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WOMEN AND TECHNOLOGY IN DEVELOPING COUNTRIES:

Technological Change
and Women's Capabilities
and Bargaining Positions



United Nations International Research
and Training Institute for the Advancement of Women
(INSTRAW)

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WOMEN AND TECHNOLOGY IN DEVELOPING COUNTRIES: TECHNOLOGICAL CHANGE AND WOMEN'S CAPABILITIES AND BARGAINING POSITIONS

Study prepared by Deborah Fahy Bryceson
at the request of UNCTAD and INSTRAW



**United Nations International
Research and Training Institute for the Advancement of Women
(INSTRAW)**

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Preface

The United Nations International Research and Training Institute for the Advancement of Women (INSTRAW) aims to promote through research, training and information activities, the full participation of women in the development process. This requires that the Institute monitor closely the current debate on development and international economic relations, and participate in the ongoing search for meaningful ways to address development issues in order to contribute through its work to the fulfillment of the objectives of the International Development Strategy for the Third United Nations Development Decade.

Pursuant to the search for solutions to development problems arising from the present world economic situation, it has been found necessary to study the impact of this situation on the role of women in the development process focusing on the interdependence between the international and national levels of the economy, thereby helping in taking into account women's participation and requirements in development processes.

In the course of developing this idea, INSTRAW undertook numerous activities, including a brainstorming session, which was organized at United Nations Headquarters on 25 July 1982 to solicit views of the specialists on the subject from within and outside the United Nations and a review of United Nations resolutions and decisions relevant to the status of women and their role in development, particularly, those adopted by the General Assembly, the Economic and Social Council and the Commission on the Status of Women, in order to determine the areas which needed further in-depth study.

As a result of surveying the area of women and development, it was found that the aspects to be further developed are: a) to review and analyze the present model of development and different approaches and concepts so far used in these development strategies; b) to identify the economic dimension of actual development theories and approaches especially where they merge into the social perception of the work and life of women; c) to assess the benefits and losses to women that derive from the economic and social changes in present-day society; d) to examine the linkage between the international and national dimensions, taking into consideration the economic, social and cultural aspects as they relate to women, e) and to examine problems emerging from the world economy and influencing national economic and social policies which affect the role, status and well-being of women.

The Board of Trustees of INSTRAW at its Third Session in January 1983 decided that the Institute should conduct a series of research studies on the role of women in international economic relations, concentrating particularly on the analysis of the interlinkages between the macro and micro economy and their impact on the role and status of women.

In this respect, the United Nations General Assembly requested that the Institute's activities continue to contribute to the full integration of women in the mainstream of development and that due attention be given to the interdependence of the micro and macro levels of the economy and its impact on women's role in the development process.

This programme has, therefore, been carried out by the Institute in two successive phases. The first phase consisted of the preparation of a series of research studies on industry, trade, agriculture, technology and money and finance, examining the interlinkages between the macro and micro economy and their consequent impact on women in collaboration with a number of internationally renowned academic and research institutions. The second phase consists of a number of meetings including a high-level meeting of eminent personalities to review the studies and to consolidate them into a publication of women in international economic relations.

In preparing these studies, the Institute drafted jointly with the collaborating institutions and individuals the outline of the studies, reviewed the various drafts of the studies and convened a consultative meeting in September '84 of the authors of the studies and experts in international economic to review and finalize the studies.

This study entitled, "Women and Technology in Developing Countries: Technological Change and Social Definitions of Women's Capabilities and Responsibilities" prepared under this subprogramme by INSTRAW in collaboration with the United Nations Conference on Trade and Development (UNCTAD), supplies empirical evidence to the women and technology issue by considering women with respect to technology in its wider sense, i.e. objects, techniques, skills and processes which facilitate human activity in terms of: first, reducing human energy expenditure; second, reducing labour time; third, improving spatial mobility; and fourth, alleviating material uncertainty. Moreover, it examines the social constraints exerted on women's relationship to technology through the social institutions of households, community, market, and state.

The views expressed in this study are those of the author, Deborah Bryceson, of St. Anthony's College, Oxford, to whom INSTRAW wishes to express its gratitude for her collaboration in the preparation of this work.

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Part I

Introduction: Women, Technology and Society

Technological Change in Developing Countries

Over the past century, technological advances have been undermining the traditional lifestyles and institutions of rural-based societies throughout the developing world and engendering new forms of livelihood, consumption patterns and social values. Men and women, old and young alike have been affected, although not all in the same way. This paper's aim is to consider how and why the experience of technological change is sexually differentiated.

In the context of the world market and the nation-state, developing countries have both imported and developed new technologies at an accelerating rate during the twentieth century. Now, even remote rural areas are at least tangentially involved in commodity production, wage labour and in the purchase of manufactured consumer goods.

Developing countries are experiencing tremendous structural change. A process of de-agrarianisation is underway whereby proportionately fewer and fewer people are engaged in agricultural production. De-agrarianisation is not new to the world, but the rate at which it is taking place in developing countries far exceeds that of 18th and 19th century Europe. Furthermore, de-agrarianisation in developing countries is happening at a time when a process of de-industrialisation is being experienced in the developed countries with consequences for developing countries' choice of technology. The competitive forces of the world market, foreign aid packages and the demonstration effect of the developed countries, have usually led developing countries into adopting capital-intensive production techniques. Thus the labour absorption capacities of industries in developing countries are far less than those prevailing in Europe a century ago.

How Women are Perceived in the Process of Technological Change

In scanning the literature on women and technology in developing countries, one is struck with how little there is directly on the topic, in marked contrast to the wealth of material that has appeared on the more general subject of women and work, (see bibliography).

Facets of the inter-relationship between women and technology are covered in the literature on women and work, but only in passing. Recently, however, three edited collections have appeared: Dauber and Cain (1979), D'Onofrios-Flores and Pflafflin (1980) and Ahmed (1983), which concentrate on the technology theme with specific regard to the effects of the Green Revolution on women's role in rural production; second, the labour-saving potential of appropriate technology on rural women's work and third, the employment of female labour in off-shore, labour intensive industries, especially that of micro-electronics and textiles.

There seems to be a large measure of consensus amongst the various authors. Above all, technological change is seen to be having the effect of displacing women in the labour market, both in agriculture and industry. Secondly, it is argued, that women in rural households do not have access to technology, because they do not have one or another of the following: the knowledge of available technology, the purchasing power or credit to obtain it, the skill to use it and the decision-making power over the proceeds derived from its use (Agarwal 1981, Kelkar, Cain 1981, Dey 1982, Ventra-Dias 1983).

In critiquing the existing women and technology literature, it must be noted that to date the

literature deals mostly with the issue of technology adoption and does not provide adequate coverage of technological invention and its maintenance and operational control. Only the 'appropriate technology' segment of the literature has given these aspects any consideration. There are also huge gaps in coverage. Between the landless woman in Bangladesh whose wage labour opportunities are displaced by Green Revolution technology, and the young girl working in a clothing factory in Mexico, or a micro-electronics firm in Singapore, there are countless aspects of women and technology that remain undocumented. To a large extent the literature is limited by the way 'technology' is defined. Almost all the authors portray technology as discrete technical hardware or mechanised techniques or production rather than considering the industrialisation/de-agrarianisation process as a whole. Furthermore, only rarely is there any consideration of technology in a non-production context.

The authors generally agree that it is not technology per se that is causing women's declining status, but rather the impact of male domination on technology usage which is the root of the problem. But in almost all the literature, male domination in its cultural and institutional sense, is treated as an historical given fact. Having identified the extent and incidence of the edge that men have over women in the acquisition and control of technology, the analyses rarely offer an in-depth dissection of its nature, nor is there an explanation of its ubiquity throughout the world regardless of variation in cultures and economic and social institutions. Few venture to predict future tendencies or possible consequences if the gap between the sexes' technology usage continues to widen, as is likely. In other words, the literature to date is primarily descriptive. A willingness to delve deeper is vital to understanding the inter-relationship between technology and women's social and economic status.

Perhaps Boserup, more than any other has demonstrated that willingness. She has placed women's social and economic roles in the context of demographic and technological change. Since women are the prime decision-makers in demographic change and, as the literature has argued, are isolated from decision-making in technological change, the crux of women's dilemma and deteriorating status may well be in the convergence of demographic and technological change both at the levels of the individual and the social aggregate.

Focus of the Paper

This paper takes as its working hypothesis that it is only when women's socially defined roles and bargaining positions are trace vis-a-vis the prevailing patterns of production and human reproduction and the inter-relationship between demography and technology is highlighted, that the issue of women and technology can be understood holistically.

The purpose of this paper is to consider women with respect to technology in its wider sense, i.e. objects, techniques, skills and processes which facilitate human activity in terms of: first, reducing human energy expenditure, second, reducing labour time, third, improving spatial mobility and fourth, alleviating material uncertainty. Because women's relationship to technology is mediated by social constraints which are exerted primarily through the household, community, market and state, the four social institutions will be the categories through which women's relationship to technology will be discussed. Furthermore, women's relationship to technology will be considered with respect to technology adoption, maintenance and control, and invention in the process of de-agrarianisation, industrialisation and urbanisation.

Section II will provide a brief discussion of the underlining social values, material circumstances and social institutions which determine women's relationship to technology. In this section and throughout the paper special emphasis will be placed on the effects of technological change on women's human capabilities' and 'bargaining positions'. These are theses that have been elaborated in a preceding INSTRAW/UNCTAD paper by Amartya Sen (1984) entitled 'Women, Technology and Sexual Divisions'. Sections III through, will cover women and technology in the social institutions of the household, market and state respectively. Section VI will conjecture about the possible changes in women's relationship to technology in the future. Section VII is a summary and conclusion.

Part II

Technology, Human Capability and Society

Defining Technology and Realms of Human Capability

In this paper 'technology' is defined as objects, techniques and processes which have arisen from the application of human understanding and knowledge of matter and that serve to enhance human capabilities (see Sen 1983a,b,c for a discussion of 'capability'). 'Human capabilities' denote not only an individual's physical and mental capacities but also the social freedom for pursuing one's capacities. An individual's 'bargaining position' denotes the relative strength of the individual in exerting control in social decision-making and self-determination. It is a measure of one's social freedom. A good bargaining position is usually a precondition for realizing the potentiality of one's human capacities to a level of personal fulfillment.

