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Technology and women's status

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PREFACE

This study represents part of a joint programme of work between the United Nations Conference on Trade and Development (UNCTAD), Geneva and the United Nations International Research and Training Institute for the Advancement of Women (INSTRAW), Santo Domingo, on the impact of technological development on the advancement of women and the policies required to assure greater participation of women in the process of technological transformation. An earlier study "Women, technology and sexual divisions" (UNCTAD/TT/79) prepared by Amartya K. Sen at the request of the UNCTAD secretariat and INSTRAW and being published jointly by the two organizations, also forms a part of this joint programme.

I. Introduction

1. The systematically inferior position of women in productive activities both inside and outside the household in most societies has been the subject of a good deal of research and comment in recent years. Most striking among the manifestations of this inferior position has been the unequal participation of women in technological progress, as reflected in unequal access to modern tools, equipment and skills, lack of employment opportunities and high susceptibility to technologically-induced job displacement. The concern is that not only are women deprived of a just share in the benefits of technological change but that their lack of integration in that change retards the expansion of production possibilities and, therefore, the whole process of economic and social development. The theme of the present report -- that the asymmetrical impact of technological change on women has its origins in the factors determining sexual divisions in the household -- has implications for decisions on the package of remedial policies to be applied in both poor and rich societies.

2. After a brief discussion in section II of the relationships between household arrangements and technology, section III presents an interpretation of the dynamics of intra-family relations in terms of bargaining problems involving cooperation and conflict. Against this background, section IV reviews the ways in which technological change and modernization has affected the status of women and section V relates the effects of such a change to a number of important constraints on access to technology. The final section considers the types of policy measures that need to be designed in order for women to benefit more fully from technological progress.

II. Technology and sexual divisions^{1/}

3. Many social scientists have stressed the social content of technology. In the present context, the inclusion of sexual divisions as part of the operations and processes that make up "ways of doing things" - that is, technology - assists in clarifying a range of important problems surrounding the unequal status of women in productive activities, in which technology is a central element. For example, in the spheres of production and technology, household activities have typically been viewed in ways that are contradictory. Whereas it is accepted that the sustenance and reproduction of workers are obviously essential for such workers to exist and be part of the labour force, the activities that give rise to or support that sustenance, survival or reproduction are usually not regarded as contributing to output. Indeed, it is only recently that serious attention has been given to the task of valuation of these activities and also of reflecting them in national income and consumption estimates. What is central for present purposes is not the accounting aspect but the need to take an integrated view of the pattern of activities both outside and inside the home that together make up the production processes in traditional as well as in modern societies.

4. Thus, taking the broader view of technology and production has some far-reaching effects. It brings out the necessity of penetrating beyond the stereotyped social perceptions obscuring the productive contributions that are in fact made by labour devoted to activities which do not constitute "production" in the narrow sense. It draws attention to the entrenchment and survival of inequitable social arrangements in general, and the deeply asymmetric sexual division of labour by which women, for example, do the cooking and are able to take on outside work only in so far as this can be

^{1/} This and the ensuing section draw heavily on A.K. Sen, op. cit.
(UNCTAD/TT/79)

combined with continuing as the cook. In such a setting, the division between paid and unpaid work can be seen as imparting systematic biases in the perception of who is "producing" and/or "earning" - biases that help to explain the inferior economic position of women, not only in traditional but also in modern societies. Most importantly, the specific pattern of sexual divisions and specialization of women in particular economic activities - even outside the household - can be seen as a reflection, in part of the traditional intra-household relations and separation of tasks which put women at a comparative disadvantage in acquiring skills, especially new or "non-traditional" skills. In sum, the existing household arrangements have to be clearly identified and analysed in order to understand the inferior economic position of women inside and outside the household in most societies, and to see how their situation can be improved.

III. Co-operative conflicts and bargaining

5. The formal properties underlying the dynamics of household arrangements have the features of what social scientists writing on the subjects of collective decision theory and game theory have characterized as the "bargaining problem". In the simplest case, this can be visualized as the problem of comparing the outcomes facing two persons, where each outcome has associated with it a pair of numerical values - one for each person. The two persons can either co-operate or collude to improve the position of each one or fail to co-operate. The outcome for each when they fail to collude is called his or her fall-back position.

6. If, in a particular situation, there is only one collusive possibility that is better for both persons (e.g. offering a higher value for each) than the fall-back position, then there is no bargaining problem since both persons would choose that outcome. The opportunity for conflict and bargaining arises when there exists a whole set of co-operative outcomes, superior for both persons to all other outcomes, including the fall-back position, but ranked by each person in exactly opposite ways - for example, co-operative outcomes x and y , such that one person ranks x better than y and the other person ranks y better than x . The choice between either x or y as opposed to the fall-back position is a matter of co-operation, since either of the former is better, for both persons, than the latter.

7. It is this explicit mixture of co-operative and conflicting aspects in the bargaining problem that makes the analysis of that problem valuable in understanding household arrangements which also involve a mixture of this kind. In assessing the interests and advantages of the different parties in co-operative conflicts, particularly in developing countries, it is expedient to focus on the capabilities of a person - what he or she can do or be. This includes such parameters as longevity, nutrition, avoidance of morbidity and educational achievements.

8. The solution that emerges to the bargaining problem depends on a number of influences, including the bargaining power of both sides. Although the ambiguity and imprecision of individuals' perceptions of their advantages practically foreclose the possibility of predicting precise solutions in co-operative conflicts, the insights from bargaining problems do help in indicating the direction of such outcomes. Three propositions can be made regarding the direction of such outcomes. They refer to (a) breakdown response, (b) threat response, and (c) perceived contribution response.

- (a) Breakdown response: If the fall-back position of one person worsens, then the chosen collusive solution will become less favourable to his or her interest.

9. A person's fall-back position has much to do with his or her strength in "bargaining". If it becomes apparent that, in the event of a breakdown (i.e. failure to reach a co-operative outcome), one of the persons is going to end up in worse circumstances than was thought previously, this will undermine that person's ability to secure a favourable outcome. The notion of bargaining power can be extended to bring in the element of "threat" - that is, one person threatening the other with some harmful action if the bargaining is to fail. The threat of adverse action can make the threatened party's fall-back position worse than he would otherwise have perceived it.

- (b) Threat response: If a person can more severely threaten the other - explicitly or implicitly - with possible dire consequences, then the chosen collusive solution will become less favourable to the interest of the threatened person.

10. Whoever contributes the most to overall material well-being has a strong say in how the benefits of co-operation are shared. In actual fact, it may be difficult to determine with any great clarity who actually contributes the most, and what is more decisive in determining the legitimacy of enjoying a bigger share of the gains from co-operation is the perceived contribution.

- (c) Perceived contribution response: If a person is perceived as making a larger contribution to the overall prosperity of the group, then the chosen collusive solution will become more favourable to that person.

11. The three responses relating, respectively, to breakdown, threat and perceived contribution throw light on the way that relationships between the sexes tend to be biased. The pattern of many of the disadvantages of women has varied in different times, places and circumstances. Thus, the disadvantages of women in terms of "breakdown response" would have tended to relate much more to physical factors in a primitive hunting community than in a typical modern community. Some disadvantages of women apply in many different situations, whereas others are specific to particular situations. The most outstanding example of the former is the frequent pregnancy and, consequently, many years of child-rearing (as is the case in many modern communities and most of the traditional ones) which must make the outcome of co-operative conflicts less favourable to women through worse fall-back position, greater vulnerability to threats and lower ability to make a perceived contribution to the economic fortunes of the family.

12. Whatever may be the universality of pregnancy and any other disadvantages of women vis à vis men, they are intensified and in many instances transcended by the influence of particular aspects of the socio-economic setting, such as family income, religion, cultural values, legal institutions, economic sector and the role of the market. Although it is hard to generalize about the relative strength of these different influences which take on different patterns in different parts of the world, the income category of the household where the woman resides must rank very near the top. Women from prosperous households are obviously in a less disadvantaged position than those from poor households. They enjoy, on the average, better health and nutrition, greater purchasing power and material wealth, more education, more marketable skills and easier access to technology. These advantages both mean that they are better off in a real sense than poorer women and also that they are able to achieve superior outcomes to co-operative conflicts in terms of the three bargaining responses.

13. In general, the combined effect of the socio-economic variables mentioned at the beginning of the preceding paragraph tends to be more favourable to the relative position of the typical woman in what are presently the more developed as compared with the less developed countries. Although sexual discrimination and inequality persist everywhere, it is unquestionable that women have, on balance, achieved significant gains in the co-operative conflicts taking place in developed countries.^{2/} The problems of sexual discrimination faced by women in poor countries and especially of poorer women in those countries, therefore, deserve particular attention in the consideration of technological and other strategies for economic and social transformation.

14. The relation between co-operative conflicts in one period and those in the next is of the greatest importance in the sense that the person with the best outcome in one round is better situated (and has enhanced bargaining power) in the next. For example, better education or superior skills contribute not only to immediate well-being but also to a better fall-back position in the future. This "feedback transmission" can work from one generation or even epoch to the next, as the "typical" patterns of employment and education for men get enshrined vis-à-vis those for women.^{3/} Often, the main channel of transmission is from mother to daughter; as it is mothers (as well as grandmothers and aunts) that have universally assumed the responsibility of training and indoctrinating their daughters (granddaughters, nices) according to established religious and cultural values regarding their duties within the traditional division of labour in the household and their expected responsibilities as wives and mothers to be. A general lack of social and economic mobility, as is common in societies or segments of societies where development is taking place very slowly, is highly conducive to intergenerational transmission of sexual biases, in that it ensures that poverty, lack of education and inadequate access to technology and other productive assets are passed on between generations of the same families and to the women in those families.

IV. Technological change

15. The systematically biased impact on women in general of industrialization and technological change is a manifestation of their inferior position in the pattern of household relationships that has been just discussed in terms of co-operative conflicts. The link between technology and the position of women is of a dual nature. On the one hand, the factors governing existing status determine the distribution of benefits and costs of technological change. On the other hand, it is technological modernization itself that offers the possibility of a change in status for the better (or worse) through its effects on women's income earning opportunities, on their productivity and on the types of tasks in which they are engaged.

^{2/} On the improved economic status of women in the ECE region see "Draft conclusions and recommendations. Paper prepared by the secretariat of the Economic Commission for Europe." Seminar on the economic role of women in the ECE region, Vienna, 15-19 October 1984 (ECE/SEM.6/R.5).

^{3/} The term "feedback transmission" has been coined by Sen, op.cit.

A. Outside earnings

16. The prospect of paid employment outside the household is one of the crucial variables affecting a women's status. A positive impact can take place in two distinct ways, corresponding respectively to the "co-operative" and "conflicting" features discussed earlier in the "co-operative conflict" formulation of sexual divisions. First, such employment can enhance the overall prosperity of the household. Secondly, it would increase the woman's own share in the overall prosperity of the household by giving her (i) a better fall-back position, (ii) a better ability to resist threats (and indeed to use threats) and (iii) a higher "perceived contribution" to the family's economic position. The empirical basis of the positive link between status and outside earnings is confirmed both by aggregate research and by a number of case studies dealing with women's work, such as a recent study of women workers in a beedi (crude cigarette) factory in Allhabad, India which found that:

A greater economic role for women definitely improves their status within the family. A majority of them have more money to spend, and even more importantly, have a greater say in the decisions to spend money. Most women claim to be better treated as a result of their contribution to the household income. ... A substantial proportion of women feel that they should have a recognized economic role and an independent source of income. ... Their attitudes evidence a clear perception of the significance of their work to family welfare and their own status within the family.^{4/}

17. The nature of the impact of outside earning of women also depends on the combination of factors that influence their prior status as well as on the total amount of work performed and the form of the outside earning. With regard to prior status, for instance, a middle-class educated urban, married woman that voluntarily chooses an outside job over being a housewife may derive a sense of personal fulfillment in addition to increasing her power to bargain over the pattern of household arrangements. In contrast, for the poor rural housewife the sense of security and recognition gained from contributing to the household income may be offset by greater physical and mental strain if there are no older children or other members of the extended family to relieve the burden of household chores. Particularly difficult is the situation of female heads of households in many societies - divorces, widows, unwed mothers, and working women whose husbands have left home to take up jobs in distant localities. It has been estimated that approximately 30 percent of households in the world are de facto headed by women.^{5/} However much the outside earning may improve a woman's fall-back position, capacity to "threaten" and perceived contribution to household prosperity, the effect on her total welfare will also depend on how much the total burden of work increases and on the extent to which that outside earning is dictated by sheer need for material survival as distinct from being an unconstrained choice

^{4/} Z. Bhatti, "Economic role and status of women: a case study of women in the beedi industry in Allahabad, Working Paper ILO, 1980, p. 41. See also M. Loutfi, Rural women: Unequal partners in development, ILO, Geneva 1980 for a general discussion of some of these links. See also C. Lloyd and B. Niemi, The economics of sex differentials, Columbia University Press, New York, 1979 dealing with a related problem in the context of rich and economically-advanced countries.

^{5/} Z. Ahmad and M. Loutfi, "Decently paid employment - not more drudgery", Ceres, FAO Review on Agriculture and Development, July-August 1983, p. 41.

based on personal preference. Although labour force participation of women in industrialized countries has shown a steadily rising tendency, the total amount of hours worked has on the average increased, reflecting the fact that based on personal preference. Although labour force participation of women in industrialized countries has shown a steadily rising tendency, the total amount of hours worked has on the average increased, reflecting the fact that the division of labour in the household for most of these countries has not been changing in step with improved job opportunities for women. Against the improvement of status that has accompanied the somewhat greater equality of opportunity in the labour market one has to weigh the increased stress and psychological tension experienced by many women who are still having to fulfill their traditional roles at home after working all day on the outside.

18. The effect on bargaining positions and status depends on the form and content of the outside work as well. It has been noted for instance that certain types of "spare-time" activity by women in their own households, even where the product is sold in the world market, produce little benefit for them because they are unable to perceive this activity, as other than non-work, as a mere adjunct or supplement to their husband's work, and are hence unable to bargain for fair remuneration from their employers.^{6/} The low bargaining power of women workers in comparison with employers depresses both the earnings of the household as a whole and, via the three responses, the women's status and share of benefits that go to them within the household.

19. A similar argument applies to the status of unmarried women. Young unmarried girls from tradition-bound societies who work temporarily before settling down to the socially accepted role of wife and mother may assign a second-order status to their paid employment, viewing it as a transitory phase in their lives that helps to provide a small nest-egg for their marriage and a little more. In these circumstances, the relative bargaining position of these young girls, who already start with the disadvantage of possessing a low level of prior skills, is quite low - with the result that employers can more easily underpay them. Similarly, young women who are forced involuntarily into prostitution or sold by their families into domestic work, sweatshops, or other kinds of bonded labour enjoy little status and may well be worse off than before becoming gainfully employed. ^{7/}

^{6/} See M. Mies, The lace makers of Navsapur: Indian housewives produce for the world market, Zed Press, London, 1982.

^{7/} See P. Phongpaichit, From peasant girls to Bangkok masseuses, ILO, Geneva, 1982 and A. Fuentes and B. Ehrenreich, Women in the global factory, Institution for New Communications, South End Press, 1983, on these points.

B. Impact of modernization

20. Although technology has affected in different ways women's work in particular sectors and parts of the world, there are certain distinct patterns that can be observed over broad regions that have either been adverse for women or have left them largely untouched. The patterns cut across all sectors: including the household, agricultural, small-scale or informal (non-agricultural), and modern sectors.

1. Household

21. In addition to caring for children, women in parts of the developing world, particularly poor women, expend much labour and many hours per day on processing and cooking food for the family and on fetching fire wood and water. The techniques for threshing, hulling and grinding or crushing basic food grains, oil seeds and pulses in rural areas still involve use of the same centuries-old manual techniques handed down from mother to daughter, despite the existence of threshers and hand mills that could greatly lighten these tasks. The open fire cooking techniques used by these same women are inefficient and air polluting and require large amounts of wood that must be carried from increasingly long distances as deforestation spreads in response to rising person-land ratios. Yet, a whole spectrum of simple, energy-efficient cookers based on food and other fuels have existed for many years. A correspondingly wide range of hand pumps and other types of largely unexploited water-lifting or water-catching technologies is available for reducing the inordinate amount of women's labour time spent in fetching water.^{8/} Through a lack of access to more advanced technologies, Third World women are constrained from moving into remunerative work that would improve their status and that of their families.

2. Agriculture

22. The substantial contribution of women's labour to agricultural production in developing countries is well known. Official statistics on production and income which reflect mainly monetized output underestimate this contribution because of the far greater involvement of women than men in the production of subsistence crops as distinct from cash crops.^{9/} Sexual discrimination in access to technology marks both types of agriculture. By

^{8/} In Nepal, small-scale, direct mechanical drive units using water as an energy source are being manufactured locally for processing forest and agro-based raw materials, including food for household consumption in remote mountain areas. See the report by the UNCTAD secretariat, "Technology issues in the energy sector of developing countries: small-scale hydro-power projects in Nepal" (TD/B/C.6/116), 1984.

^{9/} In subsistence agriculture there is evidence that women's contribution may exceed that of men. In the context of India see, D.Jain and M.Chand "Report on a time allocation study -- its methodological implications", Institute of Social Studies Trust, New Delhi, 1982; P.Jacob, "The activity profile of Indian women", National Sample Survey, (mimeo), Calcutta, 1983; B.Agarwal, "Rural women and high yielding rice technology in India", Institute of Economic Growth (mimeo), New Delhi, 1984.

and large, it is women who perform the most demanding, tiring tasks, with the least equipment per worker and lowest capital-labour ratios. Because the growing of food crops is a woman's activity, it employs the most primitive; often manual methods of cultivation and irrigation and receives the fewest or poorest inputs of fertilizers and insecticides. Within cash agriculture where more mechanized, modern methods are used, women's labour is still reserved for those activities that have the lowest productivity, use the crudest implements and are the most repetitive and back-breaking. When such activities are mechanized, women typically lose their jobs to men and move into more labour-demanding jobs.^{10/}

23. The increased labour burden for women arising from the introduction of sex-specific technologies has been underscored in a recent survey of the role of women in African rice farming systems, as is illustrated by the following examples:

"In Madagascar mechanized ploughing has reduced men's input in this task and permitted an expansion in the area under cultivation which has in turn increased demand for female labour in transplanting and weeding. The swamp rice development project in the Banfora region of Upper Volta imposes substantially more intensive cultivation practices (such as line transplanting, fertilizers, careful weeding and water control). Since rice production is entirely the women's responsibility, this has considerably increased their workload. At the same time they still have to give the same labour input on the upland crops with the result that they are now working harder and spending longer hours in the fields than before."^{11/}

^{10/A} vast literature has accumulated on the observed patterns of displacement of rural women in the process of development since the appearance of E.Boserup's classic study, Women's role in agricultural development, Allen and Unwin, London, 1970. A few examples include B.Agarwal, "Agricultural modernisation and Third World women: pointers from the literature and an empirical analysis", ILO Working Paper, 1981; L.Beneria, ed. Women and development: the sexual division of labour in rural societies, Praeger, New York, 1982; M.Loutfi, 1980, op.cit.; I.Palmer, "Rural women and the basic needs approach to development", International Labour Review, vol. 115, no. 1, Geneva, 1977; V.Ventura-Dias, "Technological change, production organisation and rural women in Kenya", ILO World Employment Research Working Paper WEP 2-22/WP 101, Geneva 1982; and R. and P. Whyte, The women of rural Asia, Westview Press, Boulder, Colo, 1982.

^{11/}J.Dey, "Women in rice farming systems", Science and Public Policy, August 1984, p. 208.

24. The introduction of new agricultural technologies has not been without other asymmetric effects for women and men, particularly in connection with development projects. These include, for example, increased difficulty of harvesting rice and other crops as a result of the introduction of new varieties which may not be suitable to the type of land farmed by women; saline intrusions, weed infestation and other undesirable effects on land farmed by women, resulting from ill-conceived irrigation schemes; inadequacy of wives' share in the increased cash income accruing to the family from the application of new techniques; and relegation of formerly land-holding women to status of landless unpaid family labourers as a consequence of land-redistribution to male heads of households accompanying the promotion of larger-scale irrigation systems.

3. Informal or small-scale non-agricultural sector

25. This is a heterogeneous category encompassing a wide variety of activities such as the production and sale of handicrafts (e.g., textiles, ceramics, basketry, dolls, toys and shellwork) and food preparations; the provision of services such as dressmaking, hairdressing, domestic help, traditional health practice; and petty trade. Women engaged in these activities have access to minimal technology either in the form of skills or equipment and tools. Their main and often only endowment is their labour power. Males employed in this sector may also be poorly endowed technologically. However, in contrast to the situation of women, it is not uncommon to find individual male artisans and entrepreneurs - mechanics, carpenters, blacksmiths and other metal workers, jewellers, electricians, etc. - possessing the most advanced, small-scale technology and able to supply this technology to hired workers.

26. Women in this sector may either be direct participants in local labour or commodity markets or they may be engaged in a putting-out system of production which involves assembly or production of goods within the home using mainly externally supplied inputs. Frequently, the putting-out system of production prevails in areas where some form of pardah is practised. While women in this system are solely responsible for production, the control of "marketing technology" is with few exceptions in the hands of middlemen (often their male relatives) who sell and distribute the final products and are able to pocket most of the income that is generated. Because the income from putting-out type production is regarded by the woman as an adjunct of her main responsibilities as housewife, she does not perceive the necessity to fight for better wages or to seek and demand more productive technology.^{12/}

27. In the long term, the tendency for technological progress to displace specific categories of unskilled labour does not augur well for the kind of craft goods produced by women in this sector, particularly those for which close substitutes can be manufactured on a factory scale.

^{12/} C.f. paragraph 18.

4. Modern industrial sector

28. In most developing countries, the modern industrial sector is not able to absorb more than a minimal proportion of the labour force and the share of women in this proportion is itself quite small. The use of the modifier "modern", suggesting "technology based" is moreover misleading as to the level of skills that are demanded in the activities presently carried out by women in this sector. With few exceptions, in both rich and poor countries women occupy a narrow range of low paying jobs requiring few skills, subject to low productivity and offering few prospects for career development. Women's jobs are most heavily concentrated in those industries shaving an historical link with the household, such as food processing, textiles, toys and light leather manufacturing, which require relatively few sophisticated technological inputs as distinct from the more technology- and capital-intensive industries such as iron and steel, chemicals, heavy machinery, machine tools and automobiles that have been the preserve of men.

29. Even in the more modernized industries such as electronics or in technically-advanced factories within textiles and other traditional industries, the kind of work performed by women involves a very limited contact with machine operation and with technical functions that are left to men. Rather, most women in the factory are employed in the early and final steps of industrial production, as been described for Mexico by Srinivasan:

"Their work mostly involved preparing the raw materials, selecting and arranging items in the first stages, and assembling parts (as in the case of the maquiladoras, or piece-work plant) and packaging the finished goods in the last stages of production. The in-between stages are permeated with technology, which requires technical skills. No matter how modern the technology deployed in the particular industry, women mostly are engaged in non-technological gathering, assembling, arranging and packaging activities ..."^{13/}

Thus, in industry as in other sectors of the economy, women are only peripherally involved in the use of modern technology, but are employed selectively to support the technology intensive stages of production.^{14/} Moreover, when certain manual tasks performed by women are mechanized, as for example, washing cutting and peeling of fruits and vegetables in cannery operations, the mechanized operations are taken over by men. Looking across different industries, the more capital and technologically intensive the industry the lower the proportion of women employed as compared with men.

^{13/}M. Srinivasan, "Impact of selected industrial technologies on women in Mexico" in R.Dauber and M.L. Cain, ed, Women and technological change in developing countries, Westview Press, Boulder, Colorado, and American Association for the Advancement of Science, Washington, D.C. 1980, p. 90. See also A. Fuentes and B. Ehrenreich, op. cit.

^{14/}I.Schumacher, J.Sebstad and M.Buvinic, "Limits to productivity: improving women's access to technology and credit", International Center for Research on Women, prepared for the Bureau of Program and Policy Co-ordination, Agency for International Development, Washington, D.C. (mimeo), May 1980.

29. The confinement of women to lower-skilled jobs has also meant a distinctly lower average remuneration than for males. However, one writer has found that even in some instances where women workers have been given jobs requiring intensive training and use of sophisticated machinery, the jobs were classified at the lowest wage grade in the plant, below that of less skilled male canteen and building maintenance workers.^{15/}

30. The spread of transnational corporations into offshore assembly industries in the Far East and parts of Latin America has been fostered by the prospect of abundant, low cost labour. Large parts of the labour force in such industries - sometimes up to 90 per cent - have been unskilled female workers. Although the wages and fringe benefits and working conditions have been far below the average prevailing in industrialized countries, many women in developing countries have been attracted to these jobs because of the higher pay compared with existing employment alternatives, if any, in the countryside and in urban areas.

31. Little can be said a priori about the desirability of these industries to the host economy.^{16/} Any evaluation of such desirability can only be made in individual cases on the basis of the net contribution of the industries to income, employment and exports in comparison with other alternatives. The observations that can be made are (1) that the assembly-like and highly specialized nature of the operations carried out allow little linkage with other branches of the economy and (2) since the technological impact in the form of skill formation effects is negligible, the women in these occupations have few alternatives for new employment in the event of factory closures. In fact, offshore plant operations of the kind to be found in many of the newly industrializing countries are not stable elements of the process of economic and technological development since the industries concerned are constantly in search of lower cost labour or (export quota) advantages elsewhere. Thus, women employed in these industries are quite susceptible to job displacement.

V. Constraints on access to improved technology

32. The main conclusion of the preceding section is that women as a group have not benefitted fully from employment opportunities and other benefits of technological change. An analysis of the nature of women's activities in the household, agricultural, informal and industrial sectors reveals the persistent use of outmoded and unproductive technologies and impeded access to new techniques. The introduction of new technologies has in many instances displaced women from their jobs and increased the burden of work. Where production entails the use of advanced techniques, women are not actively in contact with technology but play an ancillary or supporting role in the production process.

^{15/}J.Humphrey, "Gender, pay and skill: manual workers in Brazilian Industry" (mimeo), 1984.

^{16/} See, however, the study by the UNCTAD secretariat, "Export processing free zones in developing countries: implications for trade and industrialization policies", (TD/B/C.2/211 and Corr.1) January 1983.

33. It has been rightly argued that the problems described are not the fault of technological change per se, since what is inappropriate is not the technology but the context in which it is applied. The context that has made technology somewhat of an "enemy" of women is linked with the traditional sexual divisions of work and reward as conditioned by the three responses identified in Section III of this report. The inherited position of women in the family extends to society as a whole and influences their access to technology in the production sector through the operation of two sorts of influences relating, respectively, to (1) attitudes and (2) resource availabilities.

34. To a great extent, the marginalization of women in the work place is a product of prejudices and preconceptions about sexual roles that have been frozen by tradition. Attitudes about the "proper place" of women coming down from the family prejudice against them the distribution of opportunities and rewards from modernization. Thus, in many developing countries the evolution of agricultural production has, as already noted, been characterized by the specialization of men in cash crop production and women in subsistence activities. Colonial administrations distributed technical inputs to farmers on the basis of inherited perceptions of the male as breadwinner, and of women's activity as supplementary to those of their husbands, a concept that has continued to influence the channeling of resources and inputs by post-colonial governments. The idea that men are responsible for cash-generating activities and women are engaged in activities that directly benefit the household is deeply ingrained in many societies and is consistent with the idea that wives should be dependent on their husbands. The limited possibility of promotion of women to higher-level positions within modern enterprises stems in part from the perceived primacy of their reproductive and homemaking functions.

35. The unequal status of most women within and outside of the household also applies to their control over and access to important resources necessary in order to be able to identify, command and make effective use of technological inputs; although as previously noted, the situation differs among different categories of women. These resources, which are both human and material, include education and training, capital, land, credit and certain types of publicly-supplied infrastructure.

36. Education and training are essential in order to understand the connection between new technical inputs and improved productivity, and to be aware of the range of technologies that may be available. Yet, women in most countries, particularly developing countries, are encouraged to leave school at an early age, thus entering the labour force with highly inadequate educations. There is, moreover, an inherent bias in the educational structure of most countries that channels women towards humanities and arts rather than science-based and technical subjects. Illiteracy and meager endowments of skills limit the opportunities for advancement and make women particularly vulnerable to the adverse effects of new labour-displacing technologies. The heavy burden of child-rearing and household responsibilities makes it difficult for working women to get the continuing training necessary in order to move on to higher-skilled jobs. Vocational training for women is generally scarce and has tended to be confined to home economics and, to some extent, secretarial subjects that offer little or no preparation for technology-intensive pursuits in agriculture, industry and in the more sophisticated service sectors.

37. To the extent that new technologies are embodied in machinery and in other physical forms, they require investment of financial resources. Lack of capital is another factor that constrains women's demand for improved technology, particularly among the large numbers of women engaged in agriculture. Several of the most important avenues for obtaining financial resources with which to purchase technological inputs are relatively less accessible to women than to men. Inheritance of financial resources that can be put to productive use is reserved for male offspring in many countries. The opportunity to earn cash income through wage labour is limited because of prejudices concerning the kind of work that women are allowed to do, lack of the necessary training, and the time that must be devoted to household tasks.

38. Another cash-generating asset for financing the acquisition of technology is land. In so far as customary patterns of inheritance, religious practices and land reforms have given some rights to women to acquire, own and utilize land, these rights are being eroded as a result of the increasing scarcity of good land, the growing pressure to allocate it according to commercial criteria.^{17/} The weak position of women politically and in the family makes it difficult for them to press for any rights they may have to land. Hence, this important source of power for making the demand for technology effective is missing for many women.

39. Access to credit and financial institutions is also instrumental in the acquisition of technological inputs. But since they are generally poor and own few other assets, women are not good financial risks for commercial lending purposes. Social customs may limit women's ability to borrow, as for example the requirement of the husband's approval or the prohibition against female members in some credit co-operatives. Other factors limiting the availability of credit to women at a reasonable financial charge are ignorance about how to obtain loans from formal credit systems, the high cost of servicing the kind of small, special-purpose loans needed by women and the time taken away from household duties that is necessary in order to negotiate a loan.^{18/}

40. The lack of assets needed in order to be able to use modern technology just discussed does not apply uniformly to all women. Those who are least endowed with the wherewithal to participate in technological change are poor women who, in developing countries, tend to be concentrated in small scale or subsistence agriculture and in petty trade, services and other activities in the informal sector. It is these women, who represent the majority of women in developing countries, that are also discriminated against in the allocation of certain resources of strategic importance that are normally supplied under the auspices of government programmes. Roads, transport and communication facilities, electricity, water for irrigation and household use represent public goods whose inadequacy constitutes one of the major impediments to the adoption of modern technological inputs by the poor, including poor women.

^{17/} See sources cited in Schumacher, Sebstad and Buvinic, op. cit., p. 23.

^{18/} ibid.

VI. Conclusions and selected policy implications

41. As far as technology is concerned, women on the whole -- abstracting from differences between certain classes and groups among them -- are caught in a vicious circle. Their inferior position in production activities and the up to now asymmetric effects on them of technological progress are based on ingrained social prejudices originating from sex biases in intra-family relations characterized by co-operation and conflict. At the same time, for many women, the very inadequacy of the technological and other means of their participating efficiently in production impedes the amelioration of their bargaining position and status in the family and in society. In short, low status limits access to the benefits of modern technology which limits possibilities for improving status.^{19/}

42. The achievement of more rapid progress in elevating the position and prospects of women would, therefore, seem to call for a "systems approach" that recognizes this two-way interaction by attacking two fronts simultaneously. Paralleling the implementation of measures directly aimed at strengthening women's technological capabilities, governments and concerned national and international organizations have the responsibility of reinforcing measures directly aimed at the transformation of traditional perceptions of men's and women's interests and of their respective contributions to family and society. The general implications that follow from this approach are clear enough, though particular policy packages would have to be specifically derived with respect to the economic and social conditions of each country or region, respectively. A few of the more general strategic issues of policy which need to be studied in detail may call for brief comments, in line with the analysis presented earlier in this study.

43. First, as already mentioned, women's lack of access to (or effective demand for) modern technology in the household, agriculture and industry, and their concentration on less skillful jobs that are repetitive and mechanical relates, to a great extent, to disadvantages in access to human and material resources -- education and training, cash resources, land, credit and social overhead facilities needed in order to be able to identify, command and make effective use of technological inputs. These disparities themselves are best seen as results of the outcomes of co-operative conflicts and of feedback transmission.

^{19/} This vicious circle is illustrative of the "feedback transmission" of women's disadvantage vