained in Section 2, this interpretation is problematic and is made even more difficult for models that include family income in the set of explanatory variables (Hill and Duncan, 1987; Haveman, Wolfe and Spaulding, 1991; Kiernan, 1996).

For a sample of youths from the Panel Study of Income Dynamics (PSID), the early hybrid-equation study by Hill and Duncan (1987) shows that, while years of schooling and maternal hours of work are not correlated for girls, boys' schooling decreases with mother's employment. Later research, which again uses American data from the same source (Haveman, Wolfe and Spaulding, 1991) or from the Current Population Survey (Graham, Beller and Hernandez, 1994) found actually the opposite results, that is, mother's employment is positively (and significantly) related to her children's educational achievements. From this evidence is clearly difficult to draw any general conclusion. Indeed all these estimates are from hybrid equation regressions.¹⁴

¹⁴ In a more recent study Duncan, Teachman and Yeung (1997) use sibling models and find that the number of years in which mothers worked more than 1000 annual hours when their children were aged 0-5 reduce child's schooling at age 20, while the number of years in which mothers worked more than

But by focusing our attention on the results of studies that use data from other countries, we may find evidence that more consistently points either to positive or negative or no effects. This is in part true for Britain.¹⁵ Using data from the 1958 NCDS, Kiernan (1996) finds that daughters of working lone mothers are less likely to have attained no qualifications (at age 33) than their contemporaries in the reference group of intact families with a working mother. In this study, therefore, it is both the structure of the family of origin (living with a lone mother) and the employment patterns of mothers that are consequential to daughters' schooling (see also subsection 4.4). However, for children of working mothers in general (and, particularly, those in intact families) and for boys, Kiernan does not report any significantly greater or smaller educational achievement with respect to children of nonworking mothers. Using data from the more recent 1970 BCS, the study by Joshi and Verropoulou (2000) shows instead that there is a negative and significant association between mothers' early employment and their offspring's later achievements, although this is not very large (see also subsection 4.3).¹⁶

These results are confirmed by the more recent study by Ermisch and Francesconi (2002), which, unlike the earlier studies, uses a conditional demand function approach and applies sibling difference (or mother fixed-effects) models (see Section 2). Ermisch and Francesconi show that it is possible to give a *causal* interpretation to the associations between parental employment when the child was very young (say he/she was a pre-schooler) and educational attainments of children as young adults: such associations are in fact parameters of a conditional demand function.¹⁷ They find a negative and significant effect on the child's educational

1000 annual hours when their children were aged 6-10 or 11-15 increase child's schooling. None of these effects is, however, statistically significant at conventional levels (and, again, they are from hybrid-equation regressions).

¹⁵ The study by Horwood and Fergusson (1999) for New Zealand, however, points towards evidence of no effects. In particular, it reports no significant impact of mother's work on tests measuring scholastic ability at age 13 as well as on school certificate attainments that are a prerequisite to university entry (and are measured at age 16).

¹⁶ In the East London study by O'Brien and Jones (1999), teenagers, interviewed a or two before sitting their GCSE exams, show the best chances of getting high results in these exams if they come from families where the mother has a part-time job (and not a full-time job). According to the children also, the time they spend with their mother was greatest where she works part-time, and about the same in the sole or dual full-time earner couples.

¹⁷ As discussed in Section 2, estimation is complicated by heterogeneity in preferences, productivity in human capital investment and children's endowments relevant to educational attainment, and by the fact that parents may compensate or reinforce children's endowments. While a sibling difference estimation strategy may eliminate heterogeneity that is common across siblings, it is generally not sufficient to identify the "effect" of parents' employment. That rests on the assumption that the idiosyncratic endowments of children are not revealed to parents until after the youngest child is

attainment as a young adult of the number of months his/her mother was in full-time employment when the child was aged 0-5. The effect of mother's months in part-time employment during these ages is also negative but smaller and less well determined. In the context of a conditional demand function framework, these results suggest that a higher full family income increases the educational attainment of children, and given full family income, a higher mother's wage reduces her children's educational attainment.

Only two studies report estimates for father's employment (O'Brien and Jones, 1999; and Ermisch and Francesconi, 2002). In both, the effect on children's educational attainment is small and not statistically significant. But while the first study finds some positive impact, the second shows a reduction in the probability of achieving higher educational qualifications as father's years of paid work increase.

From the body of evidence shown in Table 2.2 and discussed here, it is hard to come up with a clear-cut view of the effect of parental work on children's educational outcomes. Some of the studies, particularly early studies that use American data, find a negative and significant effect of mother's work, others find either no significant effect or a positive impact. But more recent research, which has focused on the experience of other countries (and particularly Britain), seems to point to a more consistent finding, namely that longer mothers' employment is typically associated with reduced educational achievements of children. This finding emerges quite clearly within the conditional demand function framework developed in Ermisch and Francesconi (2002), but it holds, at least partially, also in other reduced-form analyses of large scale British data.

2.3.3 Other outcomes

A huge number of other outcomes could be affected by childhood parental patterns. The range (and extent within each) of such outcomes would vary depending on the interest of the survey. Here we are primarily concerned with providing an

sufficiently old (e.g., he/she has completed his/her pre-school years). Estimation based on comparisons between families must also make this assumption, but additional stronger assumptions are required (e.g., no correlation in endowments across generations or no effect of parents' endowments on their employment).

overview of only a few recent studies but focusing on several outcomes. These are reported in Table 2.3. For a review of results from earlier (exclusively American) studies see Haveman and Wolfe (1995).

All the studies listed in Table 3 are (implicitly) based on a production function approach with the exception of the study by Ermisch and Francesconi (2001c), which, again, draws its interpretation (and specifications) from a conditional demand function framework. In addition, except for Ermisch and Francesconi (2001c) and Joshi and Verropoulou (2000), the other three studies estimate hybrid equations, which, as argued in Section 2.2, have less desirable properties since the hybrid effect of parental work on children's outcomes is likely to be a biased estimate of the true technical relationship embodied in the (health or wellbeing) production functions.

In the case of teenage (or early) childbearing, Kiernan (1996) finds that mother's employment (or nonemployment) does not affect their daughters' chances of having a teen birth. But women from lone-mother families where the mother is not in employment have odds of becoming teenage mothers that are significantly higher than the reference group of women from intact families with a working mother. Conversely, both Joshi and Verropoulou (2000) and Wolfe, Wilson and Haveman (2001) find that mothers' employment increases the risk of an early birth for their daughters, but in both studies the effect is not significant. Interestingly, mothers' employment is measured over the first five years of the child's life in the former study, and over the ages 6-15 in the latter. By considering instead the employment patterns of parents over the entire child's childhood, Ermisch and Francesconi (2001c) obtain different results. They find that mothers' full-time employment when their daughters were aged 6-10 significantly increases their daughters' risk of an early birth. But this is virtually offset by the lower risk of childbearing if mothers are in full-time paid work when their daughters are adolescents (aged 11-15). On the other hand, mothers' part-time employment in the first 10 years of the child's life does not affect the chances of an early birth, and actually it decreases them if mothers are part-timers when their daughters are aged 11-15.

The results on economic inactivity (or unemployment) are overall more coherent. Kiernan (1996) finds that British women and men are more likely to have experienced unemployment since they left school (and up to age 33) if their mothers were nonworking in their childhood (at age 16). This is in line with the results reported in Ermisch and Francesconi (2001c), whereby mother's full-time

employment when the child was aged 11-15 is correlated to a lower risk of economic inactivity measured when the child is 16 or older. Similarly, mother's part-time work when the child was aged 6-10 has a negative impact of the risk of inactivity later in life. The estimates in Joshi and Verropoulou (2000) are in the same direction (for both men and women) but are not statistically significant.

Table 3 shows several other outcomes that cannot be fully assessed as they are measured in one study at most and, thus, comparisons cannot be drawn. They are however interesting to illustrate. For Britain, Kiernan (1996) correlates mother's nonemployment (when the child was aged 16) with a number of socioeconomic outcomes observed when the child was aged 33, namely whether the young adult child is on income support (the most important government programme for nonworking low-income individuals), whether the child is an owner occupier, and whether he/she is in the lowest quartile of the earnings or the net household income distributions. She finds that mother's nonworking is typically associated with worse outcomes for both men and women: that is, higher chances of being on income support and being at the bottom of the income or earnings distributions, and lower chances of owning the house they occupy. Also for Britain, but on a different outcome, Ermisch and Francesconi (2001c) observe that young adults' chances of psychological distress are lowered by mother's part-time employment when the child was aged 0-5 or by mother's full-time employment when the child was aged 6-10 (but they seem to be heightened if the mother works full-time when her child was aged 11-15). Finally, for a large sample of 15 year-old Americans, Antecol and Bedard (2002) find that mothers' work is positively related to the probability that young people are more likely to drink regularly, but is uncorrelated to smoking, using marijuana and being convicted of a crime before age 15.

There is comparatively less evidence on the effects of father's employment on all these outcomes, as it has also been the case for the outcomes discussed in the previous two subsections. Ermisch and Francesconi (2001c) find that a greater employment activity of fathers when their children were aged 0-5 leads generally to better outcomes, in terms of lower probabilities of unemployment and psychological distress. None of the other studies in Table 3 contain results on father's work.

2.3.4 Summary of results and discussion

Our review so far has yielded a number of interesting findings. Clearly, because of sample selection criteria (or data constraints), choice of conditioning variables and model specifications, they vary quite considerably and they are not always consistent. Here we summarise the most salient and robust results, although in this operation we will not do justice to their subtleties and to the specific nuances of the studies that produced them. We will however emphasise some of the plausible interpretations of these results, and their interplay with potential public policy initiatives. We will also discuss the credibility of such interpretations in terms of the adequacy of the econometric modelling and in terms of their clear links to theory. To help this discussion, we report some of the key estimates in Table 2.4. The table lists only a few studies across (cognitive and educational) outcomes and econometric methods, and reports statistically significant quantitative effects of mother's work on each of the outcomes.¹⁸

2.3.4.1. Does mother's employment affect children's well being? And are there different effects between part-time work and full-time work?

Table 2.4 shows that there are some adverse effects of mother's employment on cognitive outcomes. It appears that the most detrimental impact is produced by maternal employment in the first year of the child's life. Waldfogel, Han and Brooks-Gunn (2002) find that maternal employment in the first year decreases the receptive vocabulary of 3-4 year-olds by more than 3 points, the reading/verbal achievements of 5-8 year-olds by about 2 points, and the mathematics achievements of 5-8 year-olds by other 2-3 points. These findings are for non-Hispanic white children, who instead seem to gain some positive effects from second- and third-year maternal employment. Other ethnic groups (and especially African American children) seem to experience no negative effect of first-year employment, but Hispanic children tend to show 3.5-

¹⁸ Other outcomes are not reported due to their large response heterogeneity and due to space limitations.

points lower scores (in reading and math) if they mothers work when they are aged two or three.

Some of these findings also emerge in the study by Ruhm (2000). For example, in this study a 20-hour per week increase in mother's employment throughout the first year of the child's life is correlated with a 0.7 standard deviation decline in verbal ability at ages 3 and 4. For this outcome, there is also a partially offsetting benefit for working during the next two years. But unlike the previous study, Ruhm's estimates show some negative effects of second- and third-year mother's employment: the math and reading performances of 5-6 year-olds are reduced by 0.06 and 0.08 standard deviations, respectively. Both studies, however, point to full-time work as having larger costs (or lower benefits). Waldfogel and colleagues find that children of mothers who work for more than 20 hours a week in their first year experience an additional reduction in test scores from about 10 percent (in the case of PIAT-R, ages 7-8) to 50 percent (in the case of PIAT-M, ages 5-6). Ruhm finds that the contrast between part-time and full-time work is sharper in the second and third year, where part-time work is correlated (albeit insignificantly) with increases in all cognitive but switching from part-time to full-time employment reduced the reading and math scores by 0.09 and 0.11 standard deviations, respectively.

One important difference between these two studies is in terms of the magnitude of the effects. Waldfogel, Han and Brooks-Gunn argue that their effects are fairly small, although they express concern for the fact that such effects persist to ages 7 and 8. Ruhm, on the other hand, claims that the effects he finds are substantial and equivalent to those predicted by a 2- or 3-year decrease in maternal education. However, what matters is perhaps not just the effects on these early outcomes *per se*, but also the consequences on later outcomes. Using data from the British NCDS on test scores measured at age 7 and outcomes at age 33, Currie and Thomas (2001) provide evidence that early reading and math test performance is strongly related to future educational outcomes, which, in turn, strongly affect later labour market outcomes (e.g., employment and wages). These results therefore indicate that such effects may indeed translate into persistent economic costs.

Another way of assessing the longer-term consequences of mother's employment is given by the other two studies reported in Table 4. They both refer to the British experience. Joshi and Verropoulou (2000) find that women attain 10

percent less of a grade if their mothers had been employed before they were 5, and men 12 percent of a grade less. In other words, young people are on average about one tenth less likely to advance one rung of the qualification ladder, such as the step between GCSE and A level, or A level and a non-degree higher education. These estimates are unarguably small. But one problem with these results is that the difference between, say, no qualification and some qualification is the same as that between higher vocational degrees and university degrees, while instead there may be heterogeneous responses at different points of the educational distribution. Another problem is that they do not control for any type of unobserved factor, either at the individual or at the family level. In any case, these results are confirmed in the second British study. For children with mothers working full-time an additional year when they were aged 0-5, Ermisch and Francesconi (2002) find that the probability of achieving A level or more is reduced by 7 percentage points (from 64 to 57 percent).¹⁹ An additional year of part-time employment (again when the child was aged 0-5) also leads to a reduction in the probability of educational achievement by about 4 percentage points, but this effect is significant only at the 10 percent level. To the extent that education and later socioeconomic success are correlated, these effects have important long-lasting consequences.

2.3.4.2. Do we know why?

Having established the set of results just outlined is only part of the job. Perhaps, the most important part is to uncover the mechanisms that explain them. What are the forces behind such results? To address this question, we will draw our arguments from the discussion in Section 2.2. There we have emphasised the problems of estimating and interpreting cognitive and human capital production functions. The estimation is complicated by the endogeneity of several potential inputs as well as the unobservability of others. The interpretation of the parental employment parameters is instead problematic because parents' employment may not be seen as a specific input that parents use to invest in their children's human capital. Most of the studies reviewed so far are, however, based (implicitly or explicitly) on a

¹⁹ For non-British readers, "A(Advanced)-level" corresponds to education beyond high school, but

production function framework, and many of such studies estimate hybrid equations. So these results and their interpretations warrant some caution.

Most of the developmental studies in Table 2.1 (including those reported in Table 4) are based on the observation that early years, and especially the first year, of a child's life are crucial to development, because it is in this period that an infant develops a sophisticated cognitive conception of objects and people (Harris, 1983).²⁰ Given this observation, there are two main explanations why maternal (but not paternal) employment is potentially detrimental to children (see also Baum, 2003). First, such employment decreases the quantity of time that mothers spend with their children. Spending less time in maternal care is detrimental if nonmaternal childcare arrangements are of inferior quality. The few studies that have been able to control for childcare quality when examining mother's work effects find that it does play an important role (NICHD Early Child Care Research Network, 1997) as does the type of care (Baydar and Brooks-Gunn, 1991; Han, Waldfogel and Brooks-Gunn, 2001). In addition, high-quality care, if available to low-income children, seems to make a greater difference in their development than it does to children in high-income families (Desai, Chase-Lansdale and Michael, 1989; Vandell and Ramanan, 1992). Second, marketplace work may decrease the quality of maternal time spent with children if working mothers are subject to emotional distress, overload or exhaustion, and consequently may be more contentious in the home. In sum, one set of explanations of why we observe the negative effect of mother's employment on children's outcomes operates through the lower-quality of nonmaternal childcare, which to some extent is correlated to lower family income, and the higher level of distress experienced by working mothers. But both such aspects are difficult to measure in any large-scale representative survey. More importantly, there is a substantial degree of disagreement on their genuine impact. For example, Parcel and Menaghan (1994) argue that nonworking mothers are more likely to be depressed and to withdraw from their children. Similarly, Moore and Driscoll (1997) observe that maternal employment may have positive side effects on mothers by actually reducing their depression.

short of a university degree.

²⁰ Attachment theory, which posits that children whose mothers are absent during critical periods of early child development are less likely to form secure attachments with their mothers (Bowlby, 1969), has been very influential for many psychology and sociology contributions in this area.

An alternative explanation is offered in the study by Ermisch and Francesconi (2002). This study offers a direct interpretation of the effect of mother's (or father's) employment as a parameter of a conditional demand function. Very simply, they show that higher mother's employment produces a positive *income* effect and a negative *substitution* effect on time allocated to each child. The sign of the effects is, therefore, ambiguous a priori, and must be established empirically. In societies where (or times when) the income effect dominates — because, say, higher incomes can afford greater leisure and maternal childcare time — then we expect to observe a positive association between mother's work and child outcomes. In societies where the substitution effect is greater instead, we expect a negative association. So, in the case of a negative effect (which is the result obtained by Ermisch and Francesconi, and shown in Table 4), the conditional demand framework provides a straightforward interpretation. A higher full family income when maternal employment was measured (in the case of the Ermisch-Francesconi study this is when the child was aged 0-5) increases children's human capital, because this increases parents' time allocated to human capital investment in children. Thus, the effect of poverty on child's education partly works through lower parents' time inputs. For a given full family income, higher mother's earnings in the first five years of life of her child reduce the child's educational achievements, because more time is allocated to the labour market.

Ermisch and Francesconi (2001c and 2002) point out that the relationship between any child outcome and mother's time depends, in general, on all preference and production parameters. For econometric purposes, between-family variation in mother's employment time is not likely to be exogenous because of variation in preferences, production functions and parental endowments across families. So, any estimation based on comparisons *between* families (which has been used in most of the studies listed in Tables 2.1-2.3) will lead to biased estimates of the effect of mothers' (or fathers') employment on their children's outcomes. This suggests that comparisons *within* households (i.e., sibling-difference or mother fixed-effects estimators) may instead be used. But even these are generally not sufficient to identify the "effect" of parents' employment. It can be shown, in fact, that these differences between siblings in mother's employment are not likely to be independent of the differences in child endowments when parents know their children's endowments and respond to them. The identification of the effect must rest on assumptions, most of

which are related to the process that reveals information about child endowments to the parents.

These difficulties are likely to open up new directions of research. Especially promising seems to be that offered by structural models. Early examples in this area are the studies by Bernal (2002) and Liu, Mroz and Van der Klaauw (2002). Although computationally demanding, such models have the advantage of a clear interpretation (as they are based on theory), and allow for powerful predictions of parents' and children's behaviour given any change in the state of the world through a change in their constraints, even changes along dimensions that are invariant in the data. Other research directions are possible and should be encouraged. In particular, new and relevant evidence is likely to emerge from studies that stress the availability of more detailed parental data over the child's childhood as well as from studies that emphasise the use of experimental data (e.g., Grogger, Karoly and Klerman, 2002).

2.3.4.3. Is there any effect of father's employment?

There are comparatively fewer studies that measure the impact of father's work on children's outcomes (Harvey, 1999; O'Brien and Jones, 1999; Ruhm, 2000; Ermisch and Francesconi, 2002). Generalisations are therefore hard to infer. In any case, regardless of estimating method and model specification, all these studies show very small point estimates, with generally large standard errors around them. One way of reading this result is that paternal employment is inconsequential to children's wellbeing. But this may be an oversimplification. An alternative view starts with noticing that most fathers (at least in the studies reviewed here) were employed full-time for most of the time during their children's childhood.²¹ The lack of any substantial variation in working patterns across families and over time makes it very unlikely that any difference in children's outcomes would be associated with father's employment in a way that is statistically significant. Moreover, there is the usual problem with a production function interpretation, if what is included in the analysis is father's time spent in employment without any control for time and resources directly devoted to his children. Fathers who spent an identical amount of time in paid

work might have devoted substantially different amounts of time (and resources) to their children and to activities that could be relevant to their development and future achievements. Clearly more research on this issue is needed. Quite critical to this research will be the availability of better data on fathers' and stepfathers' time, especially on the time spent with their children.

2.4. The importance of other family processes and decisions during childhood

Childhood parental employment is just one of the many factors that have a potential bearing on children's cognitive development and success in later years. It may even be a relatively minor one, when viewed as part of a constellation of other factors, which cannot be "controlled" by parents (such as their genetic endowments), and other parental "characteristics and decisions", including parents' personality and emotional stability, parenting practices and the quality of home care that children receive from their parents. In this context, social scientists have concentrated on a subset of parental characteristics and decisions during the childhood of their children or beyond. In many instances, they have done so without considering childhood patterns of parental work. Here we only focus on a few of these characteristics (regardless of whether the studies have conditioned on parental employment), and only over the child's childhood.²²

2.4.1 Family income²³

In Section 2.2 we have pointed out the problem of using family income together with parental employment in estimating child outcomes. To reiterate on the

²¹ This is not surprising given that the majority of studies refers to the experiences in the United States and Britain from the 1960s onward.

²² In particular, we will not consider inter-vivos financial and non-financial transfers and bequests. Some of these intergenerational and interhousehold links are analysed in Laitner (1997).

²³ Throughout this subsection (and later) we use the terms family income, parental income, and household income interchangeably to mean the total income of the household where the child (for who the outcomes are measured) lives.

same point, it is hard to interpret the “effect” of mother’s (or father’s) labour supply on any child outcome keeping everything else (including family income) constant. This is the interpretation we would give to the results obtained from a regression of child outcomes on child and parental characteristics. It is however difficult to imagine a situation in which the mother changes her labour market behaviour but family income remains unchanged. In any case, there is a substantial literature (particularly in economics) that evaluates the effects of income on several child outcomes (e.g., Hill and Duncan, 1987, and references therein). This research has generally predated the literature concerned with the effects of parental employment and, in many instances, has not controlled for observed differences in parental employment. Quite convincingly, this research establishes that parental income is positively associated with a wide range of children’s outcomes, such cognitive test scores, socioemotional wellbeing, mental health, behavioural problems, teenage childbearing, educational outcomes and economic status in early adulthood (see Mayer, 2002, for a review of this literature). There are however two important issues of contention. The first is on the magnitude of the impact. The second is on its interpretation.

The first issue is itself related to: (a) the income variable used in the analysis (e.g., current income versus permanent income), and (b) when, in the child’s life, income is measured (i.e., during early childhood, middle childhood, or adolescence). In their comprehensive survey, Duncan and Brooks-Gunn (1997a) find that having higher income during early and middle childhood has large positive effects on a number of measures of ability and achievement observed when children are aged between 2 and 8 and also on earnings and hours worked observed when children are aged between 25 and 35.²⁴ On the other hand, Hill and O’Neill (1994), Blau (1999) and Mayer (2002), among others, for the United States and Lefebvre and Merrigan (1998) for Canada stress that most of these income effects are small in absolute terms and small relative to the effects of other factors associated with differences in child outcomes, such as ethnicity and parental education. There is however more agreement in suggesting that permanent income is more important to children’s outcomes than short-term income. In particular, studies that measure parental income averaged over 10 or more years produce estimates that are two to five times larger than estimates generated from studies that measure income in only one year (Mayer, 2002).

Furthermore, while Duncan and Brooks-Gunn (1997a) document that family economic conditions in early and middle childhood are far more important for shaping children's outcomes than they do during adolescence, other researchers such as Mayer (2002) state that the robustness of these findings has yet to be established.

The issue of interpretation is instead related to the question of whether we estimate the *causal* effect of parental income on children's outcomes. Sometimes when analysts talk about the effect of family income, they mean the effect of family income and all its correlates. Others mean the effect of income *per se*.²⁵ Reviewing the techniques that have been used to address this issue is not the scope of our study.²⁶ Mayer (2002) notes that most of these techniques rely in one way or another on changes in parental income. Examples of such changes are given by comparisons of outcomes for siblings when their parents' income differed ("sibling fixed-effects" models), or by exploiting the fact that the same individual is observed more than once ("child fixed-effects" models), or by comparing outcomes for children of sisters ("grandparent fixed-effects" models). One criticism of these various forms of fixed-effects models is that they can lead to income effect estimates that are biased downward. Indeed Blau (1999) reports very small (and even negative) child fixed-effects estimates of family income on cognitive test scores for children of mothers drawn from the National Longitudinal Survey of Youth.²⁷ Blau's grandparent fixed-effects estimates are smaller than the estimates obtained from a model with a standard set of controls (e.g., mother's education, child's age, gender and survey year) but do not differ from those obtained when a measure of mother's ability is included in the regressions.

Some of this discussion reiterates the point made earlier on the importance of long-run family effects in shaping children's outcomes. In line with this argument, Cameron and Heckman (2001) and Carneiro and Heckman (2002) find that college enrolment in the United States is strongly and positively affected by a permanent

²⁴ The effects of family income on children's behaviour and physical and mental health seem to be smaller and not statistically significant.

²⁵ This distinction is important especially for its implications in terms of public policy. Increasing the income of low-income families is relatively simple. Finding policies that change the correlates of income is likely to be more difficult.

²⁶ The interested reader could find some relevant material on this topic in Duncan and Brooks-Gunn (1997a) and in Mayer (2002).

²⁷ Blau's (1999) estimates from the child fixed-effects models are based on annual not permanent income, which partly accounts for the fact that they are quantitatively very small.

income measure of family income over the first 18 years of life of a child. Whereas family income observed in late adolescence turns out to have no additional effect on college enrolment. Consistent with the argument based on long-run family factors are the results presented in Case, Lubotsky and Paxson (2002) according to which American parents' long-run average income is positively related to their children's health. They show that this parental income-child health relationship partly reflects higher-income parents' ability to manage chronic conditions (e.g., asthma, bronchitis, hearing problems, heart conditions, epilepsy, and mental retardation), and that poorer children are not more likely to have a particular chronic condition but are simply more likely to be in poor health if they have it. While more research is needed to unravel the mechanisms behind the income-health gradient, Case, Lubotsky and Paxson (2002) rule out several possible ones. They find that health insurance does not play a crucial role in protecting health upon the arrival of a chronic condition, not is health during childhood a systematic reflection of health at birth, not can a simple genetic model explain the gradient.

2.4.2 Parental joblessness and financial difficulty

Closely related to income are other measures of family socio-economic status, such as parental joblessness and financial difficulty of the family of origin. Although Mayer (2002) argues that the effect of financial difficulties or economic strain (and presumably parental joblessness) cannot be easily interpreted in the context of the effect of family income on children's wellbeing, in any case such measures are quite informative of the household environment in which children grow up. It is probably not true that all low-income children experience financial difficulties (measured for example by whether children receive free school meals), because for example they and their families adjust to the low incomes and report no economic strain. Similarly, some families experiencing (and reporting) financial difficulties may still continue to have middle-class incomes (because, say, one of the parents becomes ill or unemployed, while the other continues to earn). Yet these alternative measures of economic status may be relevant to understand the impact of family characteristics

and decisions on their offspring's welfare as they capture facets of the life children experience that are not captured by family income. In addition they are also intimately linked to the parents' working patterns.

Gregg and Machin (1999) analyse longitudinal data from the 1958 NCDS cohort to examine models of relative success or failure in the early years of adulthood. They find that growing up in a family in financial distress matters, and it matters more than lone parenthood, for a large set of outcomes. In particular, it increases the likelihood of juvenile delinquency by age 16, and decreases the chances of staying on at school after the minimum school leaving age, achieving higher levels of education, being employed and receiving higher wages later in life. Similar conclusions are reached in McCulloch and Joshi (2002), who study a sample of young children whose mothers were part of the original NCDS. In analysing a different outcome, namely the Peabody Picture Vocabulary Test (PPVT), which is an indicator of child's cognitive functioning, they conclude that current income is not a complete yardstick for children at risk of impaired development. In particular, their indicators of more long-term deprivation (such as lack of car access and social housing) suggest that a more sustained experience of poverty is more damaging. Also Ermisch, Francesconi and Pevalin (2003) find that childhood parental joblessness plays a key part in shaping people's outcomes in their early adulthood (e.g., unemployment, smoking, and early childbearing). Their results, however, indicate that lone parenthood has generally a greater impact on people's life.

2.4.3 Parental education

A vast empirical literature in economics, sociology and developmental psychology has focused on the effect of parents' (particularly mothers') education on children's outcomes (e.g., Duncan, Brooks-Gunn and Klebanov, 1994; McLanahan and Sandefur, 1994; Haveman and Wolfe, 1995; Duncan and Brooks-Gunn, 1997b). In US and UK studies, parental education has been consistently found to be a strong predictor of children's wellbeing, from test scores and psychological adjustments at early ages through highest schooling attainment and early labour market outcomes in young adulthood (e.g., Duncan and Brooks-Gunn, 1997a; Dearden, Machin and Reed,

1997; Ermisch and Francesconi, 2001a).²⁸ This seems to be true also for a variety of countries across the world (Behrman, 1997). So a widely held wisdom is that a key return to investments in women's education is manifested in increased schooling (and, generally, greater wellbeing) of the next generation.

One recent study has questioned the validity of this wisdom. Behrman and Rosenzweig (2002) point out that the positive relationship between the schooling of mothers and the schooling of their children may be biased because it reflects both the correlation between education and inherited 'ability' and the correlation between education and assortative mating among mothers. To account for such correlations, they exploit the differences in mother's schooling using a sample of mothers who are identical twins as well as the differences in father's schooling in a sample of fathers who are identical twins. They find that increasing men's education would increase the educational level of the next generation by a small amount, net and gross of assortative mating. But, surprisingly, raising the schooling attainment of women seems to have no (or even negative) impact on children's schooling. They argue that this pattern of results is consistent with the hypothesis that women's time in the home is a critical factor in childrearing and children's human capital formation. In a previous study, the same authors and other colleagues found, however, strong evidence that increased women's schooling leads to greater educational achievements of their children in rural India (Behrman et al., 1999). These conflicting results emphasise the importance of the labour-market contexts and cultures within which such relationships are estimated, and stress the need of further research even on a topic that, until recently, seemed to be quite uncontroversial.

2.4.4 Lone parenthood

Another important determinant of child outcomes is the type of family in which children grow up, in particular, whether both parents live in the household with the child. In many countries the proportion of children growing up with both biological parents has declined dramatically over time. Bumpass, Raley and Sweet (1995) estimate that over half of all American children born in the early 1980s will

²⁸ Haveman and Wolfe (1995) outline how economists have traditionally viewed the impact of parents'

have lived apart from at least one of their parents before reaching age eighteen. Ermisch and Francesconi (2000) find that that proportion is not less than 40 percent for British children born in the 1990s. The dissolution of parents' marriages and cohabiting unions and the ensuing period of lone parenthood that this entails affect children's life chances to the extent that expenditures on children are smaller after the dissolution.

The increase of family instability and lone parenthood has stimulated considerable concern among policy makers and the public more generally. It has stimulated also a huge research interest among social analysts who have tried to measure its impact on child outcomes. Early surveys of the relevant literatures, which mainly used data from the United States, have found that growing up in a nonintact family had negative consequences for children's wellbeing across a broad range of outcomes, including educational attainment and teenage childbearing (McLanahan and Sandefur, 1994; Haveman and Wolfe, 1995; McLanahan, 1997). Not all types of nonintact families have however similar consequences, in the sense that living in some types of nonintact families is more difficult for children than living in others. Although this conclusion must be tentative, there is some evidence that growing up with a divorced or never-married mother is associated with lower educational attainment and more behavioural and psychological problems, while growing up with a widowed parent is also never associated with poorer outcomes for children (McLanahan, 1997).²⁹ Similarly, a number of studies demonstrate that remarriage is not a panacea for divorce or nonmarital childbearing (see many of the studies reported in Duncan and Brooks-Gunn, 1997b). Current research is also inconclusive on whether family structure is more important than family income (or parental work and education) in determining children's eventual success. Although family structure is related to poverty (and financial difficulties), the two are not proxies for one another. Based on evidence presented in Haveman and Wolfe (1995) and in McLanahan (1997) family structure seems to be more important than poverty in affecting

education on children's attainment within theories of family behaviour. See Becker (1981/1991).

²⁹ Analysing administrative Canadian data, Corak (2001) finds that the major consequences of parental divorce are on children's marital behaviour. But the consequences on labour market outcomes (earnings and incomes) are relatively modest and statistically insignificant. In line with these results, Lang and Zagorsky (2001) and Biblarz and Gottainer (2000) also find that parent absence due to death has less of an impact on children's outcomes than parent absence due to divorce.

behavioural and psychological problems, whereas poverty appears to be more important than family structure in determining educational attainment.

Some of these findings are confirmed by more recent research. For example, Ermisch and Francesconi (2001b) and Ermisch, Francesconi and Pevalin (2003) use a 'sibling-difference' model to analyse British household panel data. They find that young adults who experience single parenthood as children have significantly lower educational attainments. Differently from the earlier American studies, family structure seems to be as important as (and possibly even more important than) poverty in affecting this outcome. Family structure is also found to be associated with a number of other disadvantageous outcomes for young adults, including a higher risk of unemployment, a higher risk of having a child before a woman's 21st birthday, a higher chance of being a heavy smoker and a higher likelihood of experiencing psychological distress in early adulthood. Most of these unfavourable outcomes are more strongly associated with an early family disruption (in pre-school ages), which is in line with some of the results for the impact of family income and parents' employment on educational attainments (Hill, Yeung and Duncan, 2001; Ermisch and Francesconi, 2002).³⁰

Other recent studies, however, provide us with somewhat different evidence. The research by Ginther and Pollak (2000), which also uses a sibling-difference approach, finds no significant impact of experiencing single parenthood on young Americans' educational attainments. Björklund and Sundström (2002) detect no significant impact of parental separation on the final educational attainments (measured when aged 33-48) of Swedish children using a sibling-difference method with a sample of full biological siblings, who have all lived with both parents for at least part of their childhood. These results suggest that the negative association between educational attainments and parental separation apparent in between-family comparisons would mainly reflect non-random selection of families into single parenthood. Comparison with the British results and the earlier American evidence

³⁰ A number of British studies, which examine birth cohort data, confirm these basic findings. See, among others, Kiernan (1992, 1996, 1997), Ní Bhrolcháin, Chappel and Diamond (1994). and Cherlin, Kiernan and Chase-Lansdale (1995). Other studies, which use the same cohort data, find instead that growing up in a family in financial distress matters more than lone parenthood (e.g., Gregg and Machin, 1999; McCulloch and Joshi, 2002). The differences in conclusions between these two groups of studies are possibly due to differences in estimation techniques and in sample inclusion criteria and to the choice of conditioning variables.

suggests that ‘selection’ may differ among countries, and also that the institutional and policy context is likely to matter for the longer-term impact of parental break-up on children. For instance, it is probably the case that Sweden provides more support (in a broad sense) to lone-parent families than Britain and the United States do.

2.5. Conclusions

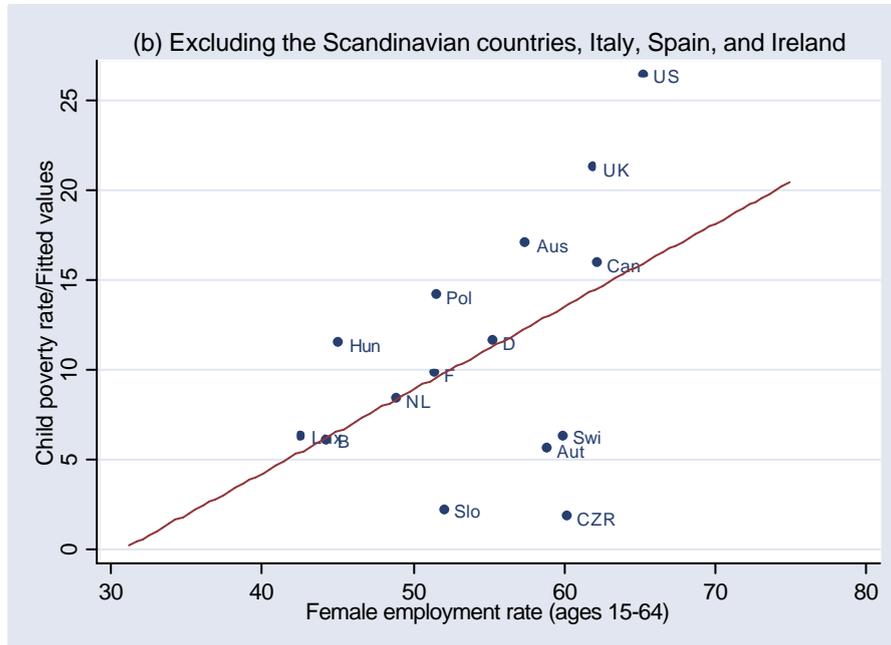
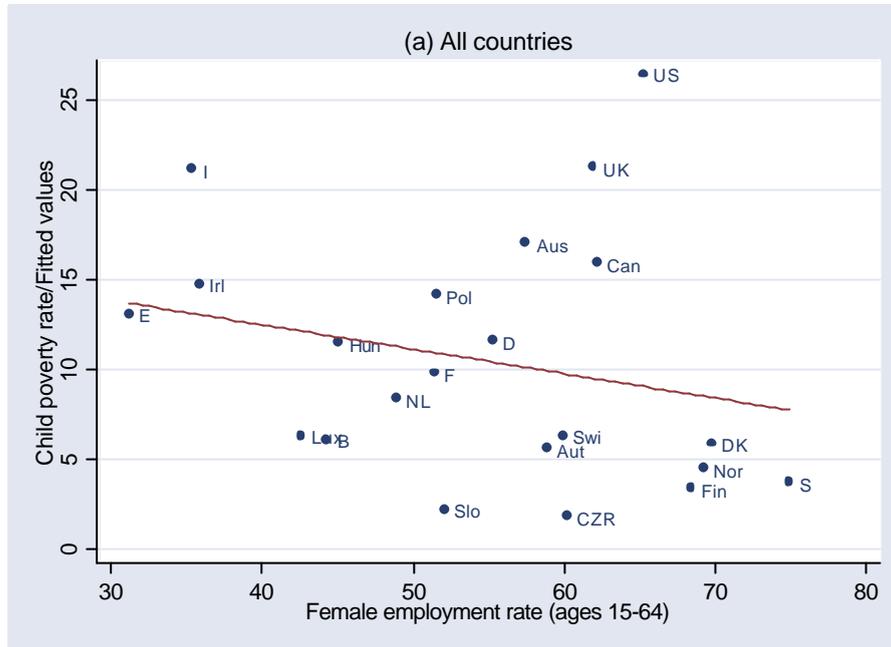
Parental employment during childhood appears to have both short-term and long-term consequences on children’s wellbeing. The short-term effects of increased early maternal employment operate through “worse” socioemotional adjustment and cognitive outcomes, which are measured when children are aged between 4 and 12. The long-term effects have their strongest manifestation on lower educational attainments for children who are in their late teens and early twenties. The effects of paternal employment seem to be far more modest. Thus, growing up in a family in which the mother chooses to work appears to have some adverse consequences on children’s welfare, suggesting a negative effect of the loss of maternal childcare time.

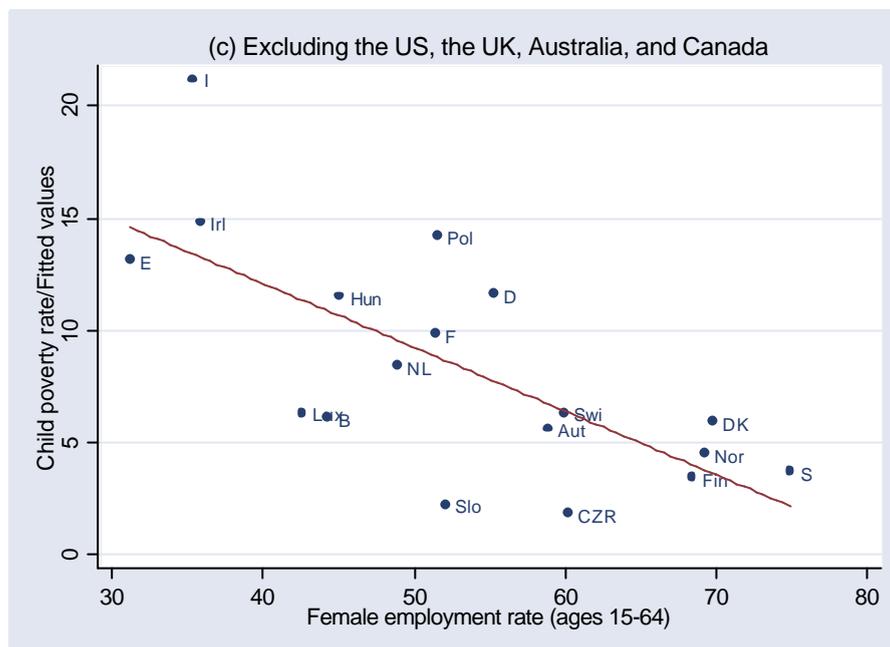
Other parental decisions, which can shape children’s outcomes, are however at work. For example, closely related to employment, we have family income. There is evidence that children in poor or low-income households tend to have lower educational and labour market attainments than children from more affluent families. Therefore, if stronger labour market involvement means higher family income, children’s life chances may be unaffected by the decision of both parents to work. They may even be enhanced if the income effect dominates. Another important process is given by the structure of the family in which children are brought up. Growing up in a single-parent or step-parent family (or experiencing a parental separation or divorce) has a negative effect on several child outcomes, measured either in early childhood or later in life. With lone parenthood and divorce becoming more widespread and with the attempt in many countries of moving low-income families from welfare to work, it is hard to see how children of single parents (who are generally poor) will get on. The higher family income that their parents’ employment is meant to provide must in fact compensate them for both the lack of parental time and the absence of one of the two biological parents. Unless single

parents are in relatively high-pay jobs, this double goal may be difficult to be achieved.

It must be said that there are several other factors that could affect children's wellbeing in even more fundamental ways than childhood parental employment patterns (or family income or family structure) do. Among them, we have for example parents' personality and emotional stability, parenting practices, the quality of home care that children receive from their parents, and the type of friends and networks with which children are involved while growing up. These tie in with the point frequently made by Heckman and colleagues (e.g., Cameron and Heckman, 2001; Carneiro and Heckman, 2002) that it is the long-term influence of family background and family income that best explains the observed relationship between child outcomes and parental behaviour. All these factors are difficult to measure and our understanding of the processes that link them to children's wellbeing is just at its initial stages.

Figure 2.1. Child poverty rates versus female employment rates – A cross-sectional/ cross-national relationship





Note: Child poverty rates (π_n) for each country n are taken from Bradbury and Jäntti (2001, Table 3.2). Children are poor if their household has an equivalent disposable income less than 50 percent of the overall median household income. Employment rates for women aged 15-64 (ρ_n) for the United States, Australia, Canada, Switzerland, and Norway are from Organisation for Economic Cooperation and Development (2002, various tables). For all the other countries they are taken from European Commission (2002, various tables). The straight line in each panel represents the linear prediction based on the linear regression: $\pi_n = a_1 + a_2\rho_n + \varepsilon_n$, where ε_n is a random shock, and a_1 and a_2 are parameters.

Legend: For each country in parentheses below we report the year(s) in which child poverty rates and female employment rates are measured. US = United States (1994); UK = United Kingdom (1995); I = Italy (1995); Aus = Australia (1994); Can = Canada (1994); Irl = Ireland (1987, 1991); Pol = Poland (1992, 1991); E = Spain (1990, 1991); D = Germany (1994); Hun = Hungary (1994, 1996); F = France (1989); NL = Netherlands (1991); Swi = Switzerland (1982, 1990); Lux = Luxembourg (1994, 1995); B = Belgium (1992); DK = Denmark (1992); Aut = Austria (1987, 1991); Nor = Norway (1995); S = Sweden (1992); Fin = Finland (1991); Slo = Slovakia (1992, 1997); CZR = Czech Republic (1992, 1997).

3. How does women's work affect family income distribution?

3.1 Women's and men's work and family income distribution.

The trend of increasing female employment and decreasing male employment has raised questions about its effects on income distribution both across and within households.

The decline in participation of husbands can have two different effects on wives' labour supply: an *added worker effect* that increases the wives' labour supply in order to maintain the same level of income and the same household living standard, and a *discouraged worker effect* which reduces the wives' labour supply since women believe that it is more difficult to find work when the husband cannot find a job.

At the macroeconomic level, the increased participation of women seems to be a response to the decline in male employment and wages. At the micro level, however, this process seems to be more complicated since the decline in male employment and wages appears to be greater in low-income families, whereas the increase in female participation is greater in high-income families (Davies *et al.* 1992). Empirical results for the U.S. and for Europe, in fact, show weak evidence in favour of the *added worker effect* (Lundberg 1985, Ercolani and Jenkins 1999, Pasqua 2001), but if family background is taken into account, wives' labour supply is more responsive to husband's unemployment where the role of women in the labour market is more well-accepted (Del Boca, Locatelli and Pasqua 2000).

In order to explain the increase in women's participation in the labour market in households where the husband is employed, it is important to take into account the fact that people do not marry randomly, but as the result of a process known as *positive assortative mating*: men with higher education and incomes tend to marry women with higher education and incomes. If a positive *assortative mating* effect exists, better educated women, with better opportunities in the labour market, get married with better educated men, who are generally employed and earn relatively high incomes. On the contrary, lower educated women marry lower educated men, who are characterised by lower incomes and higher probability of being unemployed (Jacobsen and Rayack 1996).

Recent empirical analyses have shown that in about 50-60% of dual-earner couples both spouses have the same level of education, whereas there is more discrepancy with respect to their earnings (Winkler 1998; Davies *et al.* 1998, Aaberge 2000).

As a consequence of *assortative mating* we observe a simultaneous increase in the number of families in which both spouses work and an increase in the number of households where nobody works (Gregg and Wadsworth 1996).

The conclusion is that the growth in female employment is due more to greater job opportunities (for higher-educated women), increased availability of part-time jobs and childcare services (see Del Boca and Pasqua in this volume) making it easier to reconcile family work and outside-home activities than it is to economic constraints (for less-educated women) to make up for the loss of a job or the low wage of their spouses (Junh and Murphy 1997).

If only better educated women, who are usually married to better educated men (*assortative mating*) with “good” jobs and high incomes, enter the labour market, the outcome may be increasing income inequality. However, in countries where we observe high female participation, women with middle and low levels of education also work and this may contribute to reducing inequality.

In the U.S. at the beginning of the 1970s, the probability of being a working woman decreased with the husband’s wage, while at the end of the 1980s the opposite was true. In particular, in the two decades considered, more women from the middle classes started to work and this had an equalising effect on household income distribution (Juhn and Murphy 1997).

In the U.K. female employment used to be higher in the top half of household income distribution, but between 1980 and 1990 it also increased in middle and low income families, with an equalising impact. The rates of poverty doubled during that decade, but without the increase in female employment the number of families in poverty would have been significantly higher (Harkness *et al.* 1999).

Figure 3.1 and Figure 3.2 report female employment rates and inequality for European countries in 1997 and for Italian regions in 1998. European countries and Italian regions are useful examples to understand the potential relation between women’s work and inequality since vast differences exist in the rates of female employment. In both cases, only households where both spouses are present and of an appropriate working age have been considered, since if we were also to consider other

types of households (*e.g.* single parents with or without children, households in which one of the spouses is retired) the inequality measures could be affected by different sources of inequality (*e.g.* social benefit, pensions).

Inequality is measured using the Gini coefficient of equivalent household net income³¹ for European countries and the Gini coefficient of total household net income for Italian regions. As we can see in both cases household income is distributed more equally where women work more. In Figure 3.1 only Portugal appears as an outlier, with both a high percentage of working women and high inequality, while the other countries lie quite close to the trend line.

In the Italian case, the result is similar: most Southern regions, characterised by low female employment, are also characterised by high household income inequality, while in Northern regions where women work more, inequality is lower.

The analysis of the impact of women's work on household income distribution in different European countries can be carried out using different techniques. One of the most common methodologies is the decomposition of total inequality by type of household (dual earners, male breadwinner and other types of household) and/or by sources of income (wife's earnings, husband's earnings and other sources) (Betson and van der Gaag 1984, Cancian and Reed 1998, Aslaksen *et al.* 2000, Pasqua 2002, Del Boca and Pasqua 2003). This is, however, merely a descriptive technique that does not permit consideration of the reasons why more women entered the labour market and the possible effects of those entries on men's labour supply and earnings distribution.

The impact of women's earning on household income distribution can also be analysed at different stages of a typical life-cycle: young households with no children (stage 1), households where children are present and the youngest is under 6 years of age (stage 2), and households where children are between 6 and 18 (stage 3). Women's full-time employment decreases from stage 1 to stage 2 and increases again in stage 3. On the contrary, part-time employment increases constantly during a woman's life-cycle. The effect of women's work seems to be equalising in all stages, but the effect is weakest in the second stage, when women work least (Leher 2000).

³¹ The equivalent household net income has been calculated using the OECD equivalence scale that assigns value one to the first adult in the household, 0.7 to other adults and 0.5 to children younger than 14.

In the following two sections we present differences in inequality in income distribution between dual and single earner families (section 3.2.) and between men's and women's earnings (section 2.3.), using data from the European Community Household Panel (ECHP) dataset for the year 1997 and from the Bank of Italy Survey on Household Income and Wealth (SHIW) for the years 1977 and 1998.

3.2 Dual earners and single earner households

The growth in women's participation in the labour market has increased the percentage of dual earner households, since female-breadwinner families represent a minor phenomenon in most European countries³². As a consequence it is important to understand whether income is distributed more equally within the group of dual earner or single earner households. In fact, if income distribution is more equal within the group of dual earner households, the effect of women's work on income inequality can be positive; otherwise the opposite is true.

Table 3.1 shows the inequality in the distribution of the equivalent household net income in the population sub-groups of dual earners and single earner households (population shares are also presented) in several European countries. Data are elaborated from the ECHP (European Community Household Panel) dataset and refer to the year 1997. As before, only married couples in which both spouses are present and of an appropriate working age are considered³³. Countries are ordered by increasing inequality in income distribution among all households (first column).

In every country but Finland and Greece, income is distributed more equally among dual earners than among single earner households. Ireland and Italy, in particular, show the greatest difference in inequality between the two population sub-groups. Only in Italy, Ireland and Spain, which are all high-inequality-countries, is the percentage of dual earner households lower than that of single earner ones. All these facts seem to indicate that women's work has a positive impact of on household income distribution: as more women are employed, the percentage of dual earner

³² In the ECHP dataset female breadwinner households represent on average 3% of the sample.

³³ Some countries present in the dataset have been excluded for different reasons: Luxembourg, because it is not present in the version of the dataset used, the Netherlands and Sweden because the data on participation in the labour market and on incomes refer to different years, and France because

households rises, and, since income is usually distributed more equally within dual earner than within single earner households, inequality is lower.

Analogous results have been found for Italy (Table 3.2). Here we consider two years, 1977 and 1998 from the Historical Archive of the Bank of Italy Survey on Household Income and Wealth (SHIW). Over this period the percentage of dual earner families increased on average from 24.1% to 39%, but the increase was greater in the Northern regions than in the Southern ones. On the contrary, inequality within the sub-groups of dual and single earner households did not change substantially, but the greater incidence of dual earner families on the population resulted in a more equal income distribution.

Therefore, Italian regional differences also seem to indicate a positive impact of women's work on inequality in household income distribution: where women work less (Southern regions) and the percentage of dual earner households is lower, income inequality is higher.

Similar results hold true for the U.S. in an analysis of the period 1968-1980: household income was distributed more equally in the sub-group of dual earner households than in the sub-group of single earner ones (Betson and van der Gaag 1984).

3.3. Inequality in women's and men's earnings distribution

The impact of husbands' and wives' work on the distribution of family income also depends on the inequality that characterises women and men's earnings distributions.

As is well known, a gender gap exists between men's and women's wages in all European countries. Comparing the distribution of labour income between male and female workers, we usually find that the distribution of women's labour income is much more unequal (see Table 3.3³⁴). Denmark is the only country in which earnings are more equally distributed among women than among men, likely due to the fact

the data report gross incomes rather than net incomes as reported for the other countries. Finland was not included in wave 5 and therefore relative data are taken from wave 4 (1997, income refers to 1996).

³⁴ Finland has been excluded since data on total household income are net while data for wives' and husbands' labour income are reported as gross amounts.

that women of all level of education have a job. However, no clear relation ever seems to emerge between the percentage of women working and inequality in women's earnings distribution. This may be due to the fact that we are considering total annual labour income, which is affected by the number of hours worked. Where many women work part-time (as in the U.K., Belgium and Germany, see Del Boca and Pasqua in this volume), a high percentage of women has low annual earnings.

Data for Italy (Table 3.4) show how both in 1977 and in 1998 the Gini coefficient for earnings does not differ substantially between women and men at the national level³⁵. However, in the South, where women work less, inequality in wives' earnings distribution is higher than inequality in men's earnings distribution, while the opposite is true for the Northern regions. In particular the Gini coefficient was relatively high for women in the Southern regions in 1977 but then more women entered the labour market, leading to a more equal household income distribution.

To better understand the effect of men's and women's earnings on inequality, the decomposition of the inequality measures by sources of income can be performed. This allows us to compute what percentage of total inequality is due to each source of income. Usually three main sources of income are considered: men's earnings, women's earnings (including also zero values) and a residual category, "other sources", that includes both household non-labour income and labour income from other family members. The percentage of total inequality "explained" by each source depends not only on the inequality that characterises the distribution of that particular source, but also on the correlation between that source and the total income and on the factor share in total income.

The results of inequality decomposition by sources of income in European countries show that in high-inequality/low-female-employment countries (mainly Southern countries) inequality in wives' earnings distribution is higher than in low-inequality/high-female-participation ones because of the presence of many zero values in women's labour income distribution. Therefore the main equalising impact of female work seems to be due more to the "employment effect" (the increase in the percentage of women working, and therefore with positive labour income), rather than to the decrease in the inequality in female earnings distribution. Despite this, the contribution of women's earnings to total inequality remains low in almost all high-

³⁵ The incidence of part-time is relatively low in Italy.

inequality/low-female-employment countries as a consequence of the relatively small proportion of household income earned by wives (Pasqua 2002). In Norway, inequality in women's earnings distribution decreased between 1973 and 1997 and therefore female labour income contributed less and less to inequality in household labour income distribution (Aaberge *et al.* 2000).

Another standard method for assessing the impact of women's work on inequality is the use of counterfactual distributions. This method consists in comparing actual inequality in income distribution with the inequality calculated on household income minus the wife's earnings (as if women had no earnings at all). This is obviously a gross approximation of the impact of women's work on income distribution because it does not take into account the fact that husband's labour supply would respond to the loss of the wife's earnings (Aaberge and Aslaksen 2003).

When the counterfactual distribution analysis is applied, it appears that women's earnings have an equalising impact on household income distribution (Cancian and Reed 1998 for the U.S., Pasqua 2002 for European countries and Del Boca and Pasqua 2003 for Italy).

3.4. Intra-household income distribution

The changes in the labour market participation of men and women have implications not only for income distribution across households, but also for the distribution of resources within the household.

The growth in women's employment rates and the decline in men's rates have important welfare effects, both through the changes in resources available to household consumption and through the changes in the balance of power within the households. Empirical evidence from a variety of countries has shown that wives' contributions to household income have increased and that the income received by the wives or by the husbands has different effects on the demand patterns, when total income is held constant.

The implications of these results are at odds with the neoclassical model which assumes that families behave as though they have a single utility function which represents their preferences. This would imply that an increase in family resources has the same effect on family welfare regardless of which family member receives it. If

family members “pool” their incomes and allocate total resources to maximize a single objective function, it would be only the total income that affects demand.

However, a large number of studies from several countries have rejected the “income pooling” hypothesis, finding that earned and unearned income received by the husband or by the wife have different effects on demand pattern and that children appear to do better when their mothers control a larger fraction of family resources.

In fact, increases in the wife’s income relative to the husband’s income are associated with greater expenditures in restaurant meals and childcare (Phipps and Burton 1992, using Canadian data) and with reduced expenditure on alcohol and tobacco. The shares of each spouse’s income also affects the amount spent on women’s personal necessities (Bourgignon *et al.* 1994, using French data). The results seem to indicate that in families where women have higher income, they may have greater control over family resource allocation: when the woman's income is higher, in fact, the family's choices more highly reflect the woman's preference ordering .

Similar results have been found by analysing the demand for leisure in Italy and in the U.S. in families at different stages of their life cycle. While income pooling is rejected for families without children or with older children, when children are very young the spouses’ decisions concerning leisure show greater interdependence (Del Boca 1997, Lundberg 1988).

In studies analysing developing countries, particular focus has been placed on family and child health. Here, income controlled by the mother has a greater positive effect on family health, on human capital (especially on child education) and on leisure (recreational activities) than does income under the control of the father (Thomas 1990, Schultz 1990). The strongest result emerges for child survival probabilities: the effect of the mother’s income is almost 20 times stronger effect than the father’s.

Resources under each spouse’s control are assumed to strengthen the individual’s bargaining power by increasing her or his opportunity cost of being married. The more attractive are the individual’s opportunities outside the family, the stronger is the individual’s influence on intra-family resource distribution, and consequently the final allocation more closely reflects her or his preference ordering. In this context, therefore, the external alternatives available to the wives and to the husbands are particularly relevant (McElroy and Horney 1982).

The effect of extra-household variables on women's spending patterns can be analysed in countries where there is a large regional variation of legal, demographic and labour market structures. In the U.S., for example, it has been found that in states characterized by a legal structure that allow more generous divorce settlements, women invest more on their human capital (Carlin 1992). In Italy, in regions characterized by a more favourable marriage market women are less likely to work, while in regions where more job opportunities are available they are more likely to work (Del Boca 1997).

The results presented show how the growth of women's participation and economic independence can have several important implications not only for income distribution and equality, but also for intra-household resource allocation and for household consumption decisions. More resources for women may in fact imply more spending for children, which to some extent is likely to compensate for the negative effect on children's well-being caused by the reduction in time dedicated to them when both parents work (Ermisch and Francesconi in this volume). Finally, the growth in women's employment also has an important impact on the future labour supply decisions of their daughters: in countries where labour market participation of women is low, empirical evidence shows that women's employment decisions are positively affected by the employment decisions of their mothers (Del Boca *et al.* 2000).

3.5 Conclusion

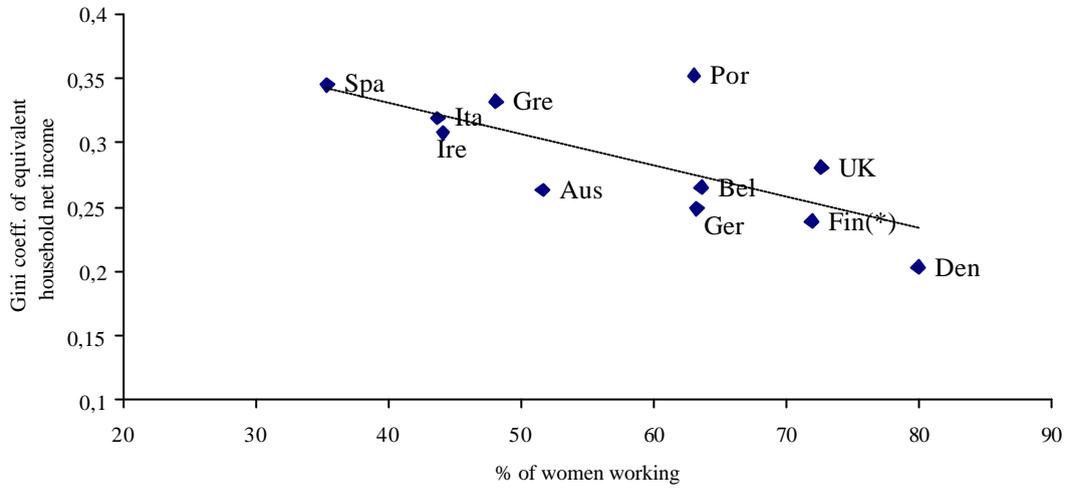
All empirical evidence presented in this session seems to indicate that women's work has an important impact on household income distribution as well as on income distribution within families. These findings suggest that public policies intended to encourage female employment may also have the positive effect of reducing inequality in household income distribution and of producing a more equal distribution of resources within the family. Moreover, increases in the share of household income earned by women may also imply a shift towards larger expenditures on children's health and education.

Affordable childcare, child benefits and part-time opportunities may have an important impact on household income distribution since they affect the labour supply

decisions of women living in low-income households who are more responsive to economic incentives than high-income women and men. The earnings of low income level partners, in fact, appear to be complements rather than substitutes, and this has important implications for income distribution (see Aaberge, Colombino and Strom in this volume). In order to consider these aspects, we need to take into account the fact that husbands' and wives' labour supply decisions are determined simultaneously. This will be the subject of the next session.

Figure 3.1

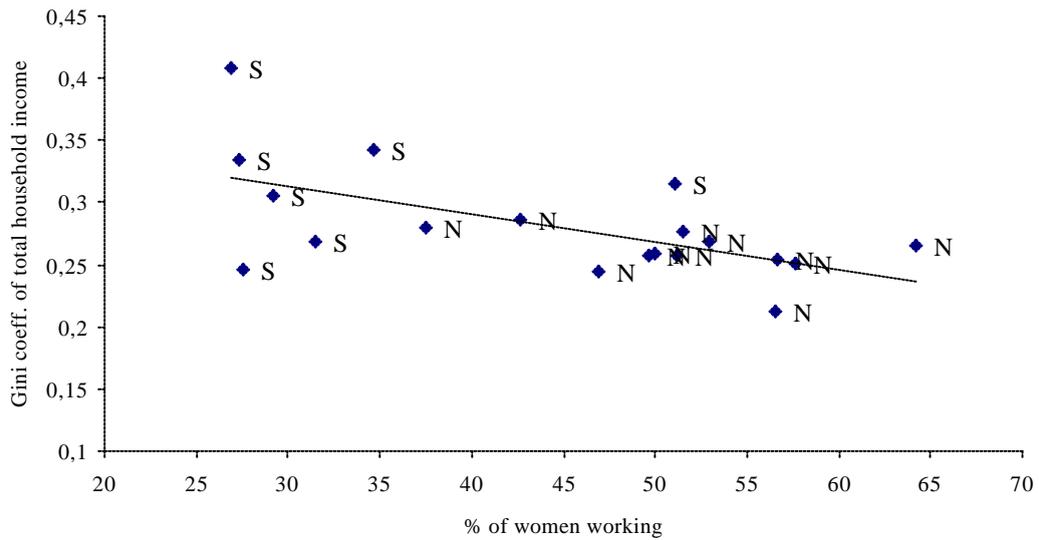
**Inequality and women's employment
in European countries (1997)**



Source: author's elaboration using ECHP dataset
(*) = referred to 1996

Figure 3.2

**Inequality and women's employment
in Italian regions (1998)**



Source: author's elaboration using SHIW dataset
N = Northern region S = Southern region

Table 3.1

**Inequality in equivalent household net income
for dual and single earner households
in European countries (ECHP, 1997)**

	<i>All households</i>	<i>Dual earner households</i>	<i>Population share</i>	<i>Single earner households</i>	<i>Population share</i>
	<i>Gini coeff.</i>	<i>Gini coeff.</i>		<i>Gini coeff.</i>	
<i>Denmark</i>	0.203	0.190	83.5	0.227	14.3
<i>Finland (*)</i>	0.239	0.232	70.3	0.211	26.4
<i>Germany</i>	0.249	0.221	64.7	0.261	31.7
<i>Austria</i>	0.263	0.242	53.6	0.254	44.9
<i>Belgium</i>	0.265	0.235	65.4	0.270	29.2
<i>United Kingdom</i>	0.281	0.258	69.3	0.299	26.0
<i>Ireland</i>	0.308	0.239	42.7	0.308	48.2
<i>Italy</i>	0.319	0.246	44.9	0.297	51.7
<i>Greece</i>	0.332	0.320	51.0	0.301	48.0
<i>Spain</i>	0.345	0.285	32.2	0.308	58.1
<i>Portugal</i>	0.352	0.326	63.3	0.331	34.7

(*) = referred to 1996

Table 3.2

**Inequality in total household net income for dual and single earner
households in Italy (SHIW, 1977 and 1998)**

	<i>All households</i>	<i>Dual earner households</i>	<i>Population share</i>	<i>Single earner households</i>	<i>Population share</i>
	<i>Gini coeff.</i>	<i>Gini coeff.</i>		<i>Gini coeff.</i>	
	<i>1977</i>				
<i>ITALY</i>	0.317	0.237	24.1	0.309	61.4
<i>Northern regions</i>	0.297	0.211	31.1	0.304	55.4
<i>Southern regions</i>	0.323	0.271	13.5	0.303	72.5
	<i>1998</i>				
<i>ITALY</i>	0.305	0.236	39.0	0.312	44.8
Northern regions			49.1		34.6
<i>Southern regions</i>	0.266	0.231		0.291	
	0.335	0.242	26.3	0.301	56.1

Table 3.3

**Inequality in women's and men's
labour income in European countries (ECHP, 1997)**

	<i>% of women working</i>	<i>Gini coeff. of women's labour income</i>	<i>Gini coeff. of men's labour income</i>
<i>Denmark</i>	79.9	0.230	0.239
<i>United Kingdom</i>	72.6	0.390	0.299
<i>Belgium</i>	63.6	0.301	0.271
<i>Germany</i>	63.2	0.383	0.267
<i>Portugal</i>	63.0	0.392	0.351
<i>Austria</i>	51.6	0.350	0.259
<i>Italy</i>	43.7	0.294	0.279
Greece	48.1	0.358	0.314
<i>Ireland</i>	44.1	0.401	0.330
<i>Spain</i>	35.4	0.406	0.338

Table 3.4

**Inequality in women's and men's
labour income in Italy (SHIW, 1977 and 1998)**

	<i>% of women working</i>	<i>Gini coeff. of women's labour income</i>	<i>Gini coeff. of men's labour income</i>
		<i>1977</i>	
<i>ITALY</i>	25.7	0.279	0.278
<i>Northern regions</i>	32.2	0.237	0.250
<i>Southern regions</i>	15.2	0.370	0.312
		<i>1998</i>	
<i>ITALY</i>	44.6	0.279	0.281
<i>Northern regions</i>	54.5	0.261	0.274
<i>Southern regions</i>	31.6	0.306	0.288

4. Taxes, transfers, labour supply and household welfare

4.1. Motivations for studying labour supply and taxation

There are important links between female labour supply and taxes. First, income taxation affects labour supply. Also, labour supply generates the basis for tax revenue. Second, married women are the most responsive component of the labour force with respect to changes in incentives. As we illustrate in this session, their behaviour turns out to be crucial in designing and evaluating tax-transfer policies.

Taxes are collected in order to finance government spending. Many trends contribute to increasing demand for government spending. The fact that individuals live longer and that cohorts born in the late 1940s and 1950s were rather large imply that in the coming decades there will be an increasing number of individuals becoming really old. In addition to the expected increase in government spending on pensions one should also expect a sharp increase in the government spending on a variety of health issues, ranging from hospital services, elderly homes and pharmaceuticals. Disability pensions and unemployment benefits are two other government programmes that have increased government spending lately in EU-countries due to high and persistent unemployment over many years. In recent years there has thus been a growing concern in Western societies regarding the increase in government spending and hence about the costs of taxation, i.e. the loss in efficiency due to disincentives and distortions on worker behaviour caused by taxation. The perceived disincentives on labour supply appeared to be the major justification for reducing marginal tax rates in many European nations during the 80s and the early 90s where the marginal tax rates faced by top earners dropped from 70-80 percent to around 40-50 percent (see e.g. Blundell, 1996).

Taxes and transfers are also implemented with the direct aim of changing incentives and distribution of resources. There is a growing interest in reforming the welfare system or the various institutions devoted to supporting incomes or consumption of disadvantaged households. While this last issue is in principle distinct, there is an obvious connection with the former: both call for a redesign of the

tax-and-benefit system with the aim of implementing a new configuration of incentives that could eventually lead to more efficiency *and* not more inequality, given total tax revenue.

In order to be able to undertake tax reforms that enhance the efficiency of the economy one needs to know how taxes and transfers affect behaviour. Here we will concentrate on labour supply. Labour supply consists of participation and hours worked in the labour market, given participation. Economists assume that individuals make their labour supply choice based on preferences that depend on the outcome of working, i.e. earnings, and leisure foregone. Preferences can be represented by a function that increases with income and leisure (utility function). Individuals are assumed to choose their labour supply so that utility is maximised, given a budget constraint and given their perceived opportunities in the labour market. The budget constraint transforms time allocated to labour into, and then - through the tax rule - gross income into net income.

Most of the individuals are married or cohabiting. To address properly the labour supply decisions in a population we therefore have to account for the interaction between spouses. Thus in most cases below the utility function relates to households with household consumption and leisure of the spouses as the main arguments in the utility function.

Most tax reforms involve a change in marginal tax rates. As a first approximation, reform effects can be discussed in terms of labour supply responses to changes in marginal tax rates. A reduction in marginal tax rates, for example, has two opposing effects on labour supply. First, lower tax rates on the margin makes it more profitable to supply more labour. This is called the substitution effect of tax rate changes. Secondly, lower tax rates make it possible to reduce labour supply and still enjoy the same level of consumption. This is called the income effect of tax rate changes. It is the net of these two effects that determine whether a cut in tax rates may increase labour supply. Substitution and income effects vary across households, depending on their taste for leisure and how interesting and challenging their jobs are, on their economic situation before taxes are changed, and whether the jobs they have, or can move to, are flexible enough to meet their preferences for working longer hours. An important part of empirical labour supply is to identify those individuals who are the most responsive to tax rate changes. If the top earners are the most responsive ones, then tax reforms should be targeted at cutting tax rates at the top.

However, many of those having high wage incomes often occupy jobs from which they derive a lot more than income. They work long hours because they may enjoy their jobs. Thus, their responses to economic incentives are weakened. Tax reforms must take this into account. If the enhancement of efficiency is the main concern of the authorities, they must target the tax cuts towards those who respond most strongly to economic incentives, not necessarily cutting tax rates for the individuals paying the highest marginal tax rates.

Economists tend to picture the trade-off between equality and efficiency as inescapable. In a widely used textbook in public economics, Stiglitz (1986, p. 481), the reader is warned that the price of redistributing income is a loss in economic efficiency. If this is true, then tax reforms that enhance the efficiency of the economy will imply more inequality. However, if high-income earners are less responsive than low-income earners to economic incentives, then a tax reform that enhance efficiency and reduce inequality may be available. To get an adequate answer on this question a micro-econometric empirical analysis is required.

4.2 Some evidence in Europe and US

There have been numerous studies of the impact of tax reforms on labour supply in the US and UK. In most of these studies male workers are found to respond very little to changes in tax rates, while the labour supply of married women and lone mothers are found to be far more responsive, Pencavel (1986), Blundell (1997), Blundell, Duncan and Meghir (1998) and Blundell and MaCurdy (1999). Labour supply can be divided into participation in the labour market, and hour supplied, given participation. Of these two, participation tends to be the most responsive to changes in economic incentives.

Most of the males in the relevant age intervals are participating in the labour market, while in many countries the labour market participation among married women has been rather low. For married women the reasons are twofold. In the first place, to take care of small children implies that less time can be devoted to working outside the home. How difficult it is to combine the raising of children and participation in labour market activities depend on the availability of child-care centres, maternity leave programmes and the wage level of child care takers in private

markets. In the US and the UK there are fewer child-care centres and the maternity leave is less generous than in the Scandinavian countries. Thus, as we should expect, the labour market participation of married women in the US and the UK has been less than in the Scandinavian countries, but higher than in countries like Italy and France. The reasons for the latter could be cultural, or the fact that the wage structure is less even in the US and the UK. The latter may imply that the wage level of a nanny is so low compared to the wage that the married women can get that she can afford to hire a nanny and participate in the labour market. It should be noted that the change in fertility in Europe would make the female labour force more like the male labour force in Europe. Thus in the coming years the whole labour force in Europe will most likely become less responsive to changes in tax rates. The second reason why the married female labour market participation is lower than among males is the role of the husband as the main breadwinner with a higher potential income than the female. The higher the income is that the married female can enjoy without working, the less the probability is that she will work. This is due to the income effect in labour supply.

Lone mothers' labour market participation is negatively affected by having small children they have to look after. Moreover, at least in Europe, including the UK, the government benefit paid to lone mothers may have a strong negative impact on labour supply. For many a reduction in government benefit if working comes at the top of a marginal tax on wage income. Thus the effective marginal tax is much higher than the ordinary marginal tax rate and the disincentive to participate in labour market activities is rather strong, Walker (1990).

Although there are strong disincentives to participate in the labour market activities among married women and lone mothers, it is of course a room for increasing labour supply in these groups provided that the improvement in the economic incentives are strong enough.

It should be noted that males and females approaching the retirement age also are facing a discrete labour market choice, namely to continue working or retiring. Hence, we should expect individuals in these age groups to be more responsive to changes in economic incentives than younger individuals.

Devanzo et al (1973) was one of the first studies that pointed out that most of the wage- and income responsiveness in labour supply was concentrated at or near zero hours of work. Later studies on the labour supply of married women both in the US and the UK gave strong support to this finding, Borjas and Heckman (1978),

Cogan (1981), Hausman and Ruud (1984), Blundell et al (1988), Ilmakunnas and Pudney (1990) and Dickens and Lundberg (1993).

The tax policy reforms in the UK in the 1980s raised the marginal tax rate for some individuals, reduced it for others, while some were not exposed to any change at all. These reforms provide the researchers with good opportunities to study the impact of tax reforms on labour supply. On repeated cross-sections set covering the period 1978-1992, with a focus on married women and with employed husbands, Blundell et al (1998) estimated the impact of these tax reforms on female labour supply. Results are reported in the form of “after-tax-wage” elasticities. In the estimations of labour supply responses effects on hours of work, given participation, as well as participation, are accounted for. The authors conclude that although the uncompensated wage elasticities are smaller than wage elasticities reported for US women, they are moderately sized and clearly significant from zero. Income elasticities are estimated to be negative, and the compensated elasticities are thus positive and high enough to lead to the following conclusion: “Our conclusion is that major tax reform should take into account behavioural effects since our compensated elasticities suggest that the welfare effects are not eligible.”

An important issue is how changes in economic incentives affect labour supply for individuals with different potential income. The higher the wage rate, the higher one would expect that the potential income would be, and/or is. One of the firsts to study this problem was Break (1957). Based on interviews with a group of lawyers and accountants in the UK he found that the majority of these affluent men were not affected in their labour supply by the strong disincentives embedded in the British tax system at the time. Across the Atlantic, Moffit and Wilhelm (1998) found similar weak effects of a tax reform in 1986 on labour supply of the American affluent men. The authors found no evidence of changes in hours of work in response to the marginal tax rate cuts in the reform of 1986. On US data Dickens and Lundberg (1993) report that labour supply responds more strongly to changes in economic incentives in households with low income than in households with high income. For the households with the highest income they report that the labour supply curve is even backward bending.

Notwithstanding the above reservations on lowering the marginal tax rates on high incomes, this choice has prevailed in the US, UK and most of Europe. Besides the (dubious) efficiency motivations, there might of course be other good reasons for

flattening the marginal rates profile, such as simplifications, reducing incentives to evading taxes, coping with mobility of highly skilled labour and fiscal competition. Taken for granted that choice, in the last decade policy and research focus has shifted towards more fine-tuning issues such as re-designing the mechanisms for low-income support, strengthening the incentives to work for the poor, reconciling work and child-bearing (e.g. Duncan and McCrae 1999; Keane 1995, Eissa and Liebman 1996, Blundel 2000). Overall, the results of these studies confirm that behavioural responses - and particularly those from married women - are strong enough to get some efficiency and/or equality return from the effort spent in redesigning incentives and institutions.

4.3. Modeling the behavioral responses to fiscal and social policies

Most of the empirical and policy analysis of labour supply and taxes up the beginning of the '90 are very close to the textbook presentation of the labour supply decision. The consumer commands a fixed wage rate on the labour market, which reflects her marginal productivity. She is free to choose any number of hours of work at that wage. She satisfies her needs by combining earned income (+ eventually other incomes from different sources, e.g. transfers) with "leisure" time (i.e. the time not sold on the market). She chooses the allocation of time that best meets her needs or preferences. The empirical model at this point consists in specifying a functional relationship between the labour supply decision on the one hand, and wage rate and other incomes on the other: $h = h(w, y)$. With observations on h , w and y , one can estimate this function and use it to simulate new decisions given new values of w and/or y . Taxes complicate the picture but the basic framework does not change. However the same framework imposes serious limitations. For example not all the tax rules can be easily represented. Simultaneous household decisions are cumbersome to model. The same holds as to modelling constraints to the choice of hours.

During the last two decades a different framework has become more popular, where the consumer is assumed to choose among jobs (i.e. "packages" of hours requirements, wages and other characteristics) rather than along a continuum of hours for a fixed wage rate. Also, the empirical analysis consists in directly estimating the

preferences as revealed by the observed choices, rather than going through the specification of a "labour supply function". This different approach accounts for the fundamental heterogeneity of the alternative job packages that form the consumer's opportunity set and simplifies enormously the representation of complex tax rules, of simultaneous household decisions and of constraints on hour choices³⁶. In most of this session we rely on a modelling framework that belongs to this approach. In particular it is a simultaneous model of household labour supply of both spouses, it allows an exact representation of the budget sets independent of how complex they are, and it accounts for quantity constraints and limitations in the choice of hours of work. An outline of this modelling framework is provided in Appendix A³⁷.

To the analyst preferences and opportunity sets are not known in full detail. Thus, utility functions and opportunity sets will contain random elements. This implies that the analyst, and hence also the authorities, at best will be able to produce the results of tax rate changes in the form of probabilistic statements. The results of a change in tax rates, i.e. tax reforms, can be reported in many ways, as the following list indicate:

- 1) Impact on the probability of participation for households and individuals. The aggregate of these probabilities gives the participation probability for the whole country, eventually in certain defined groups like all females, all males, etc.

- 2) Impact on the expected hours supplied, given participation. Again aggregation will inform about the expected hours among groups of household and individuals.

- 3) The product of the two former concepts gives the impact on the unconditional expectation of hours supplied. Consequently, the impact of tax reforms on labour supply can be decomposed into effects on participation and hours supplied, given participation.

- 4) Impact on the distribution of before- and after-tax income.

- 5) Since we have assumed that household and individuals are equipped with utility functions, which depend on consumption (after-tax income) and leisure,

³⁶ The foundations of this new approach reside in McFadden's work on discrete choice (e.g. Manski and McFadden, 1981). Important extensions are Ben Akiva and Watanatada (1981) and Dagsvik (1994).

³⁷ An interesting recent development consist in representing the household as set of agents that bargain of play some sort of game, rather than as a unit of decision. The empirical implementation of these models is more problematic. Among others, examples are provided by Hearn et al. (2003) and Chiuri and Longobardi (2002).

we can also report who will win and who will lose from tax reforms according to how the households evaluate changes not only in income but also leisure. The winners will be those households that get a higher utility level from the tax reforms and the losers will be those who get a lower utility level. We note that in order to count winners and losers we do not need to measure utility in any cardinal way. We only need to require that households are able to say whether one combination of consumption and leisure is better than another combination, but not by how much (ordinal utility functions). We would expect that if a tax reform should have been decided upon in a referendum, then our estimate of winners and losers should correspond to the outcome of the referendum.

6) If one wants to go beyond by, say, weighting gains and losses to yield a numerical estimate of the welfare gains to the society, then one needs a cardinal and comparable (across households or individuals) interpretation of utility functions. If one is prepared to accept this interpretation, then one can also report distributional effects in terms of changes in utility levels instead of in income. Next section is dedicated to this issue.

4.4 Measuring social welfare: Efficiency and Equality

In order to choose between alternative tax policies, one needs a criterion for aggregating household incomes or welfare into social welfare. Using household welfare rather than income as the informational basis of the social welfare function means that not only income but also the value of leisure is taken into account. A social welfare function is essentially a weighted sum of individual households' incomes or welfare indexes, where the weights reflect the social (e.g. the planner's) attitude towards inequality. For example, if the planner cares at all about inequality, she should give more weight to the poor than to the rich. The particular form of social welfare function that we use is such that it can be expressed as the product of an efficiency index (namely the simple average of individual incomes or welfare levels) times an index of equality (closely related to the well-known Gini inequality index): $Social\ Welfare = Efficiency \times Equality$. As a consequence, the effect of a given policy upon social welfare can be approximately expressed as

$$\% \text{Variation in Social Welfare} = \% \text{Variation in Efficiency} + \% \text{Variation in Equality}$$

Instead of using the total (or average) amount of income or welfare as a measure of efficiency, one might want to use different criteria. Recently, criteria inspired by the "equality-of-opportunity" philosophy have been developed. The idea is that in weighting individual incomes or welfare levels one should only care about that part of inequality that is due to different exogenous opportunities, and not to the residual part due to, say, different effort. According to the approach proposed by J. Roemer (1993, 1998), for example, it turns out that the equality-of-opportunity criterion essentially amounts to use the average income or welfare among the least favoured (opportunity-wise, e.g. those with lowest parental income or education) as the efficiency index. The implications of using the standard concept of efficiency versus the equality-of-opportunity concept as developed by J. Roemer. In what follows, we will present simulation exercises where alternative policies are ranked according to their effects on efficiency and on equality. More details on the computation and use of efficiency and equality indexes can be found in Appendix B.

4.5 Thinking about reforms of tax system: an exercise for Italy

At least since the end of the 60s two basic ideas inform the debate upon reforms of the tax-transfer systems. The first idea is concerned with *efficiency* (the size of the pie). Since the late '70s, the progressive tax systems prevailing in most advanced economies have been criticised for giving bad incentives and paying too high a price for income equalisation. Suppose I live in a country with a very progressive tax system and I am a very rich man. Suppose my marginal tax is 50%. It means that if I accepted to prepare that report that would keep me at work for one more week before vacation and would grant me 5000 Euro, in fact I would earn 2500 Euro. To keep things simple, let's assume I am the only one endowed with the skills to do the job. Say I decided not to do it. But suppose now taxes are changed, and starting from where I am my marginal tax is lowered to 20%. Now I would earn 4000. This time I might accept. I would be better off. Even more important, the Government would now collect 1000 more from me as additional taxes, which means that someone else could also be made better off through larger transfers or lower taxes or better

public services. If the policy maker thinks that such opportunities for being more productive mostly concern high income people, the implication is that the tax rates should be made less progressive. The basic scheme embodying the idea - together with other appealing features such as simplicity - is the so-called *Flat Tax*, i.e. a proportional tax. Every one pays - say- 20% of gross income. As said above, the advocates of this reform more or less explicitly assume that the rich are more responsive than the poor. It is expected that the FT would lower marginal taxes for the rich and increase them for the poor and possibly also for the average income people. To motivate this as a good reform efficiency-wise, most FT supporters tend to think that the good incentives given to the rich outweigh the bad incentives given to the poor. Especially during the 80s and the 90s the US and most European countries have made significant moves towards the FT by reducing the number of brackets and/or the progressivity of the bracket marginal rates, besides in some cases reducing the average tax rate (Røed and Strøm (2002)). Analyses by Hausman and associates (Hausman 1980, 1981, Burtless and Hausman 1978, Hausman and Ruud, 1984) have been very influential both from the point of view of the political debate and from that of the evaluation methodology. It should be added that a pure FT is equivalent to an expenditure tax. What one says about the FT is therefore directly relevant in view of the debate on income taxation versus expenditure taxation.

The second idea is mainly concerned with *distribution*. The various policies implemented to help the poor and the needy (tax exemptions, subsidised prices, in-kind benefits etc.) have long been criticised for being costly, chaotic and possibly iniquitous. Maybe we can think of something more direct, simple and transparent. Suppose you define a minimum guaranteed income. If you are above that level by your own, that's fine. Otherwise you will receive a transfer just sufficient to push your income up to the guaranteed level. Upon any income above the guaranteed level you will pay taxes (according to some rule). This system is called *Negative Income Tax* (NIT). In the most radical formulation, the NIT mechanism replaces any other redistributive policy. Between the end of the 60s and the middle of the 70s in the US many econometric analyses and social experiments were performed in order to evaluate NIT-like mechanisms.

Both ideas have many versions and variations. They can also be combined. For example, we can have the NIT combined with a FT above the guaranteed minimum income (we call this rule the NIT+FT). More recently, especially in the US

and the UK, rather than the NIT other low-income support mechanisms have become more fashionable, where wage subsidies to the working poor are used to supplement their income or where the transfer envisaged by the NIT is made conditional upon some minimum labour effort (or the like, e.g. participating in a training program). These alternative income-support schemes are sometimes labelled as *Workfare* (WF).

The above ideas - together with some implementations - have been circulating since more than three decades as elements of the social and economic policy debate and of the empirical economic research. Meanwhile theorists were developing sophisticated models for characterising optimal tax rules. The two strands of research have proceeded with very little interactions. In what follows we will first discuss some simulation exercises based on a microeconomic model of household labour supply, aimed at comparing hypothetical reforms inspired by FT or NIT or WF schemes. Then we will discuss some further analysis where we establish an explicit connection between the microeconomic research and the inquiry into optimal taxation.

Before entering the details of these exercises, we draw the attention on what is probably the easiest way to characterise the behavioural implications of the model that we are going to use, namely computing labour supply elasticities with respect to wage. They are computed through microsimulation, i.e. the wage is increased, and the individual responses are simulated and then averaged. They are illustrated in Fig.6a, which shows marked differences among spouses and a strong inverse relation between elasticity and household income. In a sense, it tells us that all responses are among the poor and average income households and in particular among the women living in those households. Fig. 6a must be kept in mind as a polar star, since it suggests that

- the effects of any simulated reform will be driven by this pattern of elasticities
- the design of an optimal - in some sense - tax rule should properly exploit the same pattern of elasticities

4.5.1 Comparing three reform proposals

As far as Italy is concerned, a consideration of the above ideas in the perspective of reforming the tax-transfer system has emerged with some delay compared to the US or the UK. It is interesting to note that the fiscal platforms proposed by the two coalitions running the 2001 Italian Parliament elections contained reform proposals very close to the FT (Casa delle Liberta', right coalition) and to the NIT+FT or the WF+FT (Ulivo, left coalition) respectively³⁸. We comment here on a simulation exercise that compares the FT, the NIT+FT and a WF+FT rule, as alternative to the current system.

Fig. 4.1a-4.1c provide an illustration of the three systems compared to a standard progressive rule qualitatively similar to the current Italian one.

In order to simulate the effects of the three hypothetical reforms we use a microeconomic model (see section 1.4) that we have previously developed and estimated using a sample of about 2200 Italian households (extracted from the 1993 Survey of Household Income and Wealth by the Bank of Italy). It is essentially an algorithm that allows you to compute gross and net incomes for every household given a certain tax-transfer rule. The model takes into account the decisions of household members: whether to work or not and how much. These decisions depend on various personal and family characteristics, on job and earning opportunities and on the tax-transfer rule. In other words, it represents, down to the micro-decisions level, the process by which the pie is being baked and sliced. More technical details can be found in Aaberge et al (1998). Previous exercises applied to Italy have adopted non-behavioural simulations for evaluating reforms similar to the ones mentioned above³⁹. When account is not taken of behavioural responses, the dimension of the (gross) "cake" is obviously fixed. However, the crucial issue in efficiency-equality evaluation resides precisely in the possibility that the dimension (along with the distribution) of the cake *may* change. Less distortionary tax rates *may* generate a

38 We are making a loose analogy between theoretical schemes and actual fiscal platforms. A more detailed and specific presentation and analysis of the platforms can be found in a CHILD working paper by Baldini and Bosi (CHILD WP 03/2001). See also CHILD WP 03/2002 by Chiuri and Longobardi.

39 Baldini and Bosi (2001) use a static micro-simulation model to evaluate the effects on income distribution and on net tax revenue of the two reforms contained in the electoral platforms of the two opposed coalitions, and conclude that they both are undesirable. The (almost) flat tax proposal - proposed by the centre-right coalition - would according to the results of Baldini and Bosi - entail a major loss in revenue; to keep revenue constant an unbearably high rate would be required. On the other hand, the "social dividend + flat rate" reform - proposed by the centre-left coalition - would have positive effects on redistribution but again would require an exceedingly high flat rate to keep the revenue constant. Another example of non-behavioural simulation analysis of this type of reforms is provided by Bourguignon et al. (1997).

larger amount of resources available for redistribution; a better designed redistribution and income support system *may* not only foster equality but also improve the configuration of incentives and by this route contribute in its turn to efficiency. In this paper we use a model of household labour supply to evaluate stylised versions of the above reform ideas. A behavioural model might reveal the possibility of improving both efficiency and equality.

When we simulate the working of a particular tax-transfer rule, we adjust its parameters (for example the fixed tax rate in the case of the FT) so that the total net tax revenue collected by the Government is equal to the current one. To simplify things, the guaranteed income level of the NIT+FT and of the WF+FT systems is set in advance equal to 3/4 of the poverty line (adjusted for household size). The minimum amount of hours worked in the year (by the household as a whole) to qualify for the transfer in the WF+FT system is set equal to 1000. It turns out that in order to generate the same total net tax revenue the three reforms require the following marginal and average tax rates:

Note that all the reforms imply a lower average tax rate than the current system. Since the total tax revenue (the numerator) is kept constant, the total gross income (the denominator) must have increased and therefore household choices must have changed. We stressed the ability of the model to represent behaviour and choices, so what are the new choices once a new tax-transfer system is implemented? Figs. 1-5 illustrate some of the results. We can summarise as follows:

- a) all three reforms brings about more (gross and net) income;
- b) the larger amount of income is due to a larger (and/or more productive) labour supply concentrated among the low- and average-income household;
- c) the increased labour supply is proportionally more significant among the women;
- d) the NIT+FT and the WF+FT rules seem to escape the much feared risk of reducing labour supply among the low-income households;
- e) all three reforms imply a more unequal household income distribution, notably so for the FT rule.

Probably (b) and (d) are the most striking results. Result (a) supports the view that by flattening the marginal rates profile one can obtain efficiency gains. However

(b) tells us that those gains come from an unexpected source: namely, not the high-income households but rather the low- and average income households. This is clearly due to a pattern of labour supply elasticities that vary markedly with respect to household income (and gender) - see Fig. 6. Result (d) looks somewhat paradoxical. Take the NIT for example. From Fig. 4.1 it would seem that low-income household have lower incentive to supply labour. This conclusion is driven by the comparison between income when one does not work and income when one works one (or maybe a few) hour. However, our model takes into account that there aren't many jobs requiring one (or just a few) hour a year. The relevant comparison is rather between 0 hours and some significant amount of hours. Since the average tax rate is lower under NIT than under the current rule, it may well be the case that the incentives to supply labour to the market are reinforced, even for the (originally) low-income households. It is worthwhile noting that the above result would not show up with the use of a traditional model that assumes all type of jobs are equally available. On the other hand, if the opportunity set were more uniformly dense with alternative hours, then one should indeed expect a significant negative effect on participation from NIT-like mechanisms. It must be added, however, that even in the last case, the effect could be mitigated by lowering the marginal tax rate that phases out the transfer (which is equal to 100% in the version we simulate).

A more sophisticated step consists in using welfare instead of income for evaluating the reforms. Essentially this operation amounts to taking into account not only income but also the value of leisure as reflected by the utility function. Since through the model we get estimates of household utility functions, we can derive the money equivalent of utility levels. Such a measure can be used in various ways depending on whether we are willing to make inter-household comparisons or not. If we prefer to avoid such comparison, an interesting application consists in identifying the households who are better off (winners) or worse off (losers) after a reform. Fig. 4.7 reports the percentage of winners for each reform. All three reforms bring about a majority of winners. A tentative implication is that any of them would win against the current system in a referendum; also, WF+FT does better than NIT+FT, which in turn does better than FT. The aggregate percentage of winners masks however large differences between income deciles, as illustrated in Fig. 4.8. It seems that the reforms have very different distributional implications.

Can we put together efficiency effects and distributional effect into a synthetic index? Section 4.4 and Appendix 4.1 explain how to obtain measures of individual welfare, make them comparable, aggregate them into a social welfare measure and disentangle efficiency and equality effects. A particularly useful result is that the index of social welfare can be expressed as the product of the average individual welfare (a measure of efficiency, the average size of the "cake") times an index of equality of the welfare distribution, which depends on the inequality aversion parameter. For a particular value of the inequality aversion parameter ($k=2$) the index of equality turns out to be equal to $1 -$ the familiar Gini index of the welfare distribution. Fig. 4.9 uses the above criterion to illustrate the percentage variation of social welfare and of its components under the three reforms. All reforms are *more efficient* than the current system. The FT implies *less equal* slices. But the NIT+FT and WF+FT imply *more equal* slices. So we did find tax-transfer rules that bring about a bigger pie *and* more equal slices too.

4.5.2 Looking for the best

Are there better ideas than those considered above? More generally, what's the best tax-transfer rule? This is the object of inquiry of a very sophisticated branch of economic analysis, called Optimal Taxation. This literature however is mainly theoretical. Here we present a rather uncommon type of inquiry, whereby an estimated empirical model (the same used in the previous subsection) is applied to real data in order to find an optimal tax-transfer rule according to some social welfare criterion. We limit ourselves to the class of tax-transfer rule defined by a lump-sum transfer plus two marginal tax rates, namely

$$x = \begin{cases} c + (1 - t_1)y & \text{if } y \leq \bar{y} \\ c + (1 - t_1)\bar{y} + (1 - t_2)(y - \bar{y}) & \text{if } y > \bar{y} \end{cases}$$

where

c = lump-sum transfer

t_1, t_2 = marginal tax rates

x = disposable income,

y = gross income,

\bar{y} = average individual gross income

We run the model (simulating the new household choices) until the social welfare criterion also used in the previous section is maximised with respect to c , t_1 and t_2 under the constraint that total net tax revenue is kept equal to the current one. The exercise is repeated for many different values of the inequality aversion parameter. Some results are summarised in Table 4.4 at the end of the Session. Here we exclude negative values of c , i.e. lump-sum taxes. We just mention that by allowing lump-sum taxes the optimal tax rule turns out to be the pure lump sum for any value of $k > 0.3$. At first sight the results look rather surprising, since they imply a lower marginal tax rates on higher incomes. However notice that the rules are still progressive: the progressivity is introduced through the lump-sum subsidy rather than through progressive marginal rates. In fact, the optimal tax rules turn out to be close to NIT-like rules, where the starting marginal rate is not necessarily 100% but still significantly lower than the next one. It's interesting to observe that this shape of the tax rule is close enough to the ones recently computed by Saez (2001) by feeding optimal taxation formulae into a calibrated model. The resulting rule envisages a lump-sum transfer, high initial marginal tax rates, which then rapidly decrease. The only important difference is that for higher incomes Saez obtains marginal tax rates that increase again. Of course we must remember that in the simulation exercise previously mentioned we constrained the tax rule to contain only two marginal rates. This was done in order to ease the computational burden. It might well be the case that if we search within a more general class of tax rule we get a profile even closer to Saez's. Indeed the pattern of labour supply elasticities illustrated in Fig. 2 and Fig. 3 supports such a conjecture. The elasticity in the highest deciles is essentially zero. Recall the argument used above to motivate the desirability - efficiency-wise - of the FT (which also apply to NIT+FT and to WF+FT). Is it true that the rich is more responsive, and by working more and exploiting better opportunities contribute to a bigger pie? Well, no. Our model says that the rich hardly move: they simply collect a larger slice thanks to lower taxes. A large part of the contribution to the bigger pie comes instead from lower and middle-income households (and especially from their female members). Even though most of them face a higher marginal tax rate, by supplying more labour they can access jobs that are better paid than before, since the average tax rate is lower than before. The efficiency gain attached to the FT

mechanism (whether associated or not with the NIT or the WF) apparently comes from an unexpected direction. The reforms perform better than the current system not because they lower the marginal tax rate for the rich, but because they lower the average tax rate and this may open better opportunities also for the not-so-rich and the poor. Our simulations suggest that by flattening the tax rates profile, we have indeed an efficiency gain. However, the behavioural responses that generate the gains are very different from those commonly assumed and suggest that the proposed reforms might be improved upon by reducing progressivity not so much in favour of the very high income deciles but rather in favour of the low and average income deciles. Higher marginal taxes imposed on high-income brackets would simply extract a rent and would hardly imply any loss in efficiency⁴⁰.

In section 4.4 we also presented an alternative social welfare function that takes into account the so-called Equality of Opportunity criterion. In Table 4.5 we report the results of some simulations using the EOp criterion. Income instead of welfare was used in this case. However we are able to compare these results with others that also are based on income but with the standard EO criterion. Since (comparing Table 4.4 with Table 4.5) it turns out that the EO results are rather close, either using income or welfare, we can speculate that the same might happen under the EOp criterion. The most striking result is that EOp implies optimal tax-transfer rules that are much more progressive than those implied by EO⁴¹. The result is somewhat surprising since EOp is commonly thought to be a less interventionist philosophy with respect to EO.

A general lesson to drawn from the above microeconomic exercises inspired by the optimal tax literature is that it may make a large difference whether one allows or not for a rich heterogeneity of response across the population.

⁴⁰ This conjecture might turn out to need some qualification. For example it might happen that very high marginal tax rates imposed on high incomes discourage current average income people to jump to higher income levels.

⁴¹ To be more precise, what we call here EOp is in fact a combination of the (pure) EOp criterion with the EO criterion, which is applied to the distribution within the least favoured group. When $k = \infty$, the criterion collapses to the pure EOp.

4.5.3 The reforms and female participation and fertility

There is a long tradition of evaluating reforms on the basis of their effects on labour supply. A sharp departure from this tradition is signed by Hausman (1981), who notes that the welfare effects of taxes might be (and actually are in his exercise) fairly large, notwithstanding minor behavioural effects. He recommends that policy makers should not worry so much about labour supply effects and should instead focus on welfare effects. The message is important but it should be received with some caution and flexibility. In this contribution we use a social welfare function to scale reforms since it is a theoretically well-founded way to summarise the reform effects (actually a sort of “compressing” utility). However it is still useful to complement the information compressed into social welfare function with other details. Both the utility function adopted in the model and the social welfare function used in the evaluation provide only an approximation to what might be important to the households and the policy makers. For example, the policy maker might judge that female labour market participation *per se* is important for dynamic efficiency considerations that are not fully taken into account by the model (e.g. more participation today might imply a higher productivity tomorrow). Fertility might also be important *per se* if one thinks that the number of children is not a pure private good but rather something with public good and externality components. What happens then to female participation and fertility, under the above reforms? We have already seen the general picture of labour supply effects of FT, NIT and WF in Fig. 4.2 and Fig. 4.3. Table 4.3 shows some more details. Overall female labour supply does not move much. We observe a modest increase under FT and modest reductions under NIT and WF. However, important changes are going on below this calm surface:

- first, all the reforms induce a larger supply from the poorest deciles and a smaller supply from the richest deciles. Recall that all the reforms imply an increase in the average net wage. Therefore the result can be interpreted as due to a substitution effect prevailing among the low deciles and a wealth effect prevailing among the high deciles. A role is probably played also by cross-elasticities (see Fig. 4.6b). We find that labour supply from women living in poor households increases rather elastically not only with respect to own wage but also with respect to the partner's wage, that is at low levels of household income, partners' incomes are complements rather than substitutes. Since as a consequence of the reforms the

average net wages increases for both partners, this reinforces the incentives to participate for women living in low-income households;

- second, under all reforms household income increases much more than (female and male) labour supply. Besides the modest increase in the average net wage due to less progressive rates, the increase in income must therefore be due to a change in the composition of participants. More productive individuals move in and less productive move out. The process might have some interesting implications in terms of intra-household time allocation, matching of partners etc. that we cannot fully pursue here.

As to fertility, in principle, one could argue that child "production" and care are components of leisure and therefore induce the effects of changes in the budget sets on fertility from basic estimates of labour supply responses. However, the model used above for reform evaluation is estimated under the assumption that the number of children is exogenous. We can make some suggestive speculations based on another modelling exercise were labour supply and number of children are both treated as simultaneous choice variables (Colombino, 2000)⁴². This model does not allow a detailed representation of the tax-transfer regime. We can only infer some implications of the reforms if we approximate them as changes in the average tax-rate and in exogenous income. It turns out that essentially all the three reforms can be approximated as a lowering of the average tax rate and an increase in exogenous income. When we feed the model with these changes, we get a slight positive effect on the number of children, i.e. a prevalence of the income effect (not only the exogenous income effect, also the income effect embodied into the wage effect)⁴³.

⁴² This other model is not completely comparable to the previous one not only because it treats fertility as endogenous but - among other things - because it uses a "average tax rate" linear approximation to the true budget constraint. Moreover it's a model of wife's decisions (labour supply and number of children), given husband's supply decision (exogenous). However, the dataset used and the basic methodology are similar.

⁴³ In Colombino and Di Tommaso (1996) the own wage effect upon fertility is negative. However, that effect is measured keeping constant the intertemporal wealth. On the other hand, increase in intertemporal wealth (as reflected in cohort effects) due for example to increasing wages, would have a positive effect on fertility. Therefore the results in Colombino and Di Tommaso (1996) can be reconciled with those derived from Colombino (2000).

Figure 4.1a FTruk

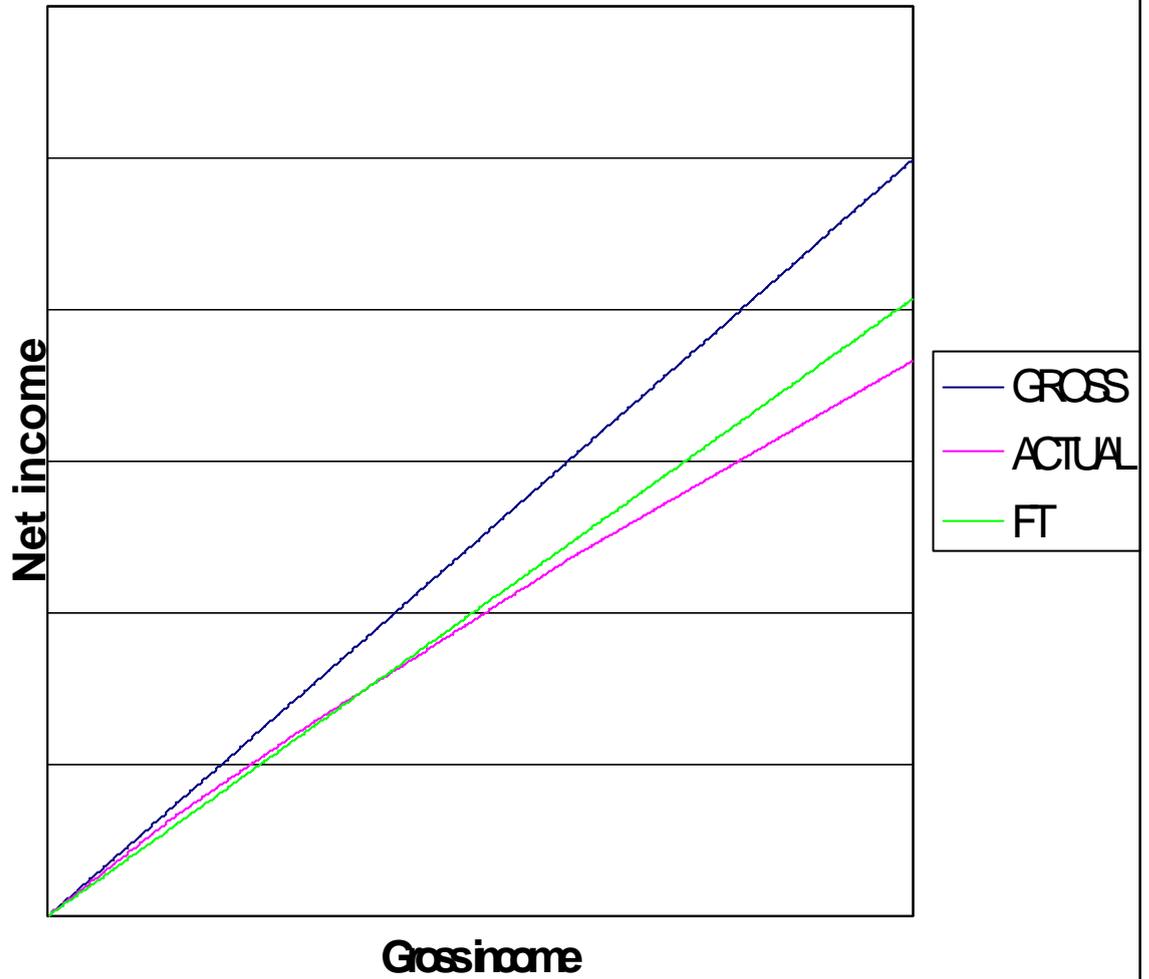


Figure 4.1b NIT+FT rule

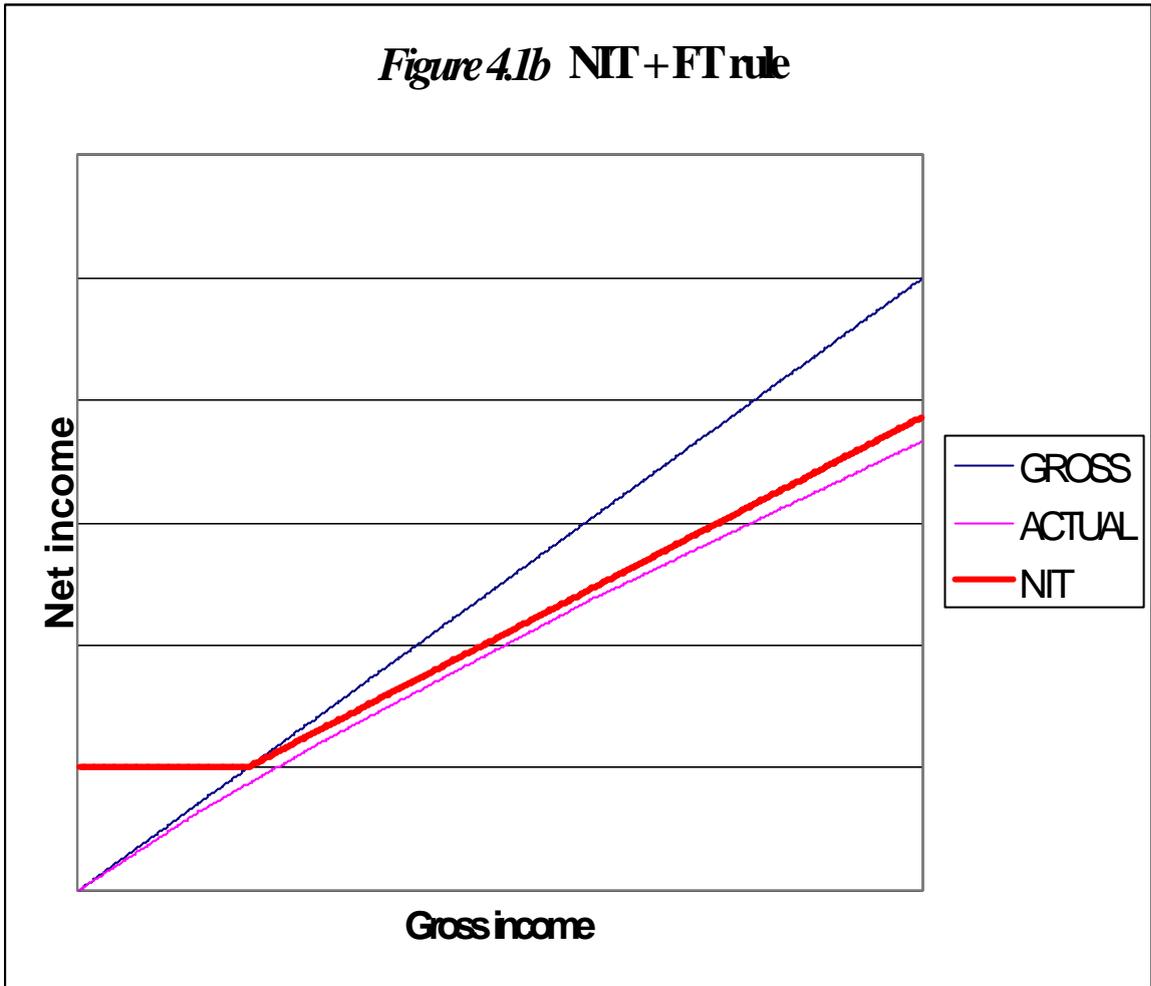


Figure 4.1c WF+FT rule

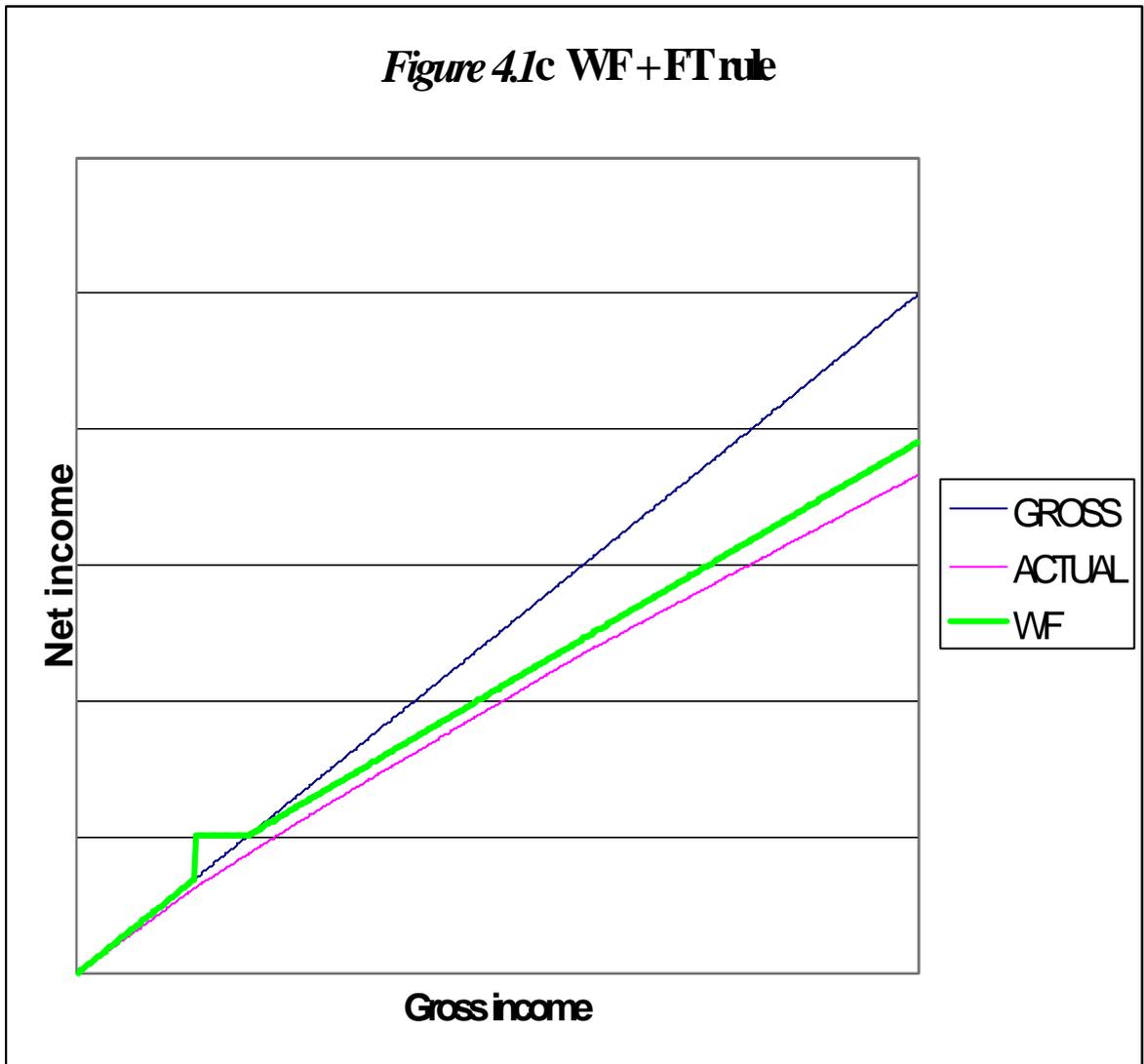


Fig. 4.2 Labour supply (annual hours) under alternative tax reforms, by income decile.

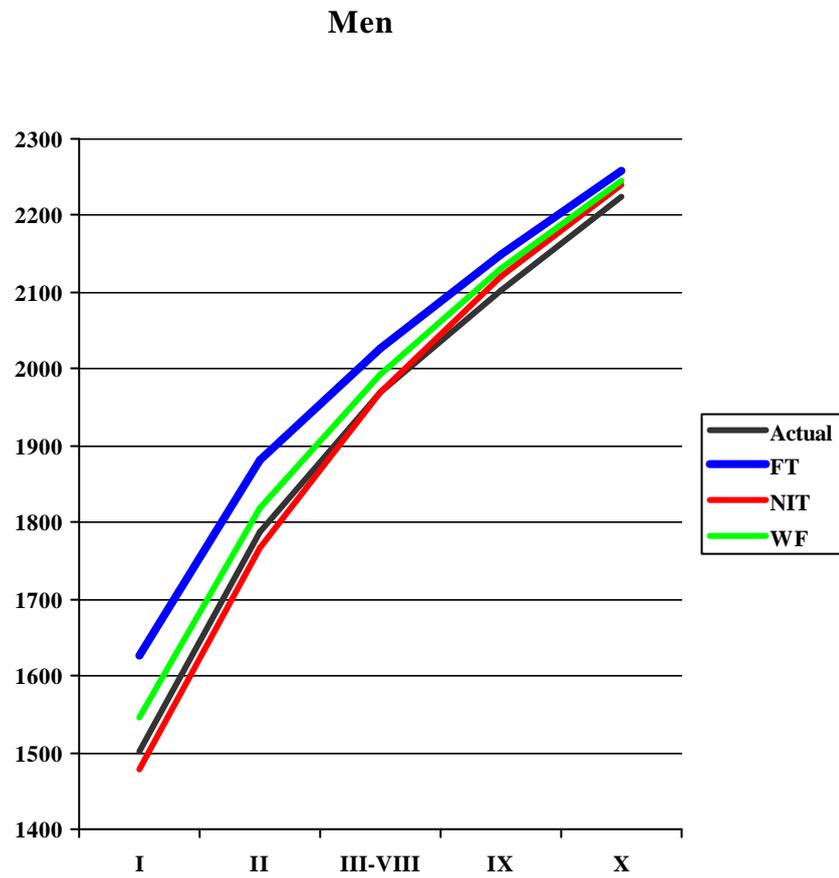


Fig. 4.3 Labour supply (annual hours) under alternative tax reforms, by income decile.

Women

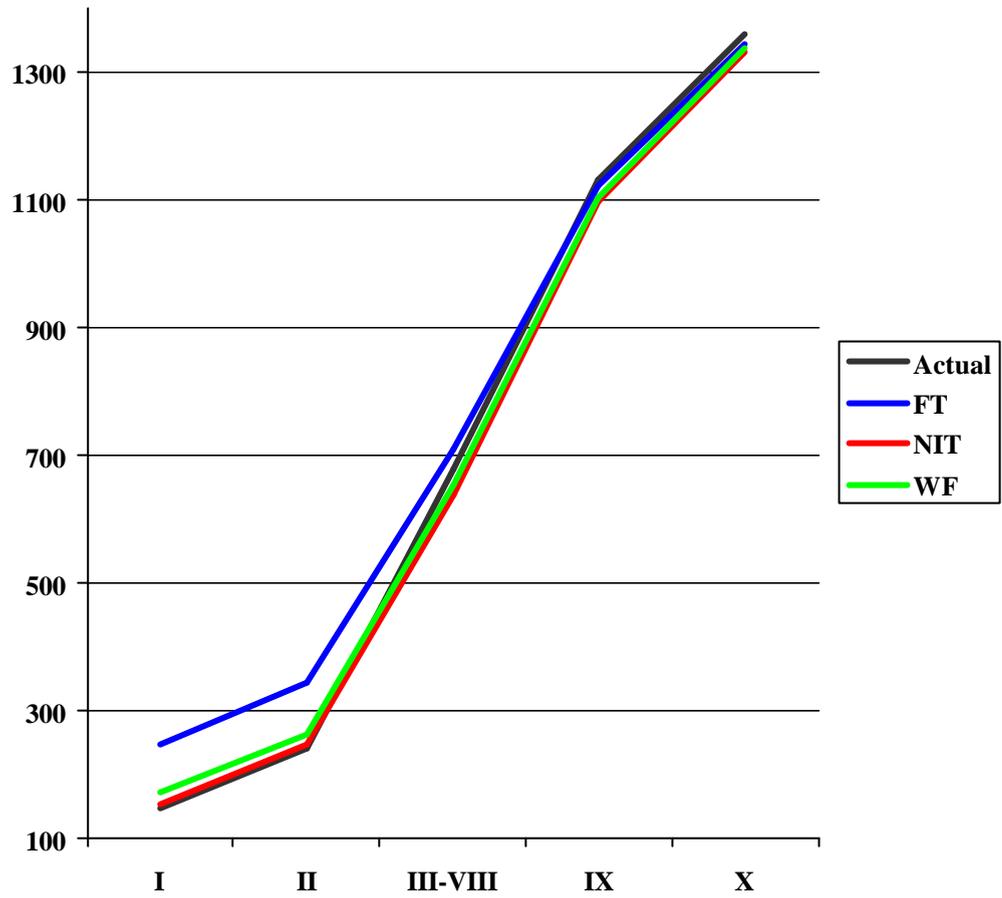


Fig. 4.4 Gross household income under alternative tax reforms, by income decile.

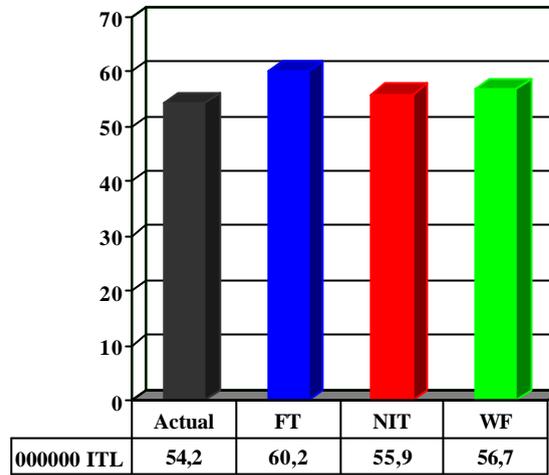


Fig. 4.5 Gini coefficient of net household income under alternative tax reforms.

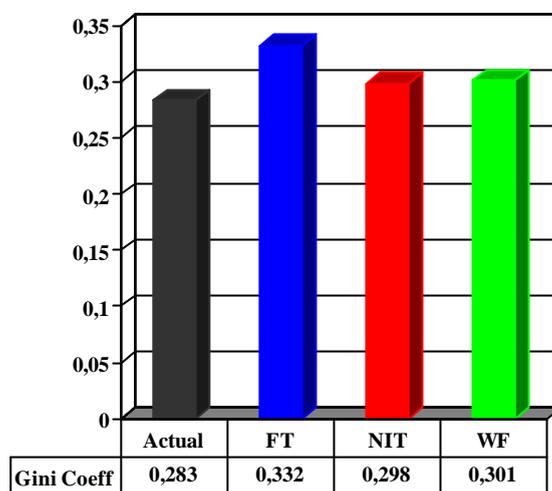


Fig. 4.6a: Labour supply elasticity with respect to own wage by household income decile

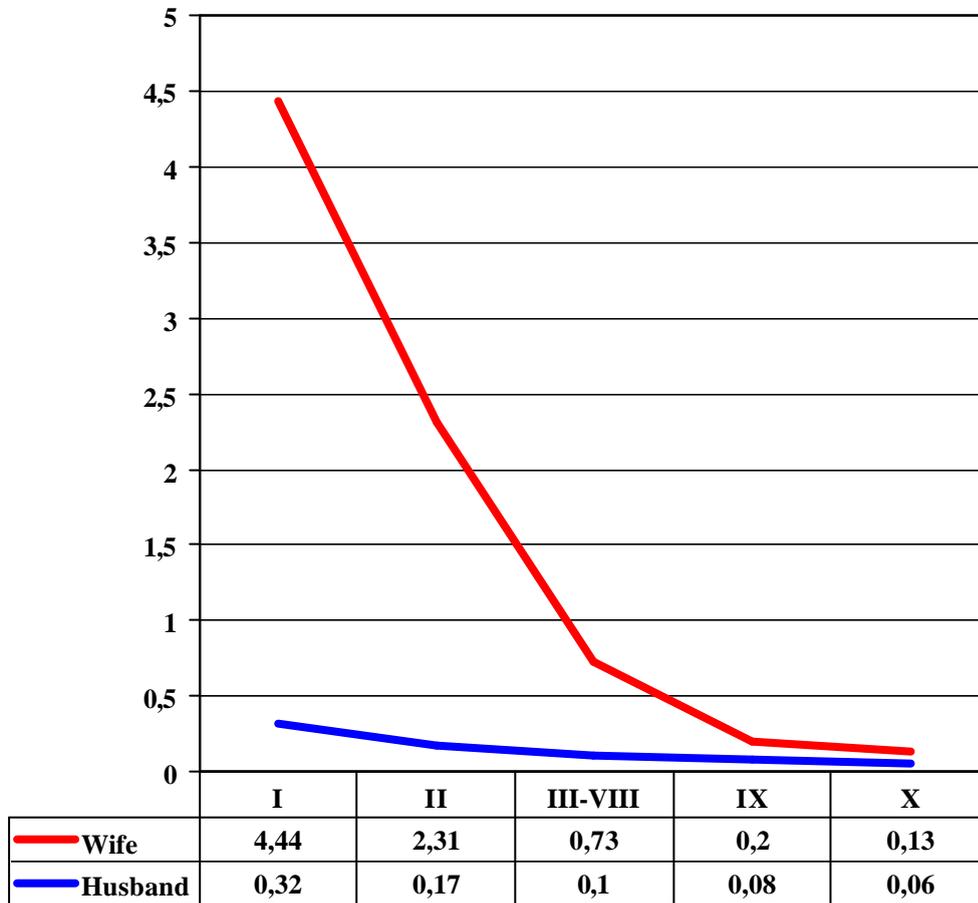


Fig. 4.6b: Labour supply elasticity with respect to partner's wage by household income decile

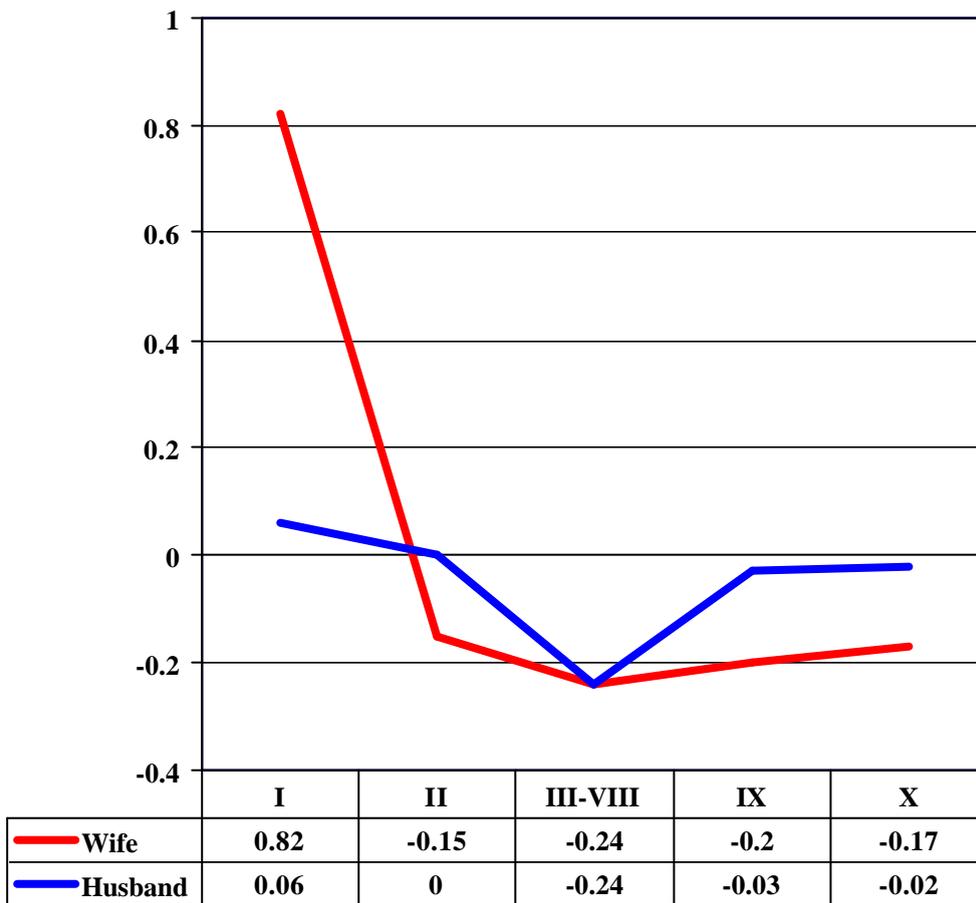


Fig. 4.7: Percentage of welfare winners

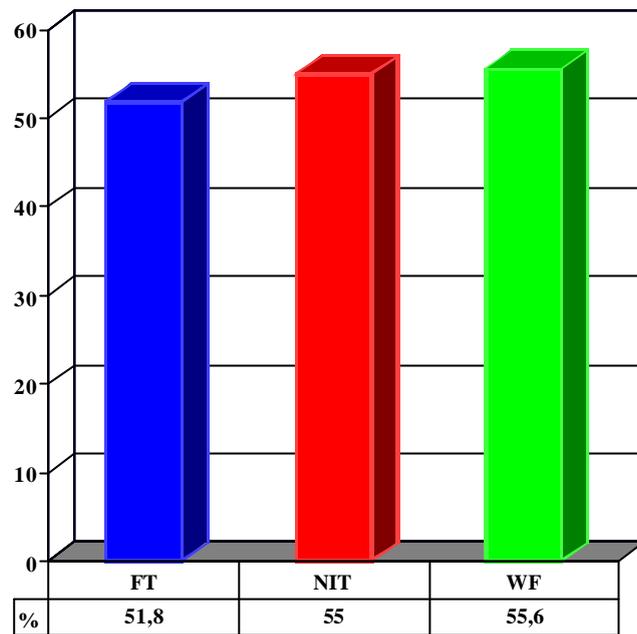


Fig. 4.8: Percentage of welfare winners by household income decile

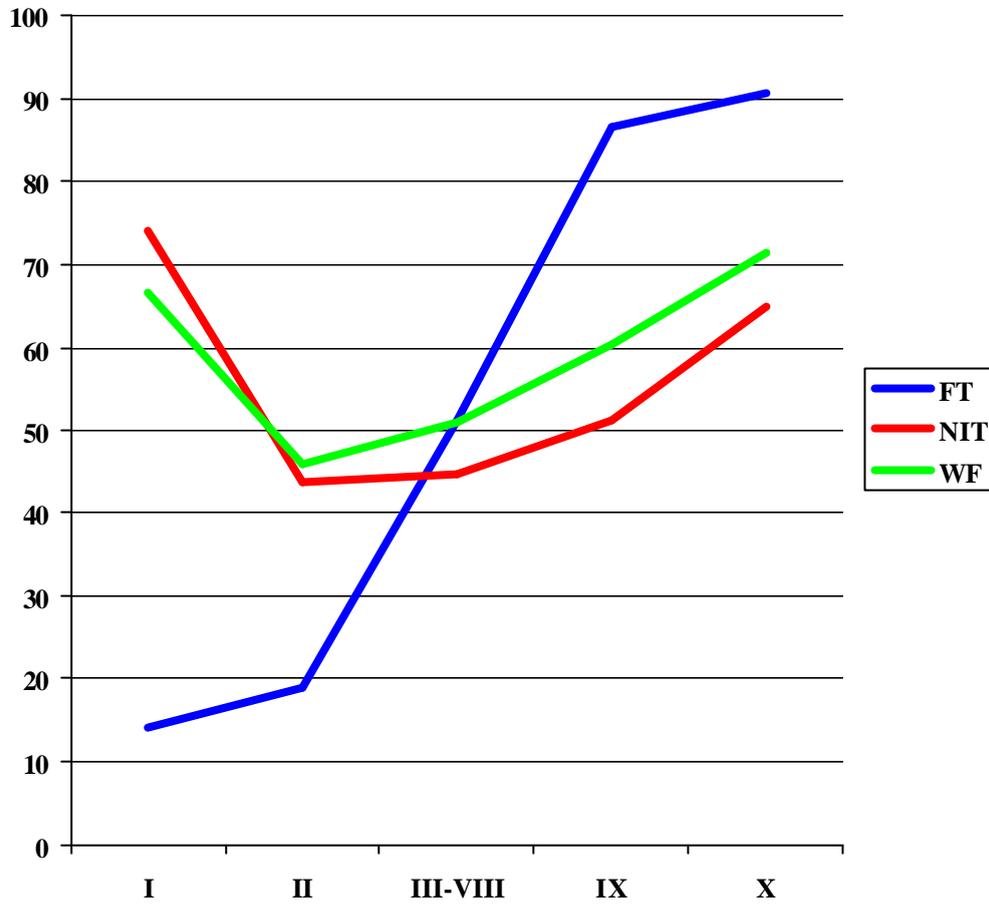


Fig. 4.9: Reform effects on Social Welfare and its components

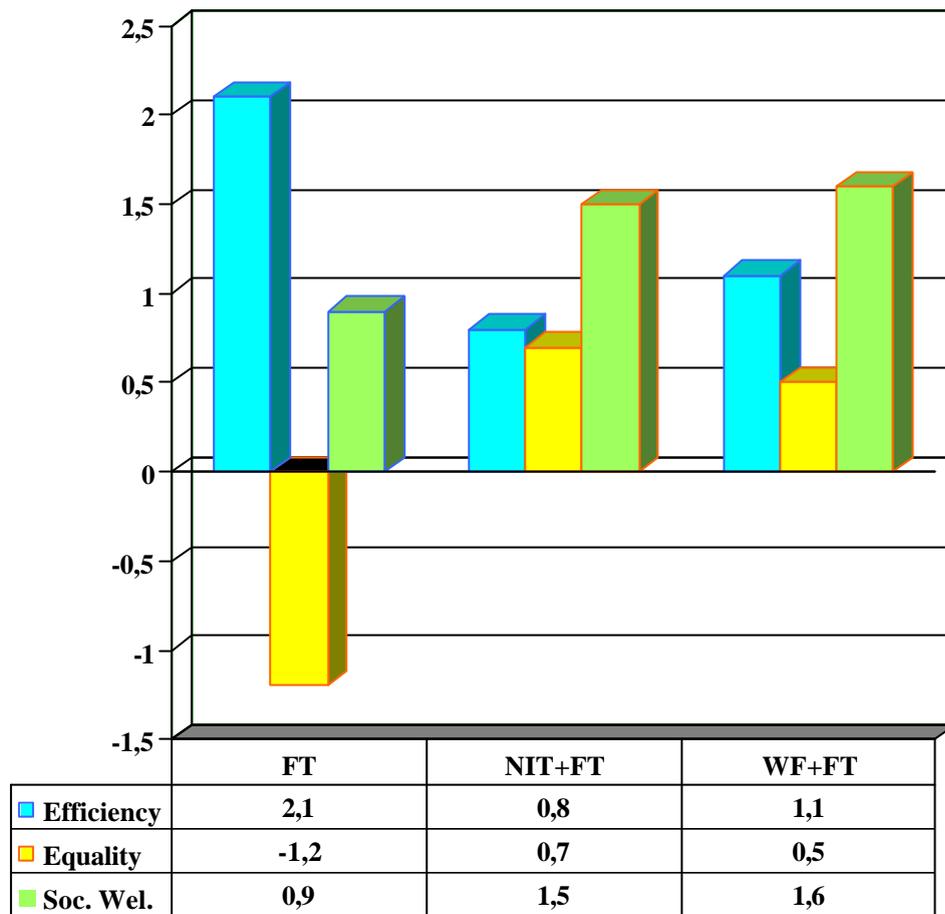


Table 4.1
Empirical evidence regarding the relationship between labour supply elasticities and income or wages.

Authors	Coverage	Methodological approach/type of data	Results
Devanzo et al (1973)	United States. Men.	Labour supply model, estimated on micro data, including information about participation/non-participation and hours.	Virtually all of the labour supply wage- and income responsiveness is found at or near the zero-hours point.
Borjas and Heckman (1978)	United States. Men.	Labour supply model, estimated on micro data, including information about participation/non-participation and hours.	Labour supply estimates are more responsive to wages and incomes when participation decisions are accounted for than when only hours of work, given participation, are used in estimating labour supply.
Arrufat and Zabalza (1986)	United Kingdom, 1974. Married women.	Micro data based on the General Household Survey. Labour supply model, with husbands' labour supply treated as exogenous.	The estimated total labour supply elasticity for married women is 2.03, out of which 1.41 is driven by participation decisions.
Dagsvik et al (1988)	France, Women, 1979	Labour supply model, estimated on micro data collected from the INSEE survey 'Budgets des Familles 1978-1979'. The data include information about participation/non-participation and hours.	The estimated total labour supply elasticity is on average around 3, out of which approximately 1.4 is driven by participation decisions.
Juhn et al (1991)	United States, 1970-89. Men.	Current population survey (CPS) data. Fraction of year spent working regressed on individual wage rates (or estimated wage rates).	The participation decision is more elastic for workers with low wages (or low potential wages). For example, the estimated partial labour supply elasticities are approximately five times higher for workers in the 1-10 percentile than for workers in the 61-100 percentile of the wage distribution.
Aaberge et al (1995)	Norway, 1979. Married couples.	Labour supply matching model, estimated on micro data collected from the Level of Living Sample Survey.	Both participation and hours elasticities are higher the lower is household income. For example, for all men (women) the estimated uncompensated labour supply elasticity is 0.45 (1.82) out of which 0.29(0.83) is due to participation. For the 10 per cent poorest, the corresponding numbers are 2.23(3.09) and 1.89 (1.85).
Aaberge et al (2000)	Married couples in Italy (1987) Norway (1986) and Sweden (1981)	Participation decisions as well as hours of work (for Sweden only working couples). Accounts for non-convex budget sets and restrictions on hours offered in the market.	For Italy see next entry. For Norway the simulated direct uncompensated labour supply elasticities for all men (women) are 0.28 (0.91) out of which 0.17 (0.37) is due to participation. For working couples in Sweden in 1981 the simulated direct labour supply elasticities are -0.02 for men and 0.07 for women.

Table 4.1
Empirical evidence regarding the relationship between labour supply elasticities and income or wages.

Authors	Coverage	Methodological approach/type of data	Results
Aaberge et al (1999)	Italy, 1987. Married couples.	Labour supply matching model estimated on data from the Survey of Household Income and Wealth.	The simulated uncompensated direct elasticities for men (women) are 0.05 (0.74) out of which 0.04(0.65) is due to participation. For the 10 per cent poorest the corresponding numbers are 0.08 (3.44) and 0.05 (2.84).
Moffit and Wilhelm (1998)	United States, 1983-1989. Affluent men.	Data is collected from the Survey of Consumer Finances (SFC) and used to evaluate hours of work responses to the 1986 Tax Reform Act.	The labour supply of high-income men is inelastic with respect to the marginal tax rate. There is no evidence of changes in hours of work in response to the marginal tax rate reductions legislated in the 1986 Tax Reform Act.

Source: Røed and Strøm (2002)

Table 4.2 Tax rates of various tax reforms

Tax rule	Marginal tax rate	Average tax rate
Current	51.0 ^(*)	20.4
FT	18.4	18.4
NIT+FT	28.4	19.5
WF+FT	27.3	19.8

(*) Maximum marginal tax rate in 1993

Table 4.3 Participation rates, annual hours of work, gross income, disposable income and taxes for married couples under alternative tax regimes by deciles of disposable household income under 1993-taxes

Tax regime	Decile	Participation rates, per cent		Annual hours of work				Households, 1000 ITL 1993		
				Given participation		In the total population		Gross income	Taxes	Disposable income
		M	F	M	F	M	F			
1993-tax rules	1	95.6	14.1	1571	1030	1501	145	15221	525	14695
	2	97.5	19.9	1832	1209	1787	241	24372	2109	22263
	3-8	98.9	43.8	1991	1546	1970	677	48187	8960	39227
	9	99.3	65.5	2117	1731	2103	1133	85135	19983	65152
	10	99.4	74.4	2237	1828	2225	1361	128396	34365	94032
	All	98.5	43.7	1972	1590	1943	694	54225	11074	43150
FT	1	95.4	19.6	1706	1264	1627	247	22933	4219	18714
	2	97.8	24.4	1924	1397	1882	342	31761	5845	25917
	3-8	99.0	44.7	2048	1585	2027	709	54142	9961	44181
	9	99.4	64.5	2162	1741	2150	1124	89459	16460	72999
	10	99.5	73.2	2267	1834	2257	1344	132888	24452	108435
	All	98.6	45.0	2036	1623	2008	731	60189	11074	49115
NIT	1	95.28	14.44	1551	1056	1478	152	16404	-1952	18356
	2	97.13	19.91	1820	1240	1768	247	26199	2537	23662
	3-8	98.63	41.42	1996	1540	1969	638	49801	9538	40263
	9	99.21	63.29	2138	1733	2121	1097	86985	20218	66767
	10	99.49	72.59	2252	1832	2241	1331	130581	32714	97867
	All	98.29	41.87	1976	1589	1942	665	55897	11074	44823
WF	1	95.32	15.19	1621	1117	1545	170	17655	-247	17902
	2	97.45	20.28	1866	1285	1818	260	27280	2956	24324
	3-8	98.82	42.20	2018	1548	1994	653	50669	9487	41182
	9	99.31	63.56	2145	1738	2130	1105	87455	19569	67885
	10	99.49	72.96	2256	1833	2244	1338	131013	31538	99476
	All	98.45	42.52	2001	1597	1970	679	56742	11074	45668

Table 4.4. EO and EOp optimal tax rules

K	EO (income)			EOp (income)		
	C	t ₁	t ₂	c	t ₁	t ₂
∞	0	.31	0	0	.31	0
3	0	.31	0	0	.11	.35
2	0	.31	0	2500	.25	.53
1	2000	.30	.18	12500	.86	.78

Table 4.5 EO-optimal tax rules (welfare)

K	c	t ₁	t ₂
∞	1000	0.37	0.00
1	1000	0.37	0.00
0.5	2740	0.37	0.13
0.4	10000	0.76	0.56

5. What Policies should do?

The analysis of female participation *and* fertility is important to determine how different combinations of social and labour market policies (e.g., part-time employment opportunities, subsidised child care provision, parental leave) designed to reconcile work and child rearing simultaneously impact the work and fertility decisions.

The comparison shows that there are important trade-offs in terms of wage differentials, career perspectives, labor market attachment, and the welfare of children. Our results show that the “best option” seems to be a combination of part-time employment, child care, and parental leave immediately following the birth of the child (a combination offered in Denmark, Sweden, and Norway, where in fact both fertility and female employment are high). In this way, women can continue working during their childbearing years, enabling them to maintain an attachment to the labor market while directly taking care of their children at least part-time. This “convex combination” of work and motherhood can have some negative impacts on career perspectives and wages, but they appear to be limited.

An alternative option can be a long optional paternal leave period that allows women to take care of their children full-time during the first three years following birth (Germany for example). This solution allows women not to lose their jobs, but the costs in terms of career and human capital loss is certainly greater.

With other options it is more difficult to combine work and childrearing. When full-time jobs are the only ones available in the labour market, there are positive implications for wage differentials (which are lower). Female wage and salary employees tend to be relatively high educated in countries where there fewer women in employment. Women less endowed with marketable productive characteristics remain outside the labour market.

In these contexts where full time employment prevails, there is lack of affordable child care which imposes a greater burden to the family, (in form of shifts between parents, help from the grandparents or other relatives but mostly a enormous stress on mothers. The analysis of these situations has to take into account that a significant proportion of households rely informal child care even when formal child

care is available. This is partly an outcome of costly and hardly available child care, but also of attitude that see being with the mothers or grandmothers the best option for the children under 3.

The analysis of labour market participation and fertility has to take other important aspects into account. If the growth in female labour market participation has many beneficial effects on women's bargaining position within the household, the inter-household income distribution, and the inter-generational income distribution, there are costs in terms of the welfare of children. Mothers' employment during childhood appears to have both short-term and long-term consequences on children's well-being. The short-term effects of increased early maternal employment are lower levels of socio-emotional adjustment and cognitive outcomes among younger children. The long-term effects have their strongest manifestation in less educational attainment for children in their late teens and early twenties. The effects of paternal employment seem to be more modest.

Thus, growing up in a family in which the mother chooses to work appears to have some adverse consequences on children's welfare, suggesting a negative effect of the loss of the mother's child-care time. On the other hand, there is evidence that children in low-income households tend to have worse educational and labour market outcomes than children from more affluent families. Therefore, if women's work is characterized by strong labour market attachment and continuity, this may imply higher family income, and children's life chances may be unaffected or even positively affected by the decision of both parents to work.

The analysis of the implications of the changes of women and men participation on family income distribution shows that at a more micro-level, the shift in the wife's role in the household from care-giver to income producer tends to make the spouses more "symmetric" with potentially large effects on the level of resources within the household and both the interhousehold and intrahousehold distribution of consumption and welfare. For example, in countries where the proportion of dual earner households is high (at all levels of income and education of household members), inequality in household income is lower.

For the analysis of the participation and hours decision of husbands and wives, the relevant decision-making unit is the household. The analysis of household taxation policies in different social welfare systems has demonstrated that a crucial role is played by the participation and hours decisions of women living in low and average-

income households. Women living in poor households are in fact very responsive to economic incentives. Moreover, at low income levels, partners' earnings seems to be complements rather than substitutes and this has important implications for income distribution. The above results appear to play a crucial role for the perspective of tax-transfer reforms.

We report on a series of simulations based on Italian data, looking at the performance of widely debated ideas such as lowering the progressivity of marginal tax rates and introducing universal systems of low-income support. It appears that by flattening the marginal rates profile we can get significant efficiency gains, which however come from a rather unconventional direction: namely, the bigger pie would be mostly due to the contribution of women living in low- and average-income households (not of high-income household members, as the common wisdom tend to suggest).

The implication is that a profitable direction for reform might consist in lowering marginal tax rates specifically on low and middle incomes. Moreover, our results indicate that the structure of own and cross-elasticities do not produce any significant reduction in labour supply at low-income levels when introducing universal support mechanisms such as a Negative Income Tax or a "Work- Fare" schemes. It seems therefore that there is scope for redesigning the tax-transfer regime in order to have more efficiency and more equality at the same time. Our results suggest that social and fiscal policies can be combined to improve the labor market participation of low income mothers who especially in Mediterranean countries are facing more constraints in their labor supply decisions. In these countries, where labor supply and fertility are both low, the objective of meeting the Lisbon's target requires a policy mix that facilitates the participation of women without discouraging fertility. Our findings suggest that policies to facilitate the participation of women in paid employment should address both family reconciliation and the special difficulties faced by low skilled women, for the most part "excluded" from the labor market by the high cost of participation (given by lack of affordable child care and by an occupation structure based on full time). Social and labor market policies should be aimed to increase the opportunities for part time jobs and affordable child care centers. Fiscal policies should be modified in the direction of lower marginal tax rates and the introduction of minimum income scheme. These policies together should

allow more women to enter the labor market (or to stay during childbearing years) and especially low skilled women in low income families.

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Appendix 1.1.

Figure 1.1

Incidence of part-time employment as a proportion of employment

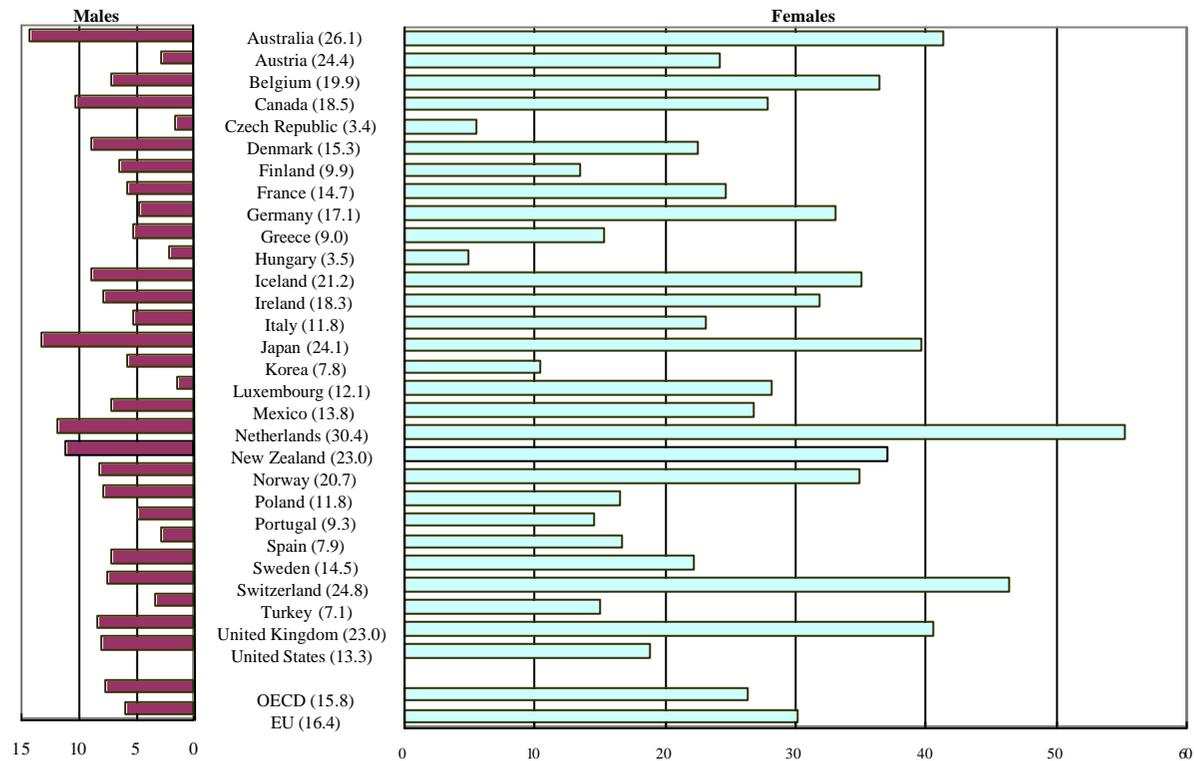


Table 1.1: Parental / child-care leave for 1999-2001

	<i>Duration of base maternity leave (weeks) (1)</i>	<i>Maternity benefits during base leave (% of average wages)</i>	<i>Duration of optional parental leave (weeks) (2)</i>	<i>Parental benefits during optional leave (% of average wages)</i>	<i>Total duration of leave (1)+(2)</i>	<i>Paternity leave (*)</i>
Sweden	14	66	64	66	78	10 days
Denmark	28	100	22	83	50	10 days
UK	18	90	24	15.3	42	None
Netherlands	16	100	24	14.2	40	None
Belgium	15	77	12	50.3	27	3 days
Germany	14	100	136	25.1	150	None
France	16	100	132	42.4	148	3 days
Portugal	16	100	96	12.7	112	None
Italy	22	80	26	30	48	None
Spain	16	100	128	7.28	144	2 days
Greece	16	50	28	0	44	1 day (**)

Source: Tanda (2001) (*) Périvier and O'Dorchai (2001)

Table 1.2.: Formal day care programmes for young children

	<i>Organisation/Financing</i>		<i>Coverage</i>	
	0 to 3	3 to 7	0 to 3	3 to 7
Italy	Mainly public organisation and financing.	Public and private organisation and financing.	6%	95%
Spain	Both organisation and financing are mainly public.	Both organisation and financing are mainly public	5%	84%
Denmark	Financing mainly public; provision is mainly public.	Both organisation and financing are wholly public.	64%	80%
U.K.	Mixed public and private provision of centres. Mostly private	Public and private provision. Mostly private.	34%	60%

Sources: OECD (1999; 2000)

Appendix 1.2

Table A.2: Descriptive statistics

	Denmark	The Netherlands	France	Italy	Spain
% of women working	78.5	56.0	64.7	48.5	39.4
% of women that had child in the past two years	23.2	18.1	21.9	18.9	18.1
Wife's Age	33.9	35.0	34.4	35.5	35.2
% of women with tertiary education	39.6	18.4	24.0	8.6	21.6
% of women with secondary education	42.7	56.7	46.5	43.0	20.5
% of women with less than secondary education	17.8	24.9	29.5	48.4	57.9
Wife non labour income (Euro PPP)	3.7	.7	1.9	.5	.5
Husband total income (Euro PPP)	16.7	20.0	18.8	15.0	14.3
% of household where there is already at least one child	64.1	64.0	72.5	74.7	75.1
% of part-time workers (regional)	21.6	36.4	15.7	6.7	7.9
Unemployment rate	6.8	5.5	11.9	13.5	21.6
Childcare provided by employer (regional)	1.4	20.9	6.1	3.3	4.7
Number of observations	5,286	10,314	6,811	14,385	12,503

L'ECHP is a standardised multi-purpose longitudinal survey co-ordinated and supported by Eurostat, which allows study and comparison of the Member States in the European Union. The survey involves annual interviews of a representative panel of households and individuals in each country, covering a wide range of topics on living conditions such as income, employment, poverty and social exclusion, housing, health, migration and other social indicators. The unit of analysis is the household and, within the household, all individuals older than 16, although it is possible to gather demographic information on family members under sixteen as well.

Appendix 2

Table 2.1. Parental Employment and Children's Cognitive Development and Early Childhood Outcomes

<i>Study</i>	<i>Data source and sample(s)^a</i>	<i>Timing issues</i>	<i>Outcomes^b</i>	<i>Estimation method^c</i>	<i>Comments^b</i>	<i>Effect of parental employment on children's outcomes^d</i>
Baum (2003)	NLSY: sample sizes vary depending on the outcome (between 1600 and 2000 observations). Children born between 1988 and 1993 to mothers who were between the ages of 23 and 30 in 1988	Outcomes are measured at ages 3-4 (PPVT) and at ages 4-5 (PIAT). Mother's employment is measured over the first three	PPVT; PIAT-M; PIAT-R	OLS (reduced-form production functions; hybrid equations)	Outcome variables are averaged, so that there is only one test observation per child Other controls: large set of socio-demographic variables of the child (e.g., sex, birth order and age), of the mother (e.g., education and age), and of the test.	For all outcomes: Mother's employment in the child's first year (weeks worked): PIAT-M: (-) 5% Mother's employment in years 2 and 3 (weeks worked): PIAT-M: (+) 10%

		years of the child's life			Plus an extensive set of supplemental background variables (including mother's AFQT, and grandmother' education), family income, and child care variables	Negative effects of maternal employment are offset by positive effects of increased family income
Bernal (2002)	NLSY: 374 mother-child observations	Outcomes are measured at ages 3-5 (PPVT) and at ages 5-7 (PIAT). Maternal employment is measured over different child's ages, from birth to age 5	PPVT; PIAT-M; PIAT-R	SML (structural estimation method)	Other variables included are: mother's age, education, and race, presence of father, number of siblings, birth order, father's income, child's birth weight, and child care choice.	For all outcomes: Mothers' employment in the first five years of the child's life: Full-time: (-)
Brooks-Gunn, Han and Waldfogel (2002)	NICHD-SECC: 900 European American non-Hispanic children (all born in 1991)	Outcomes are measured at: 15, 24 and 36 months of the child. Mothers' employment status is measured at 1, 3, 6, 9, 12,15, 24 and 36 months	MDI (=110.58 at 15 months; =95.49 at 24 months); Bracken School Readiness (=46.59 at 36 months)	OLS (hybrid equations)	Other controls: mother's age and education at child's birth, mother's PPVT-R, mother's marital status, child's sex. Plus controls for family income, presence of older siblings, mother's depression at 1-month post-birth, home environment score, child-care quality, and mother's sensitivity	School readiness: Mother's employment by 9 th month of the child: Full-time (-) 5% Part-time (-) ns Stronger effects for children whose mothers are not sensitive, for boys and for children of married women. MDI: (+) ns
Han, Waldfogel and	NLSY: 244 White and	PPVT-R is	PPVT-R; PIAT-	OLS	Six measures of maternal	Mother's employment in

Brooks-Gunn (2001)

218 African American children, aged 3-4 in 1986 and 7-8 in 1990

measured at ages 3-4; PIAT-M and PIAT-R are measured at ages 5-6 and ages 7-8; BPI is measured at ages 4 or more. Mother's employment mainly refers to employment during the first three years of the child's life. It also refers to employment status after age 3 up to the year before assessment

M; PIAT-R; and BPI

(reduced-form production functions; hybrid equations)

employment: employed during the first year of the child's life; employed during the second or third year; employed after age 3 up to the year before assessment; currently working; quarter of the first year that maternal employment began; full-time/part-time work in the first year (full-time defined as working more than 20 hours per week). Other controls: sex, presence of older siblings, family structure, mothers' AFQT score, ever experienced poverty, home environment score, child care arrangements, family income, father's working status

the child's first year of life:

Whites:

PPVT-R: (-) 1%

PIAT-M (ages 5-6): ns

PIAT-M (ages 7-8): (-)

1%

PIAT-R (ages 5-6): (-)

1%

PIAT-R (ages 7-8): (-)

5%

African Americans:

No effect

Mother's employment in the second and third year of the child's life:

Whites:

PIAT-R (ages 5-6): (+)

1%

PIAT-M (ages 7-8):

(+) 5%

African Americans:

No effect

Any employment after age 3-4:

Whites and African Americans:

No effect

Harvey (1999)

NLSY: 3-12 year olds in 1986, 1988, 1990, 1992 and 1994. Sample sizes vary depending on the

Outcomes are measured at ages 3-4 (except for PIAT), ages 5-

PPVT-R; PIAT; BPI; SPPC; compliance

OLS (hybrid equations)

Five indexes of early mother's employment: any employment during the first 3 years; number of weeks after the child's birth before

Mother's employment:

Working more hours is associated with lower cognitive development through age 9 and lower academic achievement scores before age 7.

outcome (between 2000 and 5000 children)

6, ages 7-9 and ages 10-12. Maternal and paternal employment is measured over the first three years of her child's life

the mother returned to work (timing); early weekly hours of paid work (conditional on working); number of quarters the mother did not work after she had returned to work; employment during the first year. Other controls: child's birth order, family income, mother's and father's age and education, mother's AFQT, father's employment, race, marital status

No significant association with children's behaviour problems, compliance or self-esteem.

Other measures of mother's employment (employment in the first year, timing, and continuity of early maternal employment) are not consistently related to children's development.

Father's employment hours (average over the first three years):

No effect on cognitive and emotional development

Horwood and Fergusson (1999)

CHDS: 1265 children born in Christchurch (New Zealand) in a four-month period in mid 1977, followed from birth to age 18.

Word recognition (age 8, 10 and 12); reading comprehension (age 10 and 12); mathematical reasoning (age 11); scholastic ability (age 13). Mother's employment is measured either at the time the outcomes are assessed or from birth up to the time of assessment

Word recognition; reading comprehension; mathematical reasoning; scholastic ability

OLS (reduced-form production functions)

Mother's work is measured in terms of hours worked per week and distinguished four groups (0 hours, 1-19 hours, 20-39 hours, 40+ hours). Other covariates: child's intelligence, mother's age at birth, mother's education, family socioeconomic status, mother's ethnicity, family structure, child's birth order, family size, mother's emotional responsiveness

For all outcomes and all groups of mother's hours of work: (+/-) ns

The only exception is for the word recognition test at age 12 for which compared to nonworking:

Mother's working 20+ hours per week: (-) 1%
Mother's working 1-19 hours per week: (+) 1%

Joshi and Verropoulou (2000)	NCDS children: 1730 individuals who were 5-17 in 1991; BCS, 9003 individuals (born in 1970)	<p>NCDS: Outcomes are measured in 1991 (when children were aged 5-17). Mother's employment is measured in the first 4 years of the child's life and in 1991.</p> <p>BCS: Outcomes are measured in 1980 (when children were aged 10). Mother's employment is measured in the first 4 years of the child's life (between 1970 and 1974)</p>	<p>NCDS: PIAT-M; PIAT-R; aggression; anxiety</p> <p>BCS Maths and reading tests scores</p>	Multi-level models and OLS (reduced-form production functions)	Other controls are: sex, age, number of older siblings, mother's education, mother's test scores (measured at age 7 of the child), mother's general ability (measured at age 11 of the child), housing tenure, family structure (in 1991)	<p>NCDS: Mother is employed in the first year of the child's life: PIAT-R: (-) 5%</p> <p>Mother's part-time employment when child aged 1-4 : Non-anxiety: (+) 5%</p> <p>BCS: No significant effect</p>
Liu, Mroz and Van der Klaauw (2002)	NLSY: 7164 children aged 5-15 in 1986 with up to six possible time-period specific observations per child	Outcome is observed between age 5 and age 15. Mother's employment refers to the two-year period before assessment	PIAT-M	ML (production function; structural estimation method)	Mother's employment variables: part-time and full-time employment variables (defined in terms of annual hours over the two-year period before assessment). Other variables: child's sex, race and age, mother's age, mother's marital status, mother's education, mother's AFQT score, plus	<p>Full-time work: (-) 1%</p> <p>Part-time work: (+) 1%</p>

					school-district level average characteristics (including high-school dropout rate, average teacher salary, and per child school-district expenditures), residential moves across 24 geographic areas over the two-year period before assessment (endogenous)	
Ruhm (2000)	NLSY: approximately 3000 child-mother cases, some with more than one observation per test	Outcomes are measured at ages 3-4 (PPVT) and at ages 5-6 (PIAT-M and PIAT-R). Maternal employment is measured over the first three years of the child's life	PPVT; PIAT-M; PIAT-R	OLS (reduced-form production functions; hybrid equations)	Three maternal employment variables: hours worked; proportion of weeks worked; weeks after birth of child until mother resumes employment. One paternal employment variable: father's average weekly work hours in years 1 through 3 of the child. Other controls: basic child, maternal and household characteristics (e.g., age, sex, and education) a host of other maternal, family and other characteristics (e.g., marital status, AFQT scores, poverty indicator, drug use, attitudes, birth weight, BMI) and maternal employment characteristics (including wages, occupation and hours)	Mother's labour supply during the first three years: PPVT: (-) ns PIAT-M: (-) 5% PIAT-R: (-) 5% Father's employment during the first three years: (+/-) ns (for all outcomes)
Waldfogel, Han and Brooks-Gunn (2002)	NLSY: 1872 children (903 non-Hispanic Whites, 582 non-Hispanic African American, and 387 Hispanics), who were	PPVT-R is measured at ages 3-4; PIAT-M and PIAT-R are measured at	PPVT-R; PIAT-M; and PIAT-R	OLS (reduced-form production functions; hybrid	Four measures of maternal employment status: employed during the first year of life; employed during the second or third year; employed after age 3	Mother's employment in the child's first year of life: Whites: PPVT-R: (-) 1% PIAT-M (ages 5-6): (-)

born between 1982 and 1989, and who could be followed from birth to age 7 or 8 in 1990, 1992, 1994 or 1996

ages 5-6 and ages 7-8. Mother's employment mainly refers to employment during the first three years of the child's life. It also refers to employment status after age 3 up to the year before assessment

equations)

up to the year before the assessment; currently working. Other covariates are: sex, presence of older and younger siblings, family income, ever in poverty, mother's age at birth, mother's education, mother's AFQT score, mother's marital status at year of child's birth, home environment score, child care type, child ever breast-fed

5%

PIAT-M (ages 7-8): (-)

1%

PIAT-R (ages 5-6): (-)

5%

PIAT-R (ages 7-8): (-)

5%

Blacks and Hispanics:

No effect

Mother's employment in the second and third year of the child's life:

Whites:

PIAT-R (ages 7-8): (+)

5%

African Americans:

PIAT-R (ages 7-8): (+)

5%

Hispanics:

PIAT-R (ages 5-6): (-)

5%

PIAT-M (ages 7-8): (-)

5%

Any employment after age 3-4:

Whites:

PIAT-M (ages 7-8):

(+) 5%

Blacks and Hispanics:

No effect

Currently working:

Whites:
 PIAT-M (ages 5-6): (-)
 5%
 PIAT-R (ages 5-6): (-)
 5%
 Blacks:
 No effect
 Hispanics:
 PIAT-M (ages 5-6):
 (+) 5%

^a NLSY = National Longitudinal Survey of Youth; NICHD-SECC = National Institute of Child Health and Human Development Study of Early Child Care; CHDS = Christchurch Health and Development Study (1977 New Zealand birth cohort); NCDS = National Child Development Study (1958 British birth cohort); BCS = British Cohort Study (1970 British birth cohort).

^b PPVT = Peabody Picture Vocabulary Test; PPVT-R = Peabody Picture Vocabulary Test-Revised; MDI = Bayley Mental Development Index; PIAT = Peabody Individual Achievement Test; PIAT-M = Peabody Individual Achievement Test Mathematics subtest; PIAT-R = Peabody Individual Achievement Test Reading subtest; BPI = Behaviour Problems Index; SPPC = Self-Perception Profile for Children; AFQT = Armed Forces Qualification Test; BMI = Body Mass Index.

^c OLS = ordinary least squares; SML = simulated maximum likelihood; ML = maximum likelihood.

^d (-), (+) = negative, positive effect; statistical significance level indicated (ns = not significant).

Table 2.2. Parental Employment and Children's Educational Attainment

<i>Study</i>	<i>Data source and sample(s)^a</i>	<i>Timing issues</i>	<i>Outcomes^b</i>	<i>Estimation method^c</i>	<i>Comments^b</i>	<i>Effect of parental employment on children's outcomes^d</i>
Ermisch and Francesconi (2002)	BHPS: about 1000 young adults (born between 1970 and 1981) matched to their mothers and, if present, fathers or stepfathers	Children's outcome is measured over the 1990s when children were aged 16 or more. Parental employment is measured from birth to age 15 of the child	Highest educational qualification (A level or more)	Logit and LP models; sibling-difference models (conditional demand functions)	Other variables: child's age and gender, mother's and father's education, birth order, whether respondent is the only child, age of the mother at birth, age of the father at birth, childhood family structure (ever in a lone-parent family and ever in a stepfamily), measures of occupational prestige for the mother and the father (averaged over the	Mother's part-time employment: Level estimates: (-) ns Sibling-difference estimates: (-) 10% Mother's full-time employment: Level estimates: (-) ns Sibling-difference estimates: (-) 5% (Stronger negative effects for children of less educated mothers)

		(and distinguished by child's developmental stage)			entire childhood of the child)	Father's employment: Level estimates: (+) 5% Sibling-difference estimates: (-) ns
Graham, Beller, and Hernandez (1994)	March/April CPS match file (including child support data): 5038 children aged 16-20 living with their mother in 1988	Outcomes are measured in 1988; maternal employment (measured by a dummy variable that is equal to one if mother works) is measured in 1987 and 1988	Five educational outcomes (including years of schooling completed, high school dropout, and entering college)	OLS and probit models (reduced-form production functions; hybrid equations)	Other controls: mother's education and age at the child's birth, nonintact family, child support receipt and eligibility, total family income, child support income, father's residence and visitation rights	Mother's work: (+) 1%
Haveman, Wolfe and Spaulding (1991)	PSID: 1258 children aged 0-6 in 1968, 19-23 in 1987	Outcome is measured in 1987; mother's employment is measured over the period 1968-1983	High school graduation by 1987	Probit models (reduced-form production functions; hybrid equations)	Other variables: sex, race, poor grandparents, parental time in preschool years, mother's and father's education, years in poverty, years in poverty interacted with AFDC, number of location moves, number of parental separations, number of parental remarriages, number of siblings, religion	Years mother worked: (+) 1%
Hill and Duncan (1987)	PSID: 854 youths living with parents, and aged 14-16 in 1968-1972 and 27-29 in 1983	Outcomes are measured in 1983 (when children were aged 27-29); determinants are measured in 1968-1972 (when children were aged 14-16)	Years of schooling	OLS (reduced-form production functions; hybrid equations)	Gender specific regressions. Other variables included are: father's and mother's education, father's presence, father's socio-economic status, number of siblings, large set of family income variables	Mother's work hours: For boys: (-) 5% For girls: (-) ns

Horwood and Fergusson (1999)	CHDS: 1265 children born in Christchurch (New Zealand) in a four-month period in mid 1977, followed from birth to age 18.	Scholastic ability (age 13); number of School Certificate passes (age 16). Mother's employment is measured either at the time scholastic ability was assessed or at age 14 (number of School Certificate passes)	Scholastic ability (TOSCA); School Certificate attainment	OLS (reduced-form production functions)	Mother's work is measured in terms of hours worked per week and distinguished four groups (0 hours, 1-19 hours, 20-39 hours, 40+ hours). Other covariates: child's intelligence, mother's age at birth, mother's education, family socioeconomic status, mother's ethnicity, family structure, child's birth order, family size, mother's emotional responsiveness	For both outcomes and all groups of mother's hours of work: (+/-) ns
Joshi and Verropoulou (2000)	BCS: 9003 individuals (born in 1970)	Outcome measured at age 26. Maternal employment is measured when the child was aged under 5	Highest educational qualification	OLS (reduced-form production functions; hybrid equations)	Gender-specific regressions. Other controls are: father's social class (at the child's birth), mother's and father's education, child's reading and maths scores at age 10, housing tenure, and free school meals	Mother's employment: For boys: (-) 5% For girls: (-) 1%
Kiernan (1996)	NCDS: 3300 men and 3300 women (born in 1958)	Outcome measured at age 33. Maternal employment is measured when the child was aged 16	No educational qualification	Bivariate analyses and logistic regressions (reduced-form production functions; hybrid equations)	Gender-specific regressions. Sample is also stratified by whether the child at age 16 lived with both biological parents or with a lone mother. Other controls are: mother's age and education; child's school performance at age 7, whether the child left school at age 16, and a measure of family's financial	Mother's nonemployment: For men: no effect For women (living with either both parents or lone mother): (+) 1%

					circumstances (when child aged 16)	
O'Brien and Jones (1999)	620 children aged 13-15, interviewed in 6 schools located in Barking and Dagenham (East London) in early 1994	Outcome measured at age 16. Maternal and paternal employment variables were measured once when children were aged between 13 and 15	Highest/lowest GCSE grades	Logit regressions (reduced-form production functions; hybrid equations)	Other variables included are: sex, race, religion, housing tenure, family structure, number of siblings, child's expectations about further education, child working, having a boyfriend/girlfriend, mother's and father's occupation, praising by mother, praising by father, joint activities with parents, presence of rules about going out at night and watching TV	<p>Low educational outcome: Mother's full-time work: (-) ns Mother's part-time work: (-) 5% Father's work: (-) ns</p> <p>High educational outcome: Mother's full-time work: (+) ns Mother's part-time work: (+) 10% Father's work: (+) ns</p>

^a CPS = Current Population Survey; PSID = Panel Study of Income Dynamics; NLSY = National Longitudinal Survey of Youth; NICHD-SECC = National Institute of Child Health and Human Development Study of Early Child Care; CHDS = Christchurch Health and Development Study (1977 New Zealand birth cohort); BHPS = British Household Panel Survey; NCDS = National Child Development Study (1958 British birth cohort); BCS = British Cohort Study (1970 British birth cohort).

^b AFDC = Aid to Families with Dependent Children; TOSCA = Test of Scholastic Abilities; School Certificate is the first of a series of national examinations in New Zealand that provide evidence of academic achievement and are a prerequisite to University entry (students typically sit School Certificate at around the age of 16 and may elect the number of type of subjects on which they wish to be assessed); GCSE = General Certificate of Secondary Education (UK certificate obtained after a national examination generally taken when the child is age 16).

^c OLS = ordinary least squares; SML = simulated maximum likelihood; LP = linear probability.

^d (-), (+) = negative, positive effect; statistical significance level indicated (ns = not significant).

Table 2.3. Parental Employment and Children's Other Outcomes

<i>Study</i>	<i>Data source and sample(s)^a</i>	<i>Timing issues</i>	<i>Outcomes^b</i>	<i>Estimation method^c</i>	<i>Comments^b</i>	<i>Effect of parental employment on children's outcomes^d</i>
Antecol and Bedard (2002)	NLSY: 15+ year olds. Sample sizes vary depending on the outcome (between 800 and 1300 children)	Children's behaviour is measured up until the end of age 14. Maternal employment is measured at age 15 of the child in terms of average weekly hours of work	Smoke regularly, drink regularly, being sexually active, use marijuana regularly, being convicted of a crime before age 15	Probit models (hybrid equations)	Other variables: gender, race, family structure (months with biological father), birth order, mother's education, and average net family income	Mother's average weekly hours of works: Smoking: (-) ns Sex: (-) ns Marijuana: (+) ns Conviction: (+) ns Drinking: (+) 10%
Ermisch and Francesconi (2001c)	BHPS: about 1000 young adults (born between 1970 and 1981) matched to their mothers and, if present, fathers or stepfathers	Children's outcomes are measured over the 1990s when children were aged 16 or more. Parental employment is measured from birth to age 15 of the child (and	Economic inactivity; psychological distress; childbearing (women only) by age 21	Logit models; sibling-difference models (conditional demand functions)	Other variables: child's age and gender, mother's and father's education, birth order, whether respondent is the only child, age of the mother at birth, age of the father at birth, childhood family structure (ever in a lone-parent family and ever in a stepfamily), measures of occupational prestige for	Mother's part-time employment: Economic inactivity: Ages 6-10: (-) 5% Psychological distress: Ages 0-5: (-) 5% Early childbearing (women only): Ages 11-15: (-) 5% Mother's full-time employment: Economic inactivity: Ages 11-15: (-) 5% Psychological distress: Ages 6-10: (-) 1% Ages 11-15: (+) 5% Early childbearing (women only):

		distinguished by child's developmental stage)			the mother and the father (averaged over the entire childhood of the child)	Ages 6-10: (+) 1% Ages 11-15: (-) 1%
Kiernan (1996)	NCDS: 3300 men and 3300 women (born in 1958)	Outcomes measured at age 33. Maternal employment is measured when the child was aged 16	In employment; ever-unemployed; owner-occupier; on income support; labour market earnings; net household income; partnership formation and dissolution; teenage motherhood	Bivariate analyses and logistic regressions (reduced-form production hybrid equations)	Gender-specific regressions. Sample is also stratified by whether the child at age 16 lived with both biological parents or with a lone mother. Other controls are: mother's age and education; child's school performance at age 7, whether the child left school at age 16, and a measure of family's financial circumstances (when child aged 16)	Father's employment: Economic inactivity: Ages 0-5: (-) 10% Psychological distress: Ages 0-5: (-) 5% Early childbearing: Ages 0-5: (+/-) ns Mother's nonemployment: For men: In employment: (-) 1% Ever-unemployed: (+) 10% Owner occupier: (-) 1% On income support: (+) 5% In lowest quartile of earnings: (+) 1% For women: Ever-unemployed: (+) 10% Owner occupier: (-) 1% On income support: (+) 5% In lowest quartile of net household income: (+) 1% Teenage motherhood (+) 1% (only for daughters of lone mothers)
Joshi and Verropoulou (2000)	BCS: approximately 9000 individuals (born in 1970), around 4700 women and 4000 men	Teenage motherhood (only for women) is	Teenage motherhood; unemployment	OLS (reduced-form production	Gender-specific regressions. Other controls are: father's social class (at the	Mother's employment: Teenage motherhood (women only): (+) ns

		measured before age 20. Unemployment is measured between school leaving and age 26 and the longest spell must be at least 4 months. Maternal employment is measured when the child was aged under 5	ent	functions)	child's birth), mother's and father's education, child's reading and maths scores at age 10, housing tenure, and free school meals	Unemployment: For women: (-) ns For men: (-) ns
Wolfe, Wilson, and Haveman (2001)	PSID, 873 women aged 0-6 in 1968 and aged 21-27 in 1989; and 720 women aged 8-12 in 1968 and aged 30-34 in 1989	Individuals are followed for 22 years (from 1968 to 1989). Outcomes are measured when individuals were teenagers, and mother's employment	Teenage nonmarital (or out-of-wedlock) birth	Probit models (reduced-form production functions; hybrid equations)	Other variables: race, mother's education, birth order, average number of siblings (ages 6-15), proportion of years lived with one parent (ages 6-15), average family income-to-needs ratio (ages 6-15), proportion of years in poverty (ages 6-15), proportion of time received AFDC	Mother's employment: (+) ns

is measured
when their
daughters
were aged 6-
15

^a PSID = Panel Study of Income Dynamics; NLSY = National Longitudinal Survey of Youth; BHPS = British Household Panel Survey; NCDS = National Child Development Study (1958 British birth cohort); BCS = British Cohort Study (1970 British birth cohort).

^b AFDC = Aid to Families with Dependent Children.

^c OLS = ordinary least squares; SML = simulated maximum likelihood; LP = linear probability.

^d (-), (+) = negative, positive effect; statistical significance level indicated (ns = not significant).

Table 2.4. Significant Effects of Parental Employment on Children’s Cognitive and Educational Outcomes – Selected Studies

Study, type of outcome, and timing of the employment measure	Mean outcome	Effect of:		
		Mother’s employment	Mother’s part-time employment	Mother’s full-time employment
Waldfoegel, Han and Brooks-Gunn (2002)				
First year of child’s life				
Whites:				
PPVT-R (ages 3-4) ^a	86.7	-3.23 (1.18)		-4.13 (1.22)
PIAT-M (ages 5-6) ^a	99.4	-1.96 (0.98)		-2.97 (1.02)
PIAT-R (ages 5-6) ^a	106.3	-2.28 (0.99)		-2.82 (1.01)
PIAT-M (ages 7-8) ^a	100.6	-2.88 (0.88)	-2.92 (1.22)	-2.85 (0.88)
PIAT-R (ages 7-8) ^a	104.1	-2.31 (0.99)		-2.53 (1.02)
Second and third year of child’s life				
Whites:				
PIAT-R (ages 7-8) ^a	104.1	2.41 (1.16)		
Blacks:				
PIAT-R (ages 7-8) ^a	104.1	3.80 (1.54)		
Hispanics:				
PIAT-R (ages 5-6) ^a	106.3	-3.44 (1.56)		
PIAT-M (ages 7-8) ^a	100.6	-3.68 (1.56)		
Third and fourth year of child’s life				
Whites:				
PIAT-M (ages 7-8) ^a	100.6	3.32 (1.30)		
Currently working				
Whites				
PIAT-M (ages 5-6) ^a	99.4	-2.32 (1.08)		
PIAT-R (ages 5-6) ^a	106.3	-2.12 (1.05)		
Hispanics				
PIAT-M (ages 5-6) ^a	99.4	3.59		

(1.65)

Ruhm (2000)

First year of child's life

PPVT (ages 3-4) ^b	0.00	-0.065 (0.027)		
PIAT-M (ages 5-6) ^b	0.00		-0.072 ^c (0.037)	
Second and third year of child's life				
PPVT (ages 3-4) ^b	0.00		0.081 ^c (0.036)	
PIAT-R (ages 5-6) ^b	0.00	-0.081 (0.029)		-0.091 ^c (0.042)
PIAT-M (ages 5-6) ^b	0.00	-0.059 (0.030)		-0.109 ^c (0.043)

Joshi and Verropoulou (2000)

Any employment (ages 0-5)

Highest academic qualifications (men) ^e	2.5	-0.12 (0.047)		
Highest academic qualification (women) ^e	2.5	-0.10 (0.039)		

Ermisch and Francesconi (2002)

Years of employment (ages 0-5):

Achieved A level or more (ages 18 or more) ^f	0.641		-0.039 (0.022)	-0.071 (0.028)
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Note: Standard errors are in parentheses.

^a These outcomes are measured in raw scores. The corresponding effects of mother's employment (again measured in scores) and deviations (-=negative; +=positive) from the means.

^b These outcomes are measured in standardised scores normalised to have a mean of zero and a standard deviation of one, that is, they are transformations, on an age-specific basis, of the raw scores (that were originally designed to have a normal distribution with a mean of 100 and a standard deviation of 15). The corresponding effects of mother's employment are changes measured in terms of a standard deviation rise (+) or decline (-).

^c These estimates compare the effect of part-time work versus no work.

^d These estimates compare the effect of full-time work versus part-time work.

^e These outcomes are measured on a 6-point scale where 0=no qualification and 5=degree. The corresponding effects of mother's employment are deviations (-=negative; +=positive) from the means.

^f These outcomes are measured in probability terms (computed at sample values). The corresponding effects of an extra year of mother's employment are marginal effects indicating the deviations (-=negative; +=positive) from the mean outcome.

Appendix 4.1

To give a brief outline of the modelling framework we will, for expository reasons, focus on the labour supply of single individuals. The extension to the labour supply of married couples is however straightforward. The individuals are assumed to choose among jobs. Each job is characterised by a wage rate w , hours of work h and other characteristics j . Examples of these other characteristics are commuting time to work, fringe benefits in terms of free parking place, how dirty the workplace is, etc. The individuals are assumed to choose the job that maximises his or her utility, given a budget constraint that transform gross income into net income, and given the opportunity set of the individual. Formally the labour supply model looks like the following:

$$(1) \begin{cases} \text{Max } U(C, h, j; Z) \\ \text{with respect to } \{h, w, j\} \\ \text{given} \\ C = f(wh, I) \\ \{h, w, j\} \in S \end{cases}$$

Here U is the (ordinal) utility level, C is net income equal to after-tax income, $f(\cdot)$ is a function that transforms gross income into net income, I is non-wage income and S is the opportunity set that the individual faces. Z is a vector that contains variable that affect preferences, like age, number of small children etc. Some of these variables are unobserved by the analysts. Non-working is of course an alternative. In that case $h=w=0$. The opportunity set also covers non-market opportunities.

To the analyst both preferences and opportunity sets are random. At best the analyst can derive the probability for the observed and assumed optimal choice of the individual, i.e. a job of type $\{h, w\}$. To obtain an expression for that probability one has to assume how the random element enters the utility function and how this random variable, a taste-shifter, is distributed across jobs for a given individual, and across individuals, given the job. Moreover we also have to deal with how opportunities should be specified and how the random elements here are distributed.

First, we assume that the utility function can be factorised as

$$(2) U(C, h, j; Z) = v(C, h, z) \mathbf{e}(h, w, j)$$

where $v(\cdot)$ is the deterministic part of the utility function, z is the vector of observed characteristics and $\mathbf{e}(\cdot)$ is the random variable measuring job or household characteristics unknown to the analyst. In $\mathbf{e}(\cdot)$ is assumed to be identical and independent distributed across jobs and

individuals. The distribution function is assumed to be the extreme value distribution function of type I. If the variance of the distribution of $\ln(\epsilon)$ is infinitely large, to the analysts the choices of the individuals seem to have been made at pure random. The economic variables entering the deterministic part of the utility function will then explain nothing of what we observe. At the other extreme, if the variance in the distribution of $\ln(\epsilon)$ is close to zero, then to the analyst all choices made by the individuals can be explained entirely by the deterministic part of the utility function. The individuals then make their labour supply choice according to what maximises their deterministic utility function. This latter extreme case is actually the approach taken in the so-called Hausman tradition, Hausman and Burtless (1978), Hausman (1980, 1981, 1985), Blomquist (1983,1992), Hausman and Ruud (1984), Arrufat and Zabalza (1986). The functional form of the utility function is specified so that hours supplied becomes a linear function of marginal wage rate and an income variable that captures the location of segments in a progressive tax structure. To get a stochastic relationship a parameter in the corresponding deterministic utility function is assumed to be random, with the justification that there is some unobserved heterogeneity in the individual labour supply responses.

Second, we represent the opportunity sets by a probability density. One can interpret this as follows. Imagine that an individual has access to jobs that can be given a three dimensional description like a box. Inside the box there are many cells, each of them characterised by three sides, which reflect offered hours, the wage rate and other attributes of a job. We assume that the individual knows his or her “box” containing job opportunities. But as analysts we do not. The probability density representation of the opportunity set is then like folding a wet blanket over the “box”. Now, there are many individuals, each with a different number of available jobs and of different types. The best skilled may have much bigger “opportunity box” to choose from than the less skilled. To capture this we represent the choice set S by imposing a probability density on the choice set S . Let $p(h,w;q)$ denote the probability density of jobs of type (h,w) . q is a vector of observed variables, like education and working experience, which reflects that the opportunities of individuals differ. The q -variables affect the moments in the probability distribution.

Our representation of opportunities allow for the fact that jobs with offered hours in a certain range are more likely to be found than other jobs. The clustering of offered hours in certain intervals may be due to the production technology of firms (in car production the workers have to be together at the same time, they cannot come and go as the wish) or due to the outcome of negotiations between employers and employees organisations. Many individuals are observed to rush till and from work at the same time. It would be strange to assume that this is due to the

preferences. However, this is assumed in the Hausman approach mentioned above and in van Soest (1994).

Moreover, our representation of opportunities also allows for wages to vary across jobs for the same individual. Again, in the Hausman approach, in van Soest (1994), but also in studies more similar to ours like in Dickens and Lundberg (1993), the individual has a fixed wage rate. Thus in these studies human capital endowments of the individual determine entirely his or her wage rate. This does not accord with more recent labour market theories, in which job-specific wage rates are due to efficient wages and wages determined in negotiations between the employers and employees associations. Wage dispersion among observationally identical workers seems also to be empirically supported, Krueger and Summers (1988) and Edin and Zetterberg (1992).

We observe the chosen h and w . From the assumptions made above we can derive the probability of the chosen job with these characteristics, (h, w) . For the proof we refer to Aaberge, Colombino and Strøm (1999).

Let $\mathbf{j}(h, w; I, z_1, q)$ denote this probability and let $v(C, h; z_1) = v(f(wh, I), h; z_1) = \mathbf{y}(h, w; z_1)$. Then we have

$$(3) \mathbf{j}(h, w; I, z_1, q) = \frac{\mathbf{y}(h, w; I, z_1) p(h, w; q)}{\sum_{x \geq 0} \sum_{y \geq 0} \mathbf{y}(x, y; I, z_1) p(x, y; q)}$$

Expression (3) is analogous to a multinomial logit model with the exception that the deterministic part of the outcome function of a particular choice, $\mathbf{y}(h, w; I, z_1)$, is weighted by the probability density of jobs with the characteristics (h, w) , i.e. by $p(h, w; q)$. The intuition behind eq. (3) is that the probability of the optimal choice, $\mathbf{j}(h, w; I, z_1, q)$, can be expressed as the relative attractiveness of jobs of type (h, w) , weighted by a measure of how available this type of job is, i.e. by $p(h, w; q)$. From the outline here we observe that all details of the tax and transfer system, however complex, can be accounted for in estimating the choice probabilities in eq. (3). To proceed with estimation one has to specify the functional form of the deterministic part of the utility function, i.e. the functional form of v , and hence ψ , and the probability density $p(h, w; q)$.

With regard to the functional form of the utility function we have employed (in all works referred to above), a rather flexible functional form. Depending on the value of the parameters the deterministic part of the utility function can be linear in consumption and leisure as well as log-linear in these two variables. Moreover, again depending on the parameters, it also allows for a labour supply that is backward bending. The latter means that the higher the wage rate is, the less the labour supply will be. If so, the income effects dominate over the substitution effects. In fact,

the functional form specification allows for the responses on wage rate to vary a lot across individuals, depending on their economic situation (the magnitude of w and I) and the characteristics z . The functional form can also yield a linear labour supply curve. As mentioned above this is the only form that the Hausman approach applies. The problem with a labour supply curve, which is linear in the wage rate is that by assumption the labour supply elasticity tend to increase with the wage rate. The linearity assumption thus imply that the higher skilled, with high wage rates, are more responsive than those with lower skills, and hence lower wage rates, see Røed and Strøm (2002) for a further discussion.

In the specification of the probability density of opportunities we will assume that offered hours and offered wages are independently distributed. The justification for this is that offered hours, in particular normal working hours, are typically set in rather infrequent negotiations between employers and employees associations, while wage negotiations are far more frequent in which the hourly wage tend to be set independent of working hours. Offered hours are assumed to be uniformly distributed, except for hours related to full-time jobs. Thus, this opportunity density for offered hours implies that it is far more likely to find jobs with hours that accord with a full-time position than jobs with other working loads. To account for the fact that the availability of any job at all may vary across say regions, the proportion of market opportunities may depend on where the individual lives say, in the Northern or Southern Italy. The wage rate is assumed to be lognormal distributed, with the expectation depending on individual characteristics.

It is beyond the scope of the chapter here to go into details about specifications of the model, estimation methods and estimation results. Instead we refer to Aaberge, Colombino and Strøm (1999) where the modelling and estimation method is explained and where empirical results for labour supply among married couples in Italy are given. In Aaberge, Colombino and Strøm (2000) similar estimation result for Norway, Sweden and Italy are given and compared.

A main and robust finding when our model has been estimated on data from different countries is that the leisure of a married woman, i.e. time spent on doing all kind of domestic work and pure leisure, increases with the number of small children in the household. The marginal utility of leisure for the married female is also typically a convex function of age, which implies that after she has reached around 35 years of age, marginal utility of leisure is increasing with age. Thus, when she is young and raises small children her supply of labour outside the home is negatively affected. When the period of having small children is over, then the age effect – like for men- starts to creep in and weakens the incentive to supply labour. Because of these effects, the recent drop in fertility in many countries, like in Italy, has had a positive impact on the labour supply among younger women. Now we will turn to a discussion of how labour supply respond to changes in

economic incentives. In the next section this will be done in terms of wage elasticities. In the subsequent chapter we will present some recent results on how labours supply is affected by tax reforms.

The model outlined above, and extended to cover the labour supply of married couples have been estimated on Italian household data from 1987 and on Norwegian household data for 1986, for a description of the data we refer to Aaberge, Colombino, Strøm (2000).

The wage elasticities are calculated in the following way. The level, say, of the husbands' wage rates are raised by one percent. Then the impact on participation as well as on hours worked, given participation is calculated. The same is done for one percent increase in the wage rate of the wife. To obtain the elasticities we have to perform stochastic simulations on the model. We use the model to calculate how the married couples make new supply decisions, given their preferences, budget constraint and opportunity sets. The reason why we need to perform stochastic simulations is the fact- alluded to above- that as analyst we do not observe all variables affecting preferences and opportunity sets. Thus we have to make draws from the distributions related to preferences and opportunities, for more details on this see Aaberge, Colombino, Strøm and Wennemo (2000). Given the responses of each individual we then aggregate over the individuals to get the aggregate elasticities. Table A1 reports these elasticities.

Table A1: Uncompensated aggregate labour supply elasticities. Italy 1987 and Norway 1986.

	Male elasticities				Female elasticities			
	Own wage		Cross wage		Own wage		Cross wage	
	Italy	Norway	Italy	Norway	Italy	Norway	Italy	Norway
Participation probability, all	0.046	0.170	-0.081	-0.030	0.654	0.370	-0.120	-0.120
10% poorest	0.053	1.890	-0.109	-1.040	2.837	1.850	-1.089	-1.440
10% richest	-0.010	0.030	-0.013	0.000	0.031	0.070	-0.122	-0.030
Hours supplied, given participation, all	0.007	0.110	-0.035	-0.050	0.078	0.540	-0.120	-0.120
10% poorest	0.021	0.290	-0.0170	-0.150	0.467	1.040	-1.410	-1.040
10% richest	-0.030	0.030	-0.015	-0.010	0.004	0.0120	-0.600	-0.060
Hours supplied in the whole population	0.053	0.280	-0.160	-0.080	0.737	0.910	-0.240	-0.240
10% poorest	0.075	2.230	-0.126	-1.180	3.441	3.090	-1454	-2.230
10% richest	-0.041	0.060	-0.029	-0.010	0.035	0.190	-0.181	-0.080

The third row from the bottom of Table 1 give the aggregate elasticity of labour supply in the whole population, which means that both the impact on participation and hours supplied, given participation is accounted for.

We first observe that all own wage elasticities are positive and that the labour supply in Norway is more elastic than in Italy, in particular for males. Apparently the Norwegian labour market is more flexible than the Italian labour market.

Second, we observe all cross wage elasticities are negative, which implies that say, an increase in the wage rate for males implies that the labour supply of his spouse goes down. This is due the income effect. The negative cross wage elasticities means that an overall wage increase give far weaker impact on labour supply, both for males and females, than partial wage increase for the two gender. For Italian males this counteracting effect is so strong that the male labour supply declines from an overall wage increase. Since overall wage increases normally are the case in an expanding economy, we observe that if labour supply is estimated on aggregate time-series we will pick up the impact on labour supply of overall wage rate changes. Those who do that report that the economic incentives on labour supply are weak, which for the reasons given above is a biased result.

From the two last rows of the table we observe that the labour supply of the 10% poorest are far more responsive to changes in economic incentives than the 10% richest. Thus a tax reform that aims at enhancing the efficiency of the economy should focus on the poorest rather than on the rich. For Italian males belonging to rich households we also observe that the impact on labour supply from an increase in the own wage rate is negative, which means that the labour supply curve is backward bending. Income effects dominate over substitution effects.

The upper part of the table shows that participation, in particular among the poorest, is by far more responsive than hour supplied, given participation, in Italy. The result for Norway is more mixed reflecting that Norwegian women with small children have more access to jobs with part-time working hours than Italian women. In Norway benefits during maternity leave is rather generous. The mother can stay home with the child for one to two years with a full pay, provided of course that she is employed before she gives birth to the child. In Italy the benefits during maternity leave is less generous. Moreover, the coverage of day care programmes for young children is higher in Norway than in Italy. Thus, in Norway compared to in Italy, it is easier for women to combine the raising of children and participation in labour market activities. Accordingly, female labour market participation is higher in Norway than in Italy. Although the young children can be kept in day care centres for many hours a day, the parents, and most often the mother, may prefer to let the children be in day care centres for some, but not too many hours. Consequently, Norwegian women with young children typically work part-time, while Italian women either are at home with children or do not have children at all and work full time. Because of this female participation in Italy is more responsive to changes in economic incentives than in Norway, while hours supplied, given participation is more responsive in Norway than in Italy. Higher wage rates or lower marginal taxes may then cause the Italian women to start working, and then working full time, while Norwegian women instead expand their hours of work in part-time jobs.

Three robust findings in empirical labour supply studies that accord with our findings are first that participation elasticities tend to be higher than elasticity of hours worked, given participation. Second, the labour supply of married women is far more elastic than for married men. Third, highly elastic labour supply among low-wage worker is confirmed in many recent studies. For some recent review of labour supply studies where these three robust findings are reported are Røed and Strøm (2002) and Blundell (2000). Of particular interest when it comes to the responsiveness of the low-wage workers is a randomised experiment in Canada, the Canadian Self-Sufficiency Project. Card and Robbins (1998) report an almost doubling of employment rates for person offered in-work benefits compared to a control group.

Appendix 4.2

Social welfare functions

The standard approach in evaluating tax systems is to employ a social evaluation or welfare function as the basic evaluating instrument. This function is commonly used to summarise the changes in (adult-equivalent) income/welfare resulting from introducing various alternatives to the actual tax system in a country. The simplest way to summarise the changes that take place is to add up the income/welfare differentials, implying that individuals are given equal weights in the social welfare function independently of whether they are poor or rich. However, if besides total welfare we also care about the distributional consequences of a tax system, then an alternative to the linear additive welfare function is required. In this study we rely on the rank-dependent social welfare functions that have their origin from Mehran (1976) and Yaari (1988)¹ and are defined by

$$(4) \quad W_k = \sum_{i=1}^n p_k \left(\frac{i}{n}\right) X_{(i)}, k = 1, 2, \dots,$$

where $X_{(1)} \leq X_{(2)} \leq \dots \leq X_{(n)}$ are the ordered (adult-equivalent) income or welfare levels of a sample of size n of the population, and $p_k \left(\frac{i}{n}\right)$ is a positive decreasing weight function². A preliminary problem to solve consists in computing income or welfare measures that can be compared across households. We use money-metric utility measures as explained in King (1983) and Aaberge, Colombino and Strøm (2001). Note that the weight function decreases less steeply when k increases, which means that the inequality aversion exhibited by W_k decreases with increasing k . As $k \rightarrow \infty$, W_k approaches inequality neutrality and coincides with the linear additive welfare function defined by

$$(5) \quad W_\infty = \frac{1}{n} \sum_{i=1}^n X_{(i)}.$$

It follows by straightforward calculation that $W_k \leq W_\infty$ for all k and that W_k is equal to the mean W_∞ for finite k if and only if the distribution function is the egalitarian distribution. Thus, W_k can be interpreted as the equally distributed (equivalent) level of equivalent income. As recognised by Yaari (1988) this property suggests that I_k , defined by

$$(6) \quad I_k = 1 - \frac{W_k}{W_\infty}, k = 1, 2, \dots$$

¹ Several other authors have discussed rationales for this approach, see e.g. Sen (1974), Hey and Lambert (1980), Donaldson and Weymark (1980, 1983), Weymark (1981), Ben Porath and Gilboa (1992) and Aaberge (2001).

² $p_k(t) = \begin{cases} -\log t, & k = 1 \\ \frac{k}{k-1} (1 - t^{k-1}), & k = 2, 3, \dots \end{cases}$

can be used as a summary measure of inequality. Actually, I_1 is equivalent to a measure of inequality that was proposed by Bonferroni (1930), whilst I_2 is the Gini coefficient.³

Note that each of the welfare functions W_1 , W_2 , and W_3 and the corresponding measures of inequality (I_1 , I_2 , and I_3) exhibit aversion to inequality. The essential difference between these measures of inequality is revealed by their transfer sensitivity properties. The Gini coefficient (I_2) attaches an equal weight to a given transfer irrespective of whether it takes place at the lower, the middle or the upper part of the income distribution, whilst I_3 assigns more weight to transfers at the upper than at the middle and the lower part of the income distribution, provided that the transfers are made between persons with a fixed difference in ranks. Roughly speaking, this means that I_1 exhibits very high downside inequality aversion and is particularly sensitive to changes that concern the poor part of the population, whilst I_2 normally pays more attention to changes that take place in the middle part of the income distribution. The I_3 -coefficient exhibits upside inequality aversion and is thus particularly sensitive to changes that occur in the upper part of the income distribution.

For a given sum of incomes the welfare functions W_1 , W_2 , and W_3 take their maximum value when everyone receives the same income and may thus be interpreted as EO-criteria (equality of outcome) when employed as a measure for judging between tax systems.

Equality of Opportunity as a benchmark for evaluation of social policy

For a given sum of income the standard social welfare functions take their maximum value when everyone gets the same income and may thus be interpreted as equality of outcome (EO) criteria when employed as measures for judging between alternative policy regimes, for example tax systems. However, as indicated by Roemer (1998) the EO-criterion is controversial and suffers from the drawback of receiving little support among citizens in a nation.⁴ This is simply due to the fact that differences in outcomes resulting from differences in efforts are in general considered ethically acceptable and thus should not be the target of a redistribution policy. An egalitarian redistribution policy should instead seek to equalize those income differentials for which the individuals should not be held responsible, because they were beyond their control. Problematic life conditions or events - whether concerning employment, health, housing etc. - typically originate from a mixture of bad opportunities, bad luck and "wrong" decisions.

Social policies can affect the number and the quality of opportunities, the probability of unlucky events, and also the appropriateness of decision-making by providing information upon

³ For further discussion of the family $\{I_k : k=1, 2, \dots\}$ of inequality measures we refer to Mehran (1976), Donaldson and Weymark (1980, 1983), Bossert (1990) and Aaberge (2000, 2001).

⁴ See also Dworkin (1981a, 1981b), Arneson (1989, 1990), Cohen (1989) and Roemer (1993).

available choices and counseling on good procedures for learning and processing information. In order to design good social policies one has to disentangle as far as possible the contribution of opportunities, chance, preferences and decision-making ability to the individual labour market successes. Thus, not only the outcome, but its origin and how it was obtained, matters. This is the essential idea behind Roemer's (1998) theory of equality of opportunity where people are supposed to differ with respect to *circumstances*. Circumstances are attributes of the environment of the individual that influence the earnings potential of the individual, and which are "beyond his control". Thus, as distinct from the standard utilitarian EO approach Roemer's (1998) EOp approach is non-welfarist; one need to know the efforts expended by the individuals and not simply the outcomes they enjoy under them.

Assume that $X_t(\frac{i}{n_t})$ is the income (or welfare) level of the individual with rank i in the income distribution of type t , where $i=1,2,\dots,n_t$ and $t=1,2,\dots,r$, i.e. $X_t(\frac{1}{n_t}) \leq X_t(\frac{2}{n_t}) \leq \dots \leq X_t(\frac{n_t-1}{n_t}) \leq X_t(1)$ for $t=1,2,\dots,r$. The differences in incomes within each type are assumed to be due to different degrees of effort for which the individual is to be held responsible, whereas income differences that may be traced back to circumstances are considered to be beyond the control of the individual. As indicated by Roemer (1998) this suggests that we may measure a person's effort by the quantile or relative rank (i/n_t) of the income distribution where he is located. Next, Roemer declares that two individuals in different types have expended the same degree of effort if they have identical relative positions (relative rank) in the income distribution of their type. Thus, an EOp (Equality of Opportunity) tax policy should aim at designing a tax system such that $\min_t X_t(q)$ is maximised for each quantile q . However, since this criterion is rather demanding and in most cases will not produce a complete ordering of the tax systems, a weaker ranking criterion is required. To this end Roemer (1998) proposes to employ as the social evaluation function the average of the lowest income at each quantile,

$$(7) \quad \tilde{W}_\infty = \frac{1}{\min_t n_t} \sum_q \min_t X_t(q)$$

Thus, \tilde{W}_∞ ignores income differences *within* types and is solely concerned about differences that arise from differential circumstances. By contrast, the EO criteria defined by (4) does not distinguish between the different sources that contribute to income inequality. As an alternative to (4) and (7) we introduce the following extended family of EOp welfare functions,

$$(8) \quad \tilde{W}_k = \sum_q p_k(q) \min_t X_t(q)$$

where $p_k(q)$ is defined by (5).

The essential difference between \tilde{W}_k and \tilde{W}_∞ is that \tilde{W}_k gives increasing weight to the welfare of lower quantiles in the type-distributions. Thus, in this respect \tilde{W}_k captures also an aspect of inequality within types. As explained above, the concern for within type inequality is greatest for the most disadvantaged type, i.e. for the type that forms the largest segment(s) of $\{\min_t X_t(q) : q \in [0,1]\}$.

We may decompose the EOp welfare functions, \tilde{W}_k , as we did with the EO welfare functions W_k . Accordingly, we have that

$$(9) \quad \tilde{W}_k = \tilde{W}_\infty (1 - \tilde{I}_k), \quad k=1,2,\dots$$

where \tilde{I}_k , defined by

$$(10) \quad \tilde{I}_k = 1 - \frac{\tilde{W}_k}{\tilde{W}_\infty}, \quad k=1,2,\dots$$

is a summary measure of inequality for the mixture distribution \tilde{F} .

Expression (9) demonstrates that the EOp welfare functions \tilde{W}_k for $k < \infty$ take into account value judgments about the trade-off between the mean income and the inequality in the distribution of income for the most EOp disadvantaged people. Thus, \tilde{W}_k may be considered as an inequality within type adjusted version of the pure EOp welfare function that was introduced by Roemer (1998). As explained above, the concern for within type inequality is greatest for the most disadvantaged type, i.e. for the type that forms the largest segment(s) of the mixture distribution \tilde{F} . Alternatively, \tilde{W}_k for $k < \infty$ may be interpreted as an EOp welfare function that, in contrast to \tilde{W}_∞ , gives increasing weight to individuals who occupy low effort quantiles.

Note that the EOp criterion was originally interpreted as more acceptable—from the point of view of individualistic-conservative societies. Our extended EOp welfare functions can be considered as a mixture of the EO welfare functions and the pure EOp welfare function; they are concerned about inequality between types as well as inequality within the worst-off distribution. EOp looks at what happens to the distribution formed by the most disadvantaged segments of the intersecting type-specific distributions. Moreover, the pure version of the criterion only looks at the mean of the worst-off distribution. By contrast, EO takes into account the whole income distribution. For a given sum of incomes, EO will consider equality of income (everyone receives the same income) as the most desirable income distribution. The pure EOp will instead consider equality in mean incomes across types as the ultimate goal. Since the extended EOp combines these two criteria, transfers that reduce the differences in the mean incomes between types as well as the income differentials between the individuals within the worst-off distribution are considered

equalising by the extended EOp. Thus, in the case of a fixed total income also the extended EOp will consider equality of income as the most desirable distribution. However, by transferring money from the most advantaged type to the most disadvantaged type, EOp inequality may be reduced. Whether it is more “efficient” to reduce inequality between or within types depends on the specific situation. When labour supply responses to taxation are taken into account the composition of types in the worst-off distribution will change and depend on the chosen welfare function (\tilde{W}_k) as well as on the considered tax rule. Thus, the large heterogeneity in labour supply responses to tax changes that is captured by our model(s) makes it impossible to state anything on EOp- or EO-optimality before the simulation exercises have been completed.