The realms of human capabilities which are enhanced by technology are not only production, but also, human reproduction, exploration and destruction. The effects that technological development has had on these realms during the twentieth century are practically endless. Technology's effects on human capabilities are objective in nature and yield objective benefits and costs, but social rather than objective forces determine who uses the technology and who benefits. The unequal bargaining positions between men and women lead to technology's differential effects on each sex. At the root of these unequal bargaining positions is the delineation of female and male spheres of human capabilities.

The Social Delimitation of Female and Male Spheres of Human Capability

One of the most profound characteristics of the realms of human capability is their sexual asymmetry.

Human reproduction, i.e. childbearing, childrearing and physical and emotional maintenance of human life is a primarily female sphere of human activity. Men's participation in human reproduction activities is tangential and recreational in character both with respect to sexual activity and childrearing. In sexual activity men often treat women as recreational objects and men's involvement in childrearing is along the line's of a part-time hobby that they do in their leisure time off work. Women are held responsible for the immediate physical and emotional needs of children. The primary social value ascribed to women under these circumstances is, not surprisingly, social responsibility.

In production, women are usually expected to shoulder all 'transformation work', otherwise known as 'domestic labour' in the literature on women's position in developed capitalist societies. This involves all activities aimed at transforming goods and services into a directly consumable form for household consumption, i.e. cooking, shopping, house cleaning, and in a developing country context, many more, e.g., collecting firewood and water, processing agricultural produce for home consumption, etc. In some societies, men refrain from ever doing any household tasks of this nature.

Women's role in production other than transformation work varies a great deal throughout the developing world. The recent proliferation of material on women and work has provided ample evidence of women's role in household subsistence food production, cash crop production, crafts, trade, and informal self-employment (Bay 1982, Beneria 1982, Goldschmidt-Clermont 1982, ILO 1982a, Ahmad and Loutfi 1981 and Boserup 1970). On the other hand formal wage

employment in most developing countries is the preserve of men (UNIDO 1981 and 1983, Papola 1983 and Shields 1980).

While there has been an abundance written on women and work, far less has been done to document the hows and whys of women's relative absence in exploration and destructive activities. The male domination of these realms is the counterweight to women's hegemony in human reproduction. It is in these areas that men's prescribed social values are derived and their 'perceived contributions' (Sen 1984) are made. Individual creativity and courage are 'manly' virtues. Creative human endeavours in sports, art and invention are primarily male. Courage is a virtue which is associated with war combat. It is ironical that taking human lives is viewed as courageous whereas the converse, the act of giving human life at childbirth, which also involves human pain and suffering, is rarely depicted as courageous. Rather childbearing is often depicted as the human activity most at one with the animal kingdom (O'Brien 1981).

What does it mean to say that the pattern of male and female spheres of human activity just outlined above is a product of male domination? Is that not a description of the pattern rather than a reason for its being? And if that is the case then what is the causative force? Have the sexually-specific normative values been the force behind the creation and perpetuation of this pattern through time and space?

It is highly unlikely that the force of normative values alone could bring about such a dramatic and ubiquitous ordering to human life. It is even more unlikely that men through the ages, could have maintained such a favourable set-up by threat and insidious social control, and with such complete success in the light of the equal intelligence levels of the sexes. What, therefore, is the reason for sexual asymmetry in the spheres of human capability?

The answer lies at the level of material causation. Historically, the time and physical energy that women expended in pregnancy, childbirth and lactation, impinged on their participation in other realms of human capability in a very physical sense. At earlier stages of development, when both mortality and fertility rates were higher than those that now prevail in developing countries, most of women's adult lives were spent in either a pregnant or lactating condition. Not only did they have more pregnancies but they also died younger, thereby reducing the time and energy they could devote to the other realms of human activity.

Thus the sexual division of labour has had a material basis, which continues to be profoundly influential in today's developing countries because fertility rates remain relatively high and life expectancies are lower than in developed countries. There is, however, considerable evidence that women's productive and reproductive strategies intersect, producing the coincidence of particular fertility patterns with particular female productive patterns (Mueller 1982 and Youssef 1982). But there is no neat negative correlation between fertility and female economic activity rates.

While broad tendencies in the changing pattern of women's participation in production and reproduction can be identified, these tendencies, are mediated by particular cultural configurations, namely the specific form and content of the household, market and state. In Sections III through V women's and men's relationships to technology will be examined vis-a-vis these three social institutions. In addition, the sexually-specific values of female social responsibility and male individual creativity will be juxtapositioned and evaluated for their possible significance to male control over the invention, adoption, and maintenance of technology. Finally, the relative bargaining positions and human capabilities of the sexes will be discussed in relation to material welfare.

Part III

The Household, Women and Technology

In this section, women and technology will be considered in the context of the household. The 'household' will be taken to mean a residential grouping, sharing a common 'cooking pot' and/or common budget. Even with this limited definition, the household is a problematic term; not only do households vary in structure, but also in function, often with household members resorting to participation in other groupings for some of their production and consumption functions (Oppong 1979). Nonetheless, the household is an identifiable social institution in all developing societies, serving to a greater or lesser extent as an unit of human reproduction, production, recreation, consumption, investment, etc.

In a schematic fashion, three main types of households will be outlined: first, the rural land-owning, subsistence and/or commodity-producing household; second, the rural landless or urban informal sector household; and third, the urban formal sector wage-earning household. These three types are intended to represent the most common differences between households based on rural/urban residence and household endowments of land and labour, and admittedly abstract from the complexity of different household characteristics found in developing countries.

The Rural Asset-holding Household

Households of this type are the most comprehensive in their functions, serving as units of production, transformation work, human reproduction, consumption, recreation, investment and social security. Women's activities in such households center around human reproduction, production and transformation work. While human reproduction and transformation work are solely female activities, women's participation in agricultural subsistence and commodity production, is part of a larger household effort which is usually dominated by male heads of households.

Technological adoption by and/or for the benefit of women in rural land-owning households is potentially very promising and in practice very disappointing. As Whitehead (1983:3) points out, it is usually the technological innovations which are introduced into the rural production system as a whole, rather than those specifically direct at women, which have the greatest impact on women's lives, e.g. feeder roads, water and electricity supplies, etc. Elmendorf (1981) documents the effects of the opening of a feeder road and the inauguration of a regular bus service, on young women in a Mexican village. The young women gained mobility and new role identifications which changed their productive activities as well as their fertility pattern.

There is a wide array of technological devices that could reduce women's labour intensive activities in transformation work, e.g. for food processing: grinders, graters, oil extractors, improved stoves, solar cookers, low cost refrigeration; for water supplies: pumps; for transport: handcarts, wheelbarrows, etc. (Carr 1983a and Tinker 1981). Often these 'appropriate technologies' have met with less-than-hoped-for success because of limited dissemination, limited access or poor design. While the male bias in the society overall generates insensitivity to women's needs, the failure to disseminate the existing suitable technology, is largely attributable to male domination of the agricultural extension services. Most extension officers in sub-Saharan African countries are male and they are generally found to be focussing their efforts solely on male farmers (Fortmann 1981, Staud 1978a,b, Seidman 1981 and Tadesse 1982).

Even in regions where rural women work longer hours than men and are more active in field

production, the introduction of new production technologies has tended to be directed solely at men. Often new production technologies have imposed severe strain on women's workloads. When a woman's labour time is reduced by a new technological adoption in a particular task, the structure of her household responsibilities may not afford her increased leisure or consumption; another household member may usurp her gains. Furthermore, in view of women's simultaneous execution of multiple tasks, technology aimed at lightening a specific task might not reduce a woman's total labour time (Ahmed 1983).

Technology in the area of human reproduction has perhaps made the most profound impact on women. Infant mortality rates have drastically declined the world over. Less prevalent, but of growing importance, is the use of modern birth control techniques, which are especially appreciated in those parts of the developing world where rural population densities are high, and additional children often means the fragmentation of land holdings to unviable sizes. Improved health facilities lead to less pregnancy wastage and higher life expectancies affording women more energy to devote to other activities.

With the limitations women face in adopting new technology, it comes as no surprise that women are rarely involved in maintenance and control of technology (Hemmings-Gapiham 1981). Part of the limitations they face arise out of the rural setting per se. For example, often there is no one in the village, male or female who can repair a broken down water pump, a malfunctioning radio or a lorry.

As for inventions, little official encouragement is given to village inventors, let alone female village inventors. One exception to this situation is the effort presently being made by CHANGE, the London-based Science Policy Foundation newsletter, to identify inventions by rural people in developing countries by sponsoring a competition.

Where craft traditions are weak, the rural inhabitants are subject to a technicist attitude in which technical expertise is made synonymous with outside intervention. Even 'appropriate technology' represents initiatives by outsiders. Outsiders have only a simple awareness of what is generally needed, and a not very thorough knowledge of available local materials and the intricacies of the cultural, social and economic environment.

The maintenance of technology that does take place on the part of the villagers, is usually dominated by men, whose broader range of experience outside the village and superior literacy and education levels, place them in a position of knowing or at least appearing to know.

Turning to the question of welfare, both that of women and the household as a whole, and conceptualising the household arrangement as a bargaining problem (Sen 1984), it is necessary to consider briefly women's household endowments, entitlements and responsibilities. Women's endowments, their labour power, that of their children and the property that they can lay claim to, are, of course affected by technological change. Women's labour power benefits from technological developments in the realms of production and human reproduction as outlined in the previous pages.

Their children's labour power is changing in nature. On one hand, children's mortality rates are declining. Thus each child becomes a surer source of labour power. In terms of the household's traditional child labour needs, children are especially important in assisting women in transformation work, cooking, fetching water and firewood, etc. On the other hand, the rural household's experience of technological development, has often engendered an appreciation of the value of education for children as a stepping stone to non-agricultural employment. Children's schooling detracts from the time they can devote to household production.

The severe restrictions on women's property rights under patrilineality, the social structure that prevails in much of the rural areas of developing countries, especially Latin America and most parts of Asia, are well-documented (e.g. Sharma 1980 and Hewitt de Alcántara 1979).

Interestingly, areas which had usufruct rights over land, and which therefore gave women freer access to land, are going the way of patriarchy, as large-scale agricultural production, green revolution technology and the beginnings of a market in land surface (Hanger and Moris 1973, Agarwal 1981 and Boserup 1970). In so doing women's independent productive capacities are being undermined. This tendency is of growing significance, especially in Africa.

Despite the changing structure of women's endowments, household responsibilities are not being redefined by the community. In contrast, male endowments are being enhanced, usually in inverse proportion to women's loss, while men's perceptions of their responsibility to the household are changing under the effects of greater participation in secular activities of the market and the state. A man may evade the pressure of community-defined norms regarding male responsibilities, by adopting an attitude of individualism encouraged by opportunities in the wider society.

Conversely, household prosperity arising from the adoption of green revolution technology, may instigate what at first sight looks like a heightened sense of familial responsibility. Prosperous men have their wives go into purdah, relieving the women of doing agricultural field work. But the rationale behind such action is often the man's desire for enhanced social status. Purdah is a status symbol in some countries (e.g. North India and Pakistan) and advertises the fact that the male household head does not need to have his women toiling in the fields (Shaheed 1981).

Under the pressures of rapid technological change and lack of concurrent and conducive social change, severe strains are felt in the household. In the event of marital break-up, a woman usually has few claims on property and her 'fallback position' (Sen 1984) can be very unattractive. In many rural societies, she is expected to return to her own family, sometimes having to live with a cloak of disgrace and material deprivation. Nonetheless, the persistence of the extended family and her relative proximity to it, does give her some fallback security however socially demeaning it may be.

The Transitional Informal Sector Household

This household category reflects an amalgam of different tendencies in the transition from rural to urban residence and employment. It is a residual category in the sense that it represents those households which are neither materially secure in a rural or an urban setting. Without sufficient land or capital, the household's endowments are meagre. Its main and often only endowment, is the labour power of its members. As a result it does not have as many functions as the previously considered household category. The transitional informal sector household, found in either rural or urban areas is a unit of human reproduction, consumption, and transformation work, but not always a coherent unit of production, and rarely a unit of accumulation and investment activities, because of its existence on the border of mere survival.

In these households, financial necessity often compels women to become direct participants in the local labour and commodity markets (e.g. Chatterji 1984). Alternatively, the women may be engaged in a putting-out system of production which involves assembly production of goods within the home, using externally-provisioned inputs. Frequently, the putting-out system of production prevails in areas where purdah is practiced.

The transitional informal household is similar to the rural asset-holding household in the sense that household members' labour power is a productive endowment that yields returns even during childhood. Thus there are social pressures and economic incentives on women to bear many children, even though they may be living in a highly commoditized rural or urban context in which children's consumption needs have to be purchased. In cost/benefit terms, however, children are calculated to earn more for the household than they consume (Mueller 1982, Young 1978, Youssef 1976 and Peek 1975).

This type of household is economically very vulnerable. The maximizing strategies of the

household produce a meagre outcome for the aggregate. Highly competitive, overcrowded informal labour markets are characterized by below subsistence 'bachelor' wages.

It becomes imperative for as many members of the household as possible to engage in cash-earning activities, and through incremental contributions households and the social control exerted over them in the labour process, not only by the male head of household who often oversees the work and pockets the earnings, but also by the outside merchants/contracting agents who choose remote rural villages where they are assured of a labour force acceptant of extremely low wages and bad conditions of work (Mies 1982 and Bhatta 1980).

Generally in informal sector work, and especially in the putting out system, women work in labour-intensive enterprises at wages so low that employers can refrain from investing in more productive, capital-intensive technology. When wages rise or the costs of capital investment in new technology declines, the introduction of labour-displacing technology usually follows. This tendency will be discussed in more detail in Section V dealing with the labour market.

At this point the reader may have already anticipated many aspects of women's and households' welfare under the above mentioned social changes. Household welfare is essentially the adequacy of consumption and the means by which households provision their material needs. Women play both a direct and indirect role in household welfare. Directly, they along with male household members, contribute as household income earners. Indirectly, in their role as childbearers, they endow the household with its main marketable asset: labour power.

As mentioned earlier, high fertility in a rural or urban setting where commodity exchange is well developed can be an asset or a hindrance to household welfare. Child wage labour increases the likelihood of the child being cheap labour for the rest of his/her life since schooling and formalised skill training has to be sacrificed for the immediate earning power of the child. In the long term, the occurrence of technological change, with its tendency towards displacement of unskilled labour, does not auger well for high fertility as a household survival strategy vis-a-vis the labour market.

The instability of the household gives rise to a high incidence of female-headed households. The proportion of female heads of households is rising rapidly in many places. Between 1960 and 1970, the proportion of such households increased by a third in Morocco and doubled in Brazil. Using census data for 74 countries, Buvinic and Youssef (1978) calculated that the percentage of potential household heads who are women, among total potential household heads, averaged 18%, ranging between 10% and 48% for individual countries.

Female-headed households in the informal sector not only do not have capital or land, but also in the absence of adult male labour which can usually earn higher incomes than female and child labour, they occupy an exceedingly deprived position. Buvinic and Youssef found female headed households being heavily weighted in the lowest income brackets: for example, in Guayaquil, Ecuador, a survey revealed that 37.5% of the female-headed households, as opposed to only 17% of the male-headed households, constituted the lowest income groups. In the Brazilian city of Belo Horizonte 41% and 26% of female and male headed households respectively were at poverty levels (Buvinic and Youssef).

Even when an informal sector household has a male adult, the long-term welfare of the household is far from secure. These households receive the full force of commodity and labour market uncertainty with little cushioning from state welfare programmes. As income earners, household members are embarked on a co-operative welfare strategy for their mutual benefit, but there can be a tendency for individual members to want to opt out under pressure. This is especially true for men, who, according to the socially prescribed notions of male household responsibility in so many developing countries' cultures, are supposed to be their families' main support. But such notions originated in rural patrilineal societies where the male head of household had command over land and other material resources, i.e. the endowments of a rural

land-owning household. The fact that the household no longer occupies this situation, and membership in the formal wage labour force proves elusive, is at the root of the informal sector household provisioning problem.

Since divorce and household break-up is not uncommon, the fallback position of women is often resorted to. While they have so little to 'fall' from, the fallback position, might be thought of as an option that is not necessarily detrimental to household welfare. But this attitude overlooks the fact that so often the fallback position for women in the transitional informal sector household is like a plunge into the vacuous unknown. The women often do not have the traditional fallback, i.e. the natal family. A woman's natal family is often separated from her by distance or by its own economic hardship which does not put it in a position of being able to help a grown daughter with children.

Being part of the informal sector the woman does not have a pension or state social security programmes, if they exist, to draw from. In most cases, she has only herself to rely on and her strategies under these circumstances revolve around either sinking into emiseration on the low earnings she and her children can scrape together; or resorting to prostitution and in some countries beer brewing. Prostitution and beer brewing are the two economic occupations which afford women earnings that approach parity with that of men within their own economic class. The third strategy is that of making a new attachment with another male income earner and facing a fresh round of the same risks of household instability, or alternatively but usually in conjunction with one of the above, involving herself in a female solidarity network of a economic or social nature (Obbo 1980 and Little 1973).

The Urban Formal Sector Household

The urban formal sector household is characterised by its disassociation from agriculture, the rural extended family and familial forms of social security. Instead it derives its livelihood from either wage employment or self-employment in the industrial and service sectors of the national economy and is recipient to a 'family wage' through the income-earning of the head of household, almost always a male. Thus incremental earnings on the part of various household members are not necessary for household survival. Children are expected to attend school and wives are often completely financially dependent on their husbands.

The urban formal sector household is a unit of human reproduction, consumption, and transformation work like the other household categories, but it is not a unit of production. Women's capabilities in this household category are socially perceived as being home-centered reproduction and transformation work, but not to the total exclusion of female productive activity outside the home in the event of women's training in a particular skill or profession. In many developing countries there is a small but growing number of white-collar women workers.

Employed and unemployed women in urban formal sector households often avail themselves of cheap domestic labour from the informal sector as a means of lightening their transformation work. However, reliance on domestic appliances for household transformation work is bound to become prevalent as countries develop their consumer durable industries. This will cause a displacement of hired domestic labour. Since so many domestic servants, especially in Latin America are women this will have a profound effect on women's informal sector employment opportunities.

But formal sector women working outside the household will also be facing labour displacement. There is a high likelihood that the clerical and lower managerial positions that women occupy will be subject to automation in the future, as in developed countries. Future female employment in the formal sector will depend on whether daughters are being educated on a par with sons in the skills that will be required in the twenty-first century.

Women in formal sector households more than either of the two preceding household

categories have benefitted from human reproduction technology. Infant mortality rates are exceedingly low, and the women tend to use modern forms of birth control and desire fewer children. There is an attitude of what Boserup calls 'responsible parenting', the idea that the quality not the quantity of children is what matters. Children's education is often treated as something akin to a household investment. During the pre-school years, it is often considered important that the mother devote as much time as possible to childcare to afford her children good social training, hence a woman's time is still very child-centered but not necessarily full of pregnancies and breastfeeding. In fact, breastfeeding is sometimes avoided altogether with the technical development for women who work outside the home.

The welfare of women and the household is less problematic at the level of material needs than in either of the two household categories already considered. The formal sector woman usually possesses more marketable skills than either a rural or an informal sector woman would have, yet she is in a position of being able to forego the utilisation of these skills and live entirely on her husband's earnings while playing her role of housewife and mother. However, at times, inflation can seriously erode the purchasing power of the 'family wage' earned by the male head of household, making the wife's participation in the labour force an attractive option. This has been the case in many developing countries during the late 1970s.

The 'family wage' which refers not only to a minimum income level, but also to all sorts of government taxing policies and welfare measures which aim at guaranteeing urban household consumption at a socially accepted level, are foundational to the cooperative positions that a husband and wife assume in household management. As a concept of social organisation, the 'family wage' vests the man with financial responsibility for the household whereas the dependent woman is vested with responsibility for raising children and meeting household members' day-to-day needs.

Strong notions of male financial responsibility are carried over into family law. When households break up, divorce and child custody laws are couched very much in terms of the male as material provisioner and the female as nurturer. Women's fallback position derives from such laws.

In the event of household break up, there are however, hidden penalties apart from the male violence a woman may have endured during the marriage. Even though she may be recipient to property division following divorce and sometimes maintenance payments, it is often imperative for her to have a job to cover household expenses as a single parent. If she has not been working throughout her marriage she may discover that the people with like education and skills as herself are much further up the career ladder.

A woman's position in the formal sector household category has been portrayed as far more materially secure than in the other two types of households, but one cannot infer from this that her position does not warrant improvement. In the developing countries, just as in the developed countries, male and female spheres of household responsibility are a source of contention in the middle class just as they are in the working classes.

Rapid technological change which engenders drastic material and social upheaval in people's lives, encourages individualistic rather than cooperative responses and has a dissolving effect on household unity. Notions of male patriarchal duty in household provisioning coupled with female subordination originated in the material conditions of rural peasant societies. Such notions are bound to be questioned by men and women alike, albeit from different perspectives, in the process of de-agrarianisation.

Of fundamental importance in future definitions of male and female social roles is the question of childrearing and inter-generational responsibility. The household is the society's unit of childrearing, directly and indirectly involved in children's social and technical education, either succeeding or failing to prepare the next generation for the opportunities and rigours of tech-

nological change in the society of the future. Household stability is vital to child welfare. The fostering of social values and supportive institutions that can help households remain cohesive for the fifteen to twenty-odd years needed to raise and educate children is a social challenge facing developing and developed countries alike.

Can household stability be achieved when male and female household responsibilities are sexually differentiated to that of female nurturer and male material provisioner? What agency can effectively enforce these roles against the will of either parent? Might one argue that social values espousing both sexes' joint cooperation in nurturing and provisioning, and equal opportunities in the wider society are a better foundation for household stability of a flexible but lasting nature?

Part IV

Market, Technology and Women

Labour vs. Capital-Intensive Production Technology

As new technology becomes available, the relative costs and advantages of labour-intensive and capital-intensive production methods are weighed against each other with implications for future labour demand. In the urban context, the choice between labour versus capital-intensive technology usually resides in the firm. When the rural household serves as a unit of production and human reproduction, it has a degree of integrated decision-making regarding fertility, household production techniques and labour deployment. When the firm is the production unit, there is no such integration. Within the firm, labour deployment is subject to the cost-minimising competitive pressures of the market and is quite oblivious to fertility decisions being made in individual households. Because of the non-intersection of decision-making on fertility and production techniques, a disjuncture between the labour needs of the production process and the income needs of the labourers is more than likely, especially since, (and as has always been the case), fertility decisions have a lag effect on the labour supply, i.e. a child born today joins the labour force in fifteen to twenty years, as opposed to the much shorter period between production technique decisions and their implementation. In developed capitalist countries, this has for example result in a shortage of labour in the post-war boom period of the 1950s and 1960s and a relative oversupply in the 1970s. In the developing countries, oversupply has been prevailing during much of the post-war period, not merely because of fertility decisions per se, but also because of the lack of synchronisation between urban migration rates and industrial labour needs.

The debate about international technology transfer which often has pointed to the seeming irrationality of developing countries' decisions to import sophisticated, non-labour-absorbing technology, overlooks the importance of having policies that integrate choice of technology with measures to influence demographic growth. Such integration would call for a proportional increase rather than a decrease in female formal employment as non-labour-absorbing technology is introduced. Government encouragement to female formal employment, could provide a deterrent to high fertility and further the egalitarian goals of equal opportunities for men and women in the quest for a better society. By providing women with new productive roles and income-earning opportunities in the labour market, women would be availed forms of social fulfillment and economic livelihood other than motherhood.

Women's Employment Prospects in the Industrial and Service Sectors of the Urban Labour Market

Twenty-nine percent of the industrial work force in developing countries is female, virtually the same as the 28% recorded for developed countries (ILO 1980). The reasons for this low female presence in industrial employment is debatable, but the rationale so often given by the employers themselves is that men as family breadwinners need jobs more than women. A women's motherhood is seen to get in the way of her job commitment and causes expense to the employer in those countries where maternity benefits are mandatory. Other ancillary reasons given include women are less flexible, being subject to ILO conventions on the prohibition of female participation in night shifts, and women are less educated and have less marketable skills.

In addition to women's lower job prospects, they are on average receiving lower pay than men in industry, largely because of their relegation to the most menial tasks in factory production as well as receiving less pay than men for equal work in many cases. Sexual discrimination in

wages is ubiquitous. For example, in Lucknow, India, where women form only 10% of the formal labour force, the more educated have a wider sex differential in earnings. Comparing men and women with equal education, the gap was small among illiterates and those with little education and greatest for the college educated (Papola 1983:46).

The degree to which women are hired in industry, depends largely on the amount of unskilled labour-intensive hand work required, either in industries with low levels of technology or industries which have high capital intensity and sophisticated technology, but nonetheless demand labour-intensive work, notably the microelectronics industry. When advanced technology requiring skill up-grading on the part of the work force is introduced, women workers are usually phased out of their jobs.

Why are women relegated to labour-intensive work? Many employers think that women are more docile than men and have 'nimble fingers'. If this were true it could explain why women get labour-intensive jobs, but not why they are limited to these.

What is key to answering this question is the distinction between 'static' and 'progressive' jobs. Static jobs involve little or no on-the-job training and specialised knowledge that the workers would be expected to obtain overtime through the employing firm's investment in them, or that workers have otherwise obtained prior to being hired, whereas high skill levels or skill-upgrading are integral to progressive jobs (Standing 1978). Depending on the average level of fertility in the society, employers will have a greater or lesser inclination to hire women for progressive jobs assuming that their role as mothers will interfere with their acquisition or retention of skills. In many countries, women actually drop out of the labour force for an extended period of time during their childbearing years.

Static jobs on the other hand make the individual woman dispensable, while women in general are extensively utilised for their willingness to work for lower wages and poorer working conditions than men. This willingness is conditioned by the labour market's general reluctance to hire women, on the demand side, and on the supply side, women's responsibilities for the provisioning of the material needs of their households and their perception of their primary social role as that of mother and wife. In other words, women take these jobs out of necessity and social conformity, not out of lower tolerance levels than men.

The microelectronics and clothing industries sited in many of the newly industrialising countries, especially in Asia but owned predominately by multinational firms in the developed countries use female labour, in some cases almost exclusively (Lim 1978 and 1981, Elson and Pearson 1980 and 1981, Srinivasan 1981, Chapkis and Enloe 1983, Eisold 1984 and Cardosa-Khoo forthcoming). For example, in Singapore and Malaysia, 70 electronics firms accounting for 70% of total employment in the electronics industry of these two countries provided work for 55,000, 90% of whom were women (Blake 1980:5). Laws prohibiting night-work for women have been lifted and features of the female work force are:

...the workers tend to be recruited young between the ages of 16 and 23, and unmarried. For many, this is a first job. The combination of age, sex and inexperience makes this one of the cheapest and most tractable labour forces available. Thus the companies are given respite from the 'costs' of maternity benefits. Some companies are reported to be unwilling to hire married women, or else they encourage them to resign on marriage. This avoidance of the 'burden' of maternity provisions is sometimes expressed as a concern for the domestic life of women. The workers' resignation on marriage has an added advantage. It provides the companies with a mechanism for 'shedding' the older workers who would tend to be the more experienced and therefore more expensive. Retrenchment in times of economic recession also provides the same opportunities. Furthermore, in periods of recessions, to which the electronics industry is particularly vulnerable, female labour can be laid-off without risking protest from the host countries, as female labour is considered to be marginal'. (Blake 1980:7-8).

By reliance on young, unmarried single women who receive brief two-week on-the-job training, employers have a pliant unskilled labour force without maternity benefit expenses. The use of a predominately female labour force in the electronics industry bears some similarity to the early stages of the Industrial Revolution in Britain when female and child labour was often preferred. The health and social strains produced by this pattern of employment engendered a long struggle throughout the latter part of the 19th century, which resulted in the principle of the male 'breadwinner' earning a 'family wage' and protective legislation which virtually banned child labour and made female labour far more expensive and inflexible than it had been (Humphries 1980).

The principle of the male breadwinner and family wage was transferred to developing countries through colonial rule and to this day has had serious implications for female employment prospects in the face of large surpluses of male labour in so many countries. The principle acts as a screening device for hiring and lowers women's bargaining position in the labour market. Some researchers question the necessity of having some of the protective legislation, especially the ban on night work (Blake 1980). A UNIDO document challenges the principle of the family wage itself.

'An increase of two-earner households in economies with high dependency ratios would undoubtedly assist in improving standards of living. All too often, working women are viewed as supplementary wage-earners and are considered relatively unimportant when it comes to planning for the satisfaction of needs. Working women, it is often argued, lead to instability of the family as work, money and status make a woman too independent, and men often see this as a threat to domestic dominance and as a negative reflection of their ability to provide for the family. Such illogical rationalizations are particularly prevalent among the poor, where men would rather keep their women pregnant than working in order to maintain their position in the eyes of their peers as successful providers of large families. However, this attitude only serves to perpetuate their poverty.'

The neglect by national agencies to consider and analyse the current position of women in the family, at work and in society, stems from an institutionalized bias in favour of men that pervades all areas of planning and policy making. Even if policies are formulated that are conducive to women's needs and goals, and even if appropriate legislation exists, there continues to be a large gap between policy and legislation on the one hand and enforcement on the other, and this perpetuates the preferential treatment given to males in most societies'. (UNIDO 1981:25).

Women's employment prospects in industrial employment, given the current hiring patterns, very much depend on the extent of deskilled, static labour required. Some argue that the present structure of the labour market and the technological base of industrialising economies, has a bias towards unskilled labour and therefore women's employment prospects and sexual wage differentials are unlikely to lead to the degree of sexual dualism in the labour market that occurred in the late nineteenth century industrialisation of Europe (Standing 1981:74).

While it is true that the economies with the fastest industrialisation have the highest female participation in the labour force, i.e. Latin American and Southeast Asian and Far Eastern countries, they also often have a strong adherence to the family wage principle making sexual dualism within industry and within the services very strong. 'Unequal work' results in 'unequal pay': women earn half to two-thirds what men earn on average.

An example of sexual discrimination in conjunction with increasing female labour force participation, is the Republic of Korea where women's participation rate in the non-farm sector increased from 30.9% to 36.1% between 1965 and 1980 while men's decreased from 76.3% to 74.2%. In the farm sector the tendency was even more pronounced; the female rate was 41.0% in 1965 and 53.0% in 1980; the male rate for the same years was 76.8% then down to 72.4% (Cho and Koo 1983). This movement from household to labour market participation on the part of

both sexes took place within the context of a incredibly rapid shift of labour from the agricultural sector to the industrial and service sectors (Table 1).

Table 1
Sectoral Distribution of Republic of Korea Labour Force
by Sector and Sex, 1960-1980

	Sex	Agriculture	Industry	Serves	Total
1960:	Male	75.8%	5.7%	18.5%	100.0% (5,272,000)
	Female	85.6%	4.9%	9.5%	100.0% (3,250,000)
1980:	Male	30.9%	22.7%	46.4%	100.0% (8,463,000)
	Female	39.1%	22.4%	38.5%	100.0% (5,263,000)

Source: Cho and Koo 1983:520.

But in the switch from agricultural to industrial employment, wage differentials between the sexes increased; female wages in agriculture were 74% of male wages only 44% in industry in 1979 (ILO 1981). In Korea, factory assembly work is predominately that of young single women who give up their jobs at marriage. In the 20-29 years age bracket single women are six times more likely to have employment than married women; 20-29 being the age at which single women have labour force participation rates of 66-68%, close to that of men's (Cho and Koo 1983). Thus despite rapid gains in women's entry into the labour force, their labour remains cheap and disposable, within a family wage system. It is not hard to guess what would happen if and when automation makes female assembly work redundant.

The tendency for employment in the industrial sector to shrink relative to the service sector, as technological developments lead to increased industrial productivity, has become pronounced in the twentieth century in the developed world and has affected the pattern of sectoral growth in the developing countries. Bearing in mind that female employment in services is greater than industry, this hints at more positive prospects for women's future employment in the services. However, it is likely that vast numbers of women working in the informal sector will be displaced in the process of growing commercialisation and formalisation of the economy. For example, women's beer brewing activities, an especially important female source of income in Africa, is threatened by large-scale breweries (ILO 1918b:30).

Women's Employment Prospects in the Agricultural Sector

Overall technological change is causing the proportion of people in agricultural production to decline year by year, but in Latin America and Asia this phenomenon has progressed much further. Capitalised agriculture on the part of peasants, plantations and agri-business firms is most developed in these two continents and has brought about agricultural labour displacement on a large scale.

Rural labour markets have been far more prevalent in Latin America and Asia as opposed to Africa because peasant differentiation and large-scale commercialised agriculture are more pronounced. Female participation in Latin American rural labour markets is relatively low. Young girls in marginal households or with promising educational qualifications have tended to migrate to the city, rather than being employed in the rural areas. However, some do find work in rural food processing industries (Hewitt de Alcántara 1979 and Arizpe and Aranda 1981).

Historically, rural Latin American women, as wives and daughters of sharecroppers and plantation labourers, were co-opted as family field labour during the peak agricultural season.

Now, however, plantation managers are tending to abandon their reliance on resident labourers and their families (ILO 1983). Agri-business with more mechanised production is becoming more predominant causing a reduction in labour demand and the casualisation of the labour force to fit the seasonal needs of crop production to avoid labour overheads. This strategy imposes severe strain on rural households who have grown dependent on wage incomes.

In Asia, the existence of female labourers in rural areas, many if not most of whom are landless, is more common. Hart (1983) suggests that the higher productivity of Javanese rice production relative to that of Bangladesh results from more extensive use of female labour in field production. In Java, 40% of labour use is female, versus Bangladesh where women's labour is generally confined to post-harvest work. In traditional agricultural methods, Javanese use 60% more labour and achieve 57% higher productivity than Bangladesh. Using Green Revolution technology the gap is reduced to 21% and 25% respectively. Cheap female wage labour appears to be essential to Java's performance. Women's wages are lower than men's and they often are involved in labour contracts which approach an 'attenuated form of sharecropping'. 'In general, the more vulnerable position of women in (Java's) economy and society together with the lower mobility of women with children (relative to men) means that they can more easily be incorporated into the types of dependency relations which are very convenient to the employer in terms of labour management and control' (Hart 1983:1043).

The effect of labour-saving Green Revolution technology has in many cases created massive female labour redundancy. For example, new pesticides in one province in India displaced female labourers who were accustomed to being hired for weeding four hours a day during the growing season (Dauber and Cain 1981:232). The switch from female harvestors using small knives to male harvestors using sickles has occurred in some places (Tinker 1981:66). Between 1970 and 1974, it was calculated that 125 million woman days worth \$50 million in labourers' wages was lost as a result of the introduction of machine powered rice mills (Tinker 1981:72). Not surprisingly this phenomenon has received a great deal of attention in recent literature on women and work in developing countries.

Most authors while deploring the loss of jobs by the most needy in the rural society, none the less, see the solution as one of not denying further technological developments, but rather introducing alternative forms of livelihood and lifestyle as the new technology is adopted (Tinker 1981).

Women's Welfare as Labour Participants

Women's endowments, their education and skills on the one hand, and their fertility, on the other, are socially counterbalanced. A girl's parents, and later her employer, tend to refrain from making investments in her education and skill training based on their expectations that she will be pre-occupied with motherhood for a considerable period of her adult life. Thus women entering the labour market are far from being free agents capable of choosing from a wide range of possible options. Their bargaining positions are extremely weak. They tend to have less marketable skills than men and generally have to surmount public opinion, cultural dictates and labour market hiring practices to acquire full-time jobs with decent pay and promotion prospects.

Instead the formal labour market offers women the role of indirect recipient of a family wage. It is interesting to note that in those economies where the male 'breadwinner' image is not operative, notably in many places in the Caribbean, sexual dualism in the labour market is less pronounced. In Jamaica, the wage labour force is not male-dominated and the wage-differential between the sexes is small. On the other hand, women in the urban working class have primary responsibility for the maintenance of their children according to prevailing cultural norms (Standing 1981b:139). In the Dominican Republic, a study indicated that women-headed households were better off in terms of nutrition and housing because the women had better control over resources, whereas in male-headed households earnings were more often spent for the individual needs of the man and consumed outside the household (Weekes-Vagliani 1980:29).

But does it take extreme lack of responsibility on the part of men vis-a-vis the household reproduction and consumption unit to lessen sexual asymmetry in the labour market? Some defend the family wage as a means of upholding parental responsibility and the stability of the household. An alternative view is more critical of the family wage in terms of its possible demographic implications and its long-term prospects for household welfare.

When a woman's role in human reproduction receives more social recognition than her role as a producer, she is on one hand encouraged to bear children and on the other not accorded the means to provide for them in the changing material circumstances of today's developing countries. Women throughout the developing world have experienced the weakening of men's sense of household provisioning under the volatile material conditions of rapid technological change (Huston 1979). In an aggregate sense, women's primary role as mothers and the continuation of relatively high fertility rates, results in a surplus population that cannot be productively absorbed given prevailing levels of technology.

Yet policies do not address the source of the surplus labour problem except in the technicist terms of the need for family planning programmes to bring about birth control. These programmes are repressive and often self-defeating in the absence of wider structural change in the society's allocation of sexual roles vis-a-vis the labour market.

'The argument that when a surplus population, and consequently a surplus labour force exists, the priority for employment should be given to men is simplistic as it attempts to solve a fundamental problem with a temporary measure that protects the interests of those in power. Nor does this argument take into consideration the long-term disadvantages of a purely male orientation that relegates women, (often more than 50% of the national population), to a secondary position, thereby perpetuating all the factors that created rapid population growth, i.e. lack of economic opportunities, detrimental attitudes, etc. These, in turn, perpetuate poverty and unemployment'. (UNIDO 1981:22).

Part V

The State, Technology and Women

Secular forces, notably those marshalled by governments are increasingly instrumental in the social designation of male and female activities and capabilities. Contradictory forces are at work and the boundaries demarcating women's spheres of activity are widening in many areas and contracting in others, the latter often arising not so much from conscious efforts to isolate women from the benefits of technological and social change but rather through deeply rooted male bias that is embedded in the philosophical roots of the modern state, and prevalent notions of civil rights.

O'Brien (1981) provides an insightful critique of the male values that underpin the formation and operation of the nation-state. Her analysis although focussed on the Western philosophical tradition, nonetheless bears relevance to developing countries, whose government structures and legislation are often highly influenced by Western philosophy, whether they are of socialist or capitalist leanings. Rogers' (1980) analysis of the sex stereotyping policies of international aid agencies vividly concretizes the problem of Western male bias.

Developing countries' government policies that affect women's usage and benefits from technology are underpinned by both traditional ethnic and religious attitudes towards women and Western individualist notions. Both serve as ideological props to perpetuate women's socially dependent status. Yet, today's technology provides an objective basis for women to exercise their talent in all realms of human capability. Largely through the development of technology that allows women to exert control over human reproduction, women have a basis from which to challenge male definitions of female social roles.

Policies affecting Women's Relationship to Production Technology

Under the rule of the colonial state, legislation concerning women's productive role in the colonial 'mother' country was often simply lifted and imposed on the developing countries. Customary and statutory law existed side by side with the expectation that customary law would be mainly rural-based and would lose its applicability over time.

Statutory laws regulating labour and property were most decisive in the evolution of women's social position in relation to technological change. Rogers (1980:122-140) documents how women's access to land has been undermined in developing countries by the introduction of laws that implicitly assume male hegemony in property ownership. The dispossession is particularly stark in the case of the usufruct agricultural rights of women in Africa.

As has been argued in the previous section, female labour protection laws, the prohibition of night work, the provision of maternity leave, breastfeeding breaks, etc., emphasise a women's maternal role often at the expense of her role in the labour market. While these laws seemed wise at the time of their passage in late 19th and 20th century Europe, and seem indisputably beneficial to women during pregnancy and lactation, it is debatable whether the legislation in its present form is always helpful to a working-class woman in a developing country when the welfare of her entire family, not just her infant is at stake. Obviously, the baby needs her milk, but the family as a whole needs her earnings.

In a segmented labour market, maternity leave benefits often serve to improve the welfare of educated working women but can make it virtually impossible for uneducated women to get

jobs in the face of stiff competition from male unskilled labour. No amount of moral exhortation on employers to hire women, changes the fact that male labour can be had more cheaply. The only truly persuasive measure is for the government to foot the maternity benefits bill. Then maternity leave becomes a tax issue and competes with other welfare concerns in the country's taxation system. In countries where fertility is still very high, government-provisioned maternity leave benefits can be considerable. Ideally, government-provisioned maternity leave benefits would be an integral part of a wider policy aimed at changing the notion that women's primary social role is necessarily motherhood.

In general, family wage legislation tends to raise the cost and reduce the flexibility of female labour relative to male labour, thereby making the hiring of men preferable to employers. The sub-Saharan African example is illustrative. As family wage systems developed after national independence, men migrated to urban areas, got formal wage employment and brought their wives and children from the rural areas to live with them. This led to high urban economic dependency ratios in countries which could little afford to support large non-economically active urban populations. A great deal of the 'urban bias' in many developing countries has to do with the wage differentials between rural and urban areas arising from the urban family wage system.

An alternative scenario could be: urban households with both male and female adults in wage employment, a consequent decrease in the dependency ratio, a decline in the fertility rate as women wage earners find frequent childbearing incompatible with their jobs, and gain social recognition through employment as well as motherhood. If in addition existing urban residents are given preference in hiring over new migrants, the probable net effect of all this would be a slowdown in urban growth rates to manageable proportions (Boserup 1970). Equity and welfare for the nation as a whole would be furthered with a new role for women in the labour market. From the position of secondary worker, a woman would become a co-worker with men.

The other major impediment to women's equal status in the urban labour force that is intimately affected by state policies and legislation, is the relatively lower level of education and skill attainment enjoyed by women, which restricts their job opportunities to the most unskilled. Throughout the developing world, with only a few country exceptions, boys receive more formal education than girls and the gap between the two widens at each successive educational level. The primary school sex ratio for low-income developing countries, excluding China and India, is 100:61; inclusive its 100:86 (World Bank 1982).

State laws and educational policies to a large extent determine school sex ratios. Universal primary education, a policy that has been adopted by many countries, greatly increases girls' educational opportunities, reducing the gap between the sexes but not removing it.

At puberty, many parents in countries throughout the world often remove their daughters from school, thereby detrimentally affecting the girls' future fall-back position (Sen 1984:22). Several reasons are given for this practice: the daughter is needed to help with the household work load, she is ready for marriage, it is feared that she may get pregnant outside of marriage, or that too much education would ruin her marriage prospects. Essentially, the practice represents the priority given to the girl's community-defined role in human reproduction over that of production. However, there also may be another associated and little recognized material reason, which might explain a girl's acquiescence to the practice. In rural areas, an absence of commercial sales of sanitary towels and/or the households' lack of purchasing power for such goods in combination with the taboos that often surround menstruation, might well make a girl prefer to stay at home rather than risk embarrassment (Elmendorf 1981). The cessation of schooling imposes a severe impediment on the girl's realisation of her potential capabilities.

Policies affecting Women's Relationship to Reproduction Technology

National population growth rates have reached historically unprecedented levels since World War II in many developing countries. As a result of medical advances in the treatment and cure of

several tropical diseases, more people live longer. In many countries, national populations are doubling within 25-30 years, two to three times as fast as they did in Europe at a similar stage of industrialisation. Governments' responses to this mixed sign of material progress varies. Boserup (1981:186) provides a useful categorisation of the world's regions on the basis of fertility control efforts.

Table 2
Fertility Control Efforts, 1972

Region	Mean Average Effort Score	Number of Countries by Effort Score:				Total
		0	1-3	4-20	>20	
Africa	1	22	7	1	0	30
Arab Region	3	9	1	5	0	15
Latin America	9	4	2	13	2	21
East and South Asia	13	6	2	9	5	22
Total	6	42	12	28	8	90

Source: Boserup 1981:186 quoting W. Parker Mauldin and Bernard Berelson, 'Conditions of Fertility Decline in Developing Countries 1965-75', *Studies of Family Planning* 9, No. 5 (1978):103.

*) The 'effort score' results from the measurement of 15 features of government policies regarding fertility control, e.g. the legality of importing birth control technology, the establishment of family planning services, official statements made by political leaders, etc. Each feature was rated on a scale of zero to two and then added together.

Most African and Arab countries are pro-natalist and often go to the extent of banning the import of birth control technologies. In Latin America, the higher incidence of urbanisation has led to changing attitudes on the part of parents who come to feel that 'quality not quantity' of children is important. This attitude is reflected in government policies. In Asia where population densities are high, governments are often vociferous in their attempts at limiting population growth. Not only are all forms of birth control made available, but they are often imposed with force or material incentives. Such expedient methods often in the absence of health education, indicate that the government's concern extends beyond the recipient family's health and well-being.

Worldwide, traditionally there have been two main forms of birth control: abstinence and abortion. Abstinence has resulted in a proliferation of cultural expressions of 'male license', the most notable being polygamy and the male 'double standard' in sexual mores. Abortion, on the other hand, has traditionally existed in the realms of female secrets kept from men, and has involved strong female solidarity and considerable folk medical knowledge.

Government family planning programmes and birth control campaigns have generally taken the stance that women have to be motivated to use contraceptives. This is often quite contrary to the reality. Through traditional means, women have always sought to exert control over the number and timing of conception. Estimates of annual abortions indicate just how active their interest are in controlling their fertility: one million 'home-made' abortions in Mexico every year (Huston 1979:75 quoting the National Population Council), 55 million abortions throughout the world (Rogers 1980:110 quoting Worldwatch).

It is typically men, not women, who offer the most resistance to government family planning programmes in areas where community attitudes as yet do not endorse the 'quality not quantity' attitude towards children. Men reject modern birth control as an affront to their virility and see it as the means through which they lose control over women. Women are quick to recognize the beneficial impact of family planning in terms of better health and economic welfare. Perdita Huston, (1979), who interviewed women in many developing countries, records some very vivid comments by a Bedouin woman she happened to encounter working in a field across the road from a rural health centre in Tunisia:

"We have family planning now, and you can take better care of your children. That too, is different. You can't imagine how many things I tried to swallow to prevent myself from having more children. I even used to eat mothballs, thinking that would help. I am only thirty-six years old, and I have planned my family now for five years. I have a loop. I don't want any more children. Life is too difficult". She glanced away for a moment, pausing and then added, with great seriousness; "Before the new laws, all women lived the lives of beasts". (Huston 1979:28).

Besides making birth control technology generally available, government family planning programmes are a very important factor in changing men's attitudes. The same Bedouin woman explained "My husband at first didn't know that I had an IUD. I didn't want any more children. My health wouldn't stand it. Now he agrees because they talk about it on the radio". (Huston 1979:80).

Policies affecting Women's Relationship to Scientific Exploration

Up to this point in the paper has been little mention of technological invention. Stanley (1981) argues that women were technically innovative during the era of hunting and gathering, but once tribal societies switched to cultivating, women's scope for innovation was undermined by much more frequent childbirth. In the industrialisation process, most inventors, scientists and engineers have been men. This comes as no surprise in view of the allocation of roles between men and women in reproduction and production.

Government policies in the area of science education are instrumental in denying or rather, providing women with opportunities to become scientists. Table 3 shows the degree of representation of female science students in regions throughout the world.

Table 3
Regional Representation of Women among Science Students

a) The average number of men for every women among science students.

Region	Natural Science	Engineering	Medicine	All Tertiary Education
African (13)**	9.5	70.4	5.7	6.8
Arab (11)	3.4	27.6	2.6	3.4
W. European (22)	3.0	24.6	2.2	2.0
Asian (15)	2.5	22.3	1.9	2.6
Latin American (14)	1.2	16.2	1.4	1.9
E. European (9)	1.0	3.5	0.7	1.4

b) The representation of women among science students compared to their representation in tertiary education as a whole in six regions of the world.

Region	Natural Science	Engineering	Medicine
African	1.4	10.4	0.8
Arab	1.0	8.1	0.8
W. European	1.5	12.3	1.1
Asian	1.0	8.6	0.7
Latin American	0.6	8.5	0.7
E. European	0.7	2.5	0.5

Source: Kelly 1981: 11 derived from UNESCO Statistical Yearbooks.

*) Data Refers to 1969, 1970 or 1971.

**) Brackets indicate number of countries in each region.

Table 3 indicates that women are educationally disadvantaged in the sciences and especially in engineering. But sexual asymmetry in science education extends still further. Throughout the world girl science students perform less well than boys. While the evidence for developing countries is relatively scanty (e.g. Sansawal 1983, Coulson 1979), well-documented studies exist. A 1973 study covering 19 countries, mainly West European but including Japan and Hungary showed boys getting better achievement in biology (averaging 13% of a standard deviation), a slightly wider gap in chemistry (averaging 21%) and very pronounced differences in physics and practicals (averaging 61% and 49%) respectively. The difference overall being 48% of a standard deviation (Kelly 1981:26). What was especially interesting was that girls' and boys' achievement varied a great deal between countries, but within any given country, gaps between the sexes were approximately the same. Boys always achieved better than girls at a constant margin in each specific science subject. The margin was narrowest in biology and widest in physics.

While girls' socialisation and role ascription could explain the existence of a difference between men and women, it would be difficult to imagine that socialisation factors alone could produce such a constant gap with respect to each particular science subject. It is more likely that sexual dimorphism is an explanatory factor. Sex differences in visuo-spatial abilities are known to exist. Men outperform women. Quantitative thinking and mechanical ability are related to visuo-spatial-abilities. Women, on the other hand, outperform men in verbal abilities (Gray 1981 and Newcombe and Ratcliff 1978, Hutt 1974).

This in no way infers that women should avoid scientific training anymore than men should disengage from arts and social science. Biological predispositions are only a small part of the determination of cognitive abilities (Janson-Smith 1980). If they were decisive, the world's politicians and literary giants would have been women. The most important impediment to women's performance in science is the socially-fostered dichotomy between behavioural motivations on the part of men and women. Social responsibility and individual creativity, both indisputably valid motivations for human behaviour, have implicit sexual connotations. While humankind attributes these motivations to the actions of both sexes, none the less, men are more often judged on the basis of their individual creativity whereas women are expected to be more self-sacrificing and socially responsible, especially in relation to their families.

Science training and technological innovation are object-oriented. Pacey (1983) and Bergom-Larsson (1982) note how women scientists are more prone to become interested in the social implications and context of their work than male scientists. Many scientific discoveries have resulted from relentless single-minded determination on the part of the male scientist who is willing to sacrifice commitment to his family, community and nation in the process of discovery. Such neglect of social loyalties on the part of a woman would most likely occasion moral condemnation, whereas a man would receive admiration for his display of intellect and creativity.

Policies affecting Women's Relationship to Destruction Technology

War is one of the strongest motivational forces for invention and technology transfer in the world today. Just as the state is primarily a male institution, war is a male activity. Sex differences in aggressive behaviour have a neuro-endocrine basis. Androgens give men a biological predisposition for aggressive behaviour.

Some biologists (Gray 1981) have hypothesised that sexual dimorphism had a selective advantage for the human species when humankind existed at a low level of technology and had to compete directly with other species for survival. Spatial abilities and aggression, which produce an aptitude for accurate throwing at a target, are male characteristics that are thought to be associated with a strong sense of territoriality and not found in women to the same extent. It follows logically from there that war and violence with the intent to maim or kill are particularly male activities. But why should it be selectively advantageous for such behaviour to be male rather than being shared between the sexes? The answer relates to women's role in reproduction. Gray (1981) drawing on Wynne-Edward's (1962) theory of genetic-based social behaviour argues

that: '...males are more expendable than females. It is the number of females that is the most potent limiting factor on the breeding potential of a group; and breeding potential is, of course, what Darwinian fitness is all about. Thus any genetic mechanism which pushes the males of the group, rather than the females, into risky activities, (straying far from home, fighting with others of the same species, defending the group from a predator, attacking a dangerous prey, will have a higher survival value than one which is equally careless of the two sexes". (Gray 1981:52).

The recognition of men's biologically based predisposition for violence does not constitute an apologism for war. Humankind has a repertoire of survival instincts; not just aggression on the part of men, and motherhood on the part of women, but also the trait which most distinguishes humankind in the animal kingdom, namely, adaptive behaviour to changing circumstances. Adaptive behaviour is a behavioural trait shared by men and women. Human adaptive behaviour gives rise to, and mutually interacts with technological development. Through technological development, humankind changes its material circumstances and it may well be argued that a stage has been reached whereby technological development has made pronounced sexual dimorphic behaviour, i.e. frequent childbearing on the part of women and war activity on the part of men, 'selectively disadvantageous to the species', to use the words of the biologist.

None the less, high birth rates and wars of aggression continue to be features of today's world. Increasing national populations in many developing countries are instrumental in exerting pressure on natural resources. Wars often grow out of the unfulfilled material aspirations of a national population who is experiencing rapid demographic and economic change. Fought by men in the name of national interests against the national interests of another country or countries, wars by their very nature, rely on ideological portrayals of the enemy as less than human and hence deserving of the aggression being perpetrated against them.

Women's socially ascribed role in wars is generally one of support to the male warriors. In the developing world, several of the most recent wars have been wars of liberation against colonialism. Generally these wars have been fought on the basis of considerable social consensus. The inhumanities of colonial rule cause the national population, regardless of sex to feel very strongly about the justice of war.

Often these wars have been fought with a low level of destruction technology and have depended on extensive mobilisation of all sections of the society. In such cases women have been known to hold combative positions, e.g. Guinea Bissau and Mozambique (Urdang 1979 and Davies 1983). In more conventional wars, with higher levels of war technology, women have tended to be restricted to non-combative supportive positions. Serving in a civilian or military capacity, they have occupied positions similar to those they hold in the labour market, as health workers, clerical and professional staff.

Often women's participation in the labour market increases during martime as male workers get drafted into combat. But studies of the effect of war on women's position in society suggest that even though women may actively have been involved in the war effort and in some cases risked their lives, e.g. Algeria and Guinea Bissau, this has little effect on their position after the war (Urdang 1979, People's Power 1977 and Enloe 1983).

Part VI

Women and Future Technology

The 'New' Technology

Over the past decade, as the immensely labour-saving effects of new production technologies have been commercially applied in industry, business and social services of the developed countries, a new age has been heralded, the 'post-industrial' society. The technology so far most responsible for labour-time savings, is microelectronics. Microelectronics has two facets: robotics and informatics. Automated robots and automation generally have been widely used in factories and mines, especially for repetitious assembly work and technical quality control detection of an exacting nature. Informatics, or what is often called information technology, has dramatically increased the capacity to create, save and communicate pieces of information and has resulted in a vast expansion of easily accessible information.

The development of the computer gave rise to robotics and informatics. Computer were made commercially available more than two decades ago, but there were many kinks in their performance. They were slow in processing information, unreliable, and took up large amounts of space, besides being very expensive and outside of the reach of most industrial and business firms. Through a process of miniaturisation, involving the development of the silicon chip for storage of information and specifically the microprocessor chip programmed to perform the processing functions of the computer, the size of computers could be drastically reduced and their performance and versatility enormously enhanced.

The potential uses of microelectronics are vast. Human activity in production, recreation, destruction and exploration are being affected. Direct human involvement in repetitive, routine work in factories and offices is being reduced.. Microelectronics are becoming a growing feature of the legal, educational and medical services. As for the effects of microelectronics on human destruction and exploration, the fact that military concerns and the space race were two of the biggest motivating forces for the development of microelectronics technology, indicates the importance of microelectronics in these realms of human activity (Evans 1983:50).

Biotechnology or genetic engineering, is an area that has received less attention than microelectronics but will undoubtedly in the future have a far-reaching impact. Biotechnology, which involves splicing genes from recombinant DNA into plasmids from specific bacteria to produce desired living materials, is controversial both in terms of its possible effects on the genetic make-up of biological life and on world energy flows (Rifkin 1980:240). While it is just beginning to be applied, the mass-production of microorganisms that can substitute for existing forms of fuel and food is a not-too distant prospect.

Biotechnology and microelectronics represent tremendous savings in human energy and labour time, which will profoundly affect the temporal and spatial economy of human activity.

Sectoral Change in Developing Countries and Women's Employment Prospects

The impact of new technology is only beginning to become evident in developed countries and has scarcely touched much of the developing world. However, from the developed world's experiences there are hints of possible outcomes for developed countries.

It is fairly safe to assume that the new technology will serve to hasten labour displacement

in both the agricultural and industrial sector, causing these two sectors' employment to contract relative to services. While it is unclear how exactly biotechnology will affect the agricultural labour force as agricultural productivity increases, in industry, the tendency is for unskilled and semi-skilled labour to be the groups hardest hit by the labour-displacing effects of the new technology. Since the jobs women hold in industry tend to be in this category, this does not auger well for their future job prospects. The industries where they have been hired in large numbers, microelectronics, textiles and clothing industries and food processing may be subject to greater automation in the future.

In the service sector, the situation is complex if the experience of the developed world is anything to go by. Many services are liable to more automation. In developed countries since World War II, domestic appliances have been purchased in vast quantities and there has been a trade-off between purchased services and domestic appliances, because of the relatively high costs of purchased services (Gershuny 1983). In the developing countries this tendency has been far less pronounced because purchased services have been very cheap due to the existence of the informal labour market. It is an open question however, if the informal labour market will be competitive with automated services and domestic appliances produced under more automated production.

Jones (1982) has argued for the analytical distinction between market services that involve the provisioning of material goods and services for physical needs and those that involve the provisioning of 'symbolic' goods and services for intellectual or informational needs. He suggests the latter be considered a fourth major economic sector, at a parity with the agricultural, industrial and service sectors. He describes the sector as providing:

"soft", or intangible services... often difficult to quantify, and their value to consumers is often more subjective than objective. Information activities include teaching, research, office work, public service, all forms of communication and the media, films, theatre, photography, posts and telecommunications, book publishing, printing, banking, insurance, real estate, administration, museums and libraries, creative arts, architecture, designing, music, data processing, computer software, selling tickets, accountancy, law, psychiatry, psychology, social work, management, advertising, the church, science, trades unions and parliaments. The symbols used are words, sounds, images and numbers, or symbolic objects which represent tangibles (e.g. money, cheques, letters, speeches, bills, tickets, type, photographs, advertisements, keys, title deeds, legislation or newspapers)". (Jones 1982:48).

The industrial sector in most developed countries has been since World War II while the 'information' sector has been growing. In the developing countries, many with large bureaucracies, the information sector is a substantial employer. It is interesting to note that, although labour redundancy is a serious prospect for clerical and lower level management, the application of microelectronics in the information sector, has often led to an expansion of employment in new information services made possible by the information processing capabilities of microelectronics. So too, there is controversy over whether or not the use of computers in office work has led to deskilling or upgrading of secretarial work. Depending on how the office is organised women clerical and secretarial staff have sometimes been relegated to tedious, repetitive work and in other cases have been afforded varied multi-task jobs in which tedium has been alleviated by the computer (Werneke 1983, Science Policy Research Unit 1982, Barker and Downing 1980 and ISIS 1982 and 1983).

Thus it is difficult to establish the net result of microelectronics on women's employment in clerical and other information jobs. What is however clear, is that the avoidance of labour redundancy on the part of women will depend on their technical knowledge and conceptual skills. With typing, short-hand and filing no longer taking as long as they did, women in office jobs will have to be flexible and be capable of working on new office electronic machinery as well as using analytical skills to do research, write reports, etc., that would have formerly been done by

lower level management (Werneke 1983:54). This will require increased education and training for women.

In many developed countries, there have been moves to shorten the official working week from 40 hours to 35 or less hours, a response to both higher labour productivity and unemployment rates. In view of the economic crisis facing many developing countries in the 1980s, the shorter working week concept may be less appealing to management. None the less it seems likely that the application of new technology to the developing countries will make the reduction of formal working hours a likely prospect in the future.

The shorter working week together with the possibility of doing more work at home as a result of information technology, will lead people in urban areas, where formal employment has hitherto meant working in a factory or office for a third of the day, to spend more time at home. 'Homeworking' employment can however be a source of superexploitation of female labour, when it is not subject to enough labour regulation, as is usually the case in the clothing and electronics industries at present (Huws 1984a and b and Mitter 1984).

Women's Position under Rapid Technological Change

Just as developing countries' agricultural sectors are rapidly contracting, so too their industrial sectors will either contract if they have already reached high levels of proportional employment, or they will develop with less labour absorption capacity from the outset, when contrasted with employment in the European and North American industrialisation process of the nineteenth century.

Critical to making the development process less painful for the generations caught-up in the transition, is the necessity for inter-sectoral balance. Productivity gaps and returns to labour between the agricultural, industrial, service and information sectors have to be minimized. Balance must also be consciously sought between technical and cultural development.

A culture is never stagnant; it is a reservoir of old and new attitudes that people with a collective identity have to draw on in ordering and rationalizing their material existence. When technical changes are accepted by a community but then backward-looking, patriarchal notions of sexual inequality are invoked, this is often done by those elements in the society who are losing status and power under the new technical regime, i.e. older men who themselves lack the new skills needed to maintain and control the new technology. The re-affirmation of male superiority over women is often a crude compensatory measure masking male insecurity.

Invariably the incongruence between technological change and the ever more fervent affirmation of male hegemony in the culture, puts tremendous strains on the women who are loaded with their traditional household responsibilities but less and less capacity to fulfill them. The rising incidence of female headed households throughout the developing world gives some quantification of the strain. Technical change must be accompanied with conducive social change with respect to women.

Policies must be formulated to ensure women's access to new technology at a par with men. While credit schemes and other targeted policy measures can be used to get technology directly to women from government agencies, these measures can often be undermined by male hegemony in the household and the community. Thus much wider, comprehensive measures which are supportive of women in the wider social sense, are required in government policy. There are major issues in both rural and urban areas which are in need of new social policy formulation related to technological change.

In urban areas, the immediate labour displacement effects experienced by women are severely exacerbated by the legal and social convention of the male 'breadwinner' earning a family wage. As long as the notion of the family wage prevails, a woman's employment will

always be secondary to man's and she will always be the first to lose her job with the introduction of new technology.

In rural areas, new information technology will permeate households and generate new ideas and social values within the household to a degree that previously would not have been experienced. Whereas formerly, the household's most opinion-forming members, notably the youth, would have migrated to urban areas and held their new attitudes geographically separated from their rural families, now there will be more *in situ* attitudinal change as urban job opportunities contract and information technology penetrates the countryside. Agrarian patriarchal values will be increasingly challenged as rural household members' knowledge of the world outside the boundaries of the village expands.

The input of new attitudes, together with reductions in fertility resulting from the wider provisioning of rural family planning services, can provide a conducive context for changes in women's social status. State policies must be supportive of women's struggles over issues of fertility and access to household endowments within the rural household.

However, in both rural and urban areas, the gradual dissolution of traditional social constraints on women's productive role in the community and market, important though it is, will not be enough to ensure women's access to technology. Girls' science and technical education will be vital if women are to gain a better bargaining position for pursuing their capabilities in the household, market and state of the 21st century.

Part VII

Conclusion

The argument in this paper has been that technological change leads to changes in the content and inter-relationship between the household, market and state, and in turn the bargaining positions, responsibilities and capabilities of women and men in these social institutions change. Because of women's strong identification with the household and with the realms of human reproduction, they have been estranged from many developments in production, exploration and destruction. Men have become increasingly involved with such developments outside the household, while women tend to get shackled with greater responsibilities within the home, despite their inferior bargaining power and capabilities for securing household welfare via the opportunities that exist in the community, market and state.

During this century, the two most important technological changes have been: in production, advances resulting in the transition from agrarian to industrial to post-industrial societies and in human reproduction, the greater control over conception that is now possible for women. One may well ask why technological change in human reproduction has not in, and of itself served to bring about a better bargaining position for women in developing countries.

Undoubtedly, the extremely rapid pace of technological change in conjunction with its agrarian starting point have militated for men's hegemony. In most agrarian societies women have historically spent much of their time in a state of pregnancy or lactation. This has resulted in women's weaker involvement in market and state activities at the outset. As the market and state gain importance relative to the household in the transition from agrarian to industrial societies, men are better placed to seize the opportunities offered by rapid growth even though the technology affording women greater control over reproduction makes male monopolisation of these social institutions materially unnecessary. Men acquire new capabilities and earning power that put them in a stronger bargaining position within the home. Except for those women who make a supreme effort, defying prevailing social conventions and attitudes regarding women's proper roles in society, the majority of women have little means of redressing the imbalance, because they are widely dispersed and socially isolated in individual household units.

Women's bargaining position is detrimentally affected by the re-ordering of the inter-relationships between the household, market and state. Increasingly household livelihood is dependent on the market, and community sanctions are giving way to state regulations. Traditionally men had religious and community sanctions on them that required them to materially provide for their households from the proceeds of their productive activities both inside and outside the household. Now, as the power of the community pales in the face of the forces of the market and the state, many of these sanctions have weakened. The opportunities and risks of the market, together with its demands for labour mobility, often erode men's sense of responsibility to their families' material needs. Women are left with increasing responsibilities for their own and their children's material welfare. Under these circumstances, birth control technology which relieves women of the burden of undesired children would be welcome. Yet, men, sensing the challenge that birth control technology poses to their positions, are often very reluctant to support it even though birth control practices can be a positive influence on their families' standard of living.

Turning to the transition from industrial to post-industrial societies, it is hypothesised that new technology will again change the inter-relationship of the household, market and state.

Information technology could serve to increase the importance of the household and the community at the expense of the market and the state by reducing the need for the physical presence of the labourer at some centralized workplace outside the home. With the extension and improvement of birth control technology, women would be in a better position to plan when they would bear children. These developments could provide a more conducive basis for the elimination of asymmetry in male and female bargaining positions, enabling both sexes to pursue their human capabilities on more equal terms.

Policies aimed at enhancing women's bargaining positions in social institutions so that they can get maximum benefit from technological change will necessarily vary from country to country. So too, within any particular country, the existence of inequalities between women of different social classes will require sensitive policy formulation to avoid improving the position of the already privileged social group at the expense of the others.

The three main policy areas that are vital to improving women's bargaining position in the household are: female wage earning opportunities, fertility control and education. Policies that succeed in raising women's educational qualifications particularly in science and engineering are vital to women's future job opportunities. But as long as the notion of the 'family wage' prevails, men will always be hired in preference to women when both hold the same qualifications. A move towards hiring women at pay commensurate with men holding the same qualifications will require some restructuring of labour markets. More innovations such as the reduction of the eight-hour working day to six or even four hours could increase the total number of jobs and allow both men and women the opportunity of having a job and more time at home for sharing childcare and domestic work. Finally, fertility control can allow women to give birth to their desired number of children at an optimal time in their working lives.

Women's fuller participation in activities of the market and the state can have a positive influence on the realms of exploration and destruction. Female perspectives may serve to increase humanitarian considerations in the development of new technology. So too, female communication skills could have a positive influence on cold war politics, decreasing the likelihood of nuclear war.

With more flexible patterns of work outside the home, recreational activities could become more important especially in the household and the community. The community could play a vital role in defining public morality through democratic debate and interaction which could come to bear on the activities of the state and market.

To understand the impact of technological change on women, it has to be viewed from a very wide perspective. The inter-relationships between the household, community, market and state, vis-a-vis the realms of production, human reproduction, recreation, exploration and destruction are the context in which women's and men's bargaining positions, socially defined responsibilities and human capabilities evolve. But this evolution is in no way pre-determined and immutable. There is an urgent need for communities of women and men in both rural and urban areas to democratically exchange ideas and work towards defining new, more equitable division of social responsibilities between the sexes in conjunction with decisions on the content and form of technical change. Desired types of technological change should be collectively discussed and acted upon at the community level. It is dangerous to leave technological development solely up to the research interests of scientists. The community must have a say in which human capabilities it wishes to be expanded and which ones should be contained, at each stage of its technological development.

In conclusion, the policy suggestions offered in this section have had to be vague and speculative in view of both the wide variety of circumstances existing in today's developing world and the uncertainty of future technological change. Whether or not the effects of technological change on the status of women are positive, depends on the structure and content of the

household, market and state. It is a mistake to think that these three institutions can just be left to drift with technological change and by chance bring about an improvement in women's bargaining positions and increase the scope for women's realization of their human capabilities. A positive outcome for women requires conscious cooperative action on the part of men and women at all levels of society in developing countries.

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CORRIGENDUM TO:

WOMEN AND TECHNOLOGY IN DEVELOPING COUNTRIES

Technological Change and Women's Capabilities and Bargaining Positions.

Page 3. Paragraph 4. Line 9 - "...emerging from the world economy and influencing national economic and social policies which.."

Page 3. Paragraph 7. Line 2 - "The first phase consisted in the preparation of a series of research studies on industry, trade.."

Page 3. Paragraph 7. Lines 6 and 7 - "...sists in a number of meetings including a high-level meeting of eminent personalities to review the studies and to consolidate them into a publication on women in international economic relations."

Page 4. Paragraph 1. Line 4 - "...economic relations to review and finalize the studies."

Page 4. Paragraph 2. Line 3 - "...subprogramme by INSTRAW in collaboration with the United Nations Conference on Trade and..."

Page 7. Paragraph 1. Line 1 - "Over the past century, technological advances have been undermining the traditional life..."

Page 7. Paragraph 1. Line 3 - "...new forms of livelihood, consumption patterns and social values. Men and women, old and young..."

Page 8. Paragraph 6. Line 4 - "...change on women's human capabilities' and 'bargaining positions'. These are themes that have..."

Page 8. Paragraph 6. Line 6 - "...Women, Technology and Sexual Division". Sections III through V, will cover women and technolo-..."

Page 10. Paragraph 4. Line 3 - "...ages could have maintained a favourable set-up by threat and insidious social control, and..."

Page 11. Paragraph 4. Line 4 - "...system as a whole, rather than those specifically directed at women, which have the greatest impact..."

Page 12. Paragraph 5. Line 4 - "...generally needed, and not a very thorough knowledge of available local materials and the in..."

Page 13. Paragraph 5. Line 9 - "...investment activities, because of its existence on the border of mere survival."

Page 16. Paragraph 1. Line 9 - "...the technical development of hygienic methods of bottlefeeding, an important development for women who work outside the home"

Page 21. TABLE 1 - Sectoral Distribution of Republic of Korea Labour Force by Sector and Sex, 1960-1980

Sex	Agriculture	Industry	Services	Total
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Page 21. Paragraph 2. Line 2 - "...sexes increased; female wages in agriculture were 74% of male wages and only 44% in industry in..."

Page 22. Paragraph 6. Line 5 - "...between the sexes is small. On the other hand, women in the urban working class have primary..."

Page 24. Paragraph 6. Line 2 - "...night work, the provision of maternity leave, breastfeeding breaks, etc., emphasize a women's..."

Page 27. Paragraph 3. Line 1 - "Up to this point in the paper there has been little mention of technological invention. Stanley..."

Page 28. Paragraph 2. Line 4 - "...sexual dimorphism is an explanatory factor. Sex differences in visuo-spatial abilities are known to..."

Page 29. Paragraph 1. Line 5 - "...of the same species, defending the group from a predator, attacking a dangerous prey) will have a ..."

Page 29. Paragraph 6. Line 1 - "Often women's participation in the labour market increases during wartime as male workers.."

Page 30. Paragraph 3. Line 3 - "...work in factories and offices is being reduced. Microelectronics are becoming a growing feature..."

Page 30. Paragraph 3. Line 7 - "...importance of microelectronics in these realms of human activity (Evans 1983:50)."

Page 30. Paragraph 7. Line 1 - "It is fairly safe to assume that the new technology will serve to hasten labour displacement.."

Page 31. Paragraph 5. Line 1 - "The industrial sector in most developed countries has been falling since World War II while the.."

Page 31. Paragraph 6. Line 4 - "...skills. With typing, shorthand and filing no longer taking as long as they did, women in office jobs..."

Page 32. Paragraph 6. Line 2 - "...collective identity have to draw on in ordering and rationalizing their material existence. When..."

Page 32. Paragraph 6. Line 5 - "...losing status and power under the new technical regime, i.e. older men who themselves lack the..."

Page 33. Paragraph 3. Line 3 - "...women's social status. State policies must be supportive of women's struggles over issues of..."

Page 38. BIBLIOGRAPHY

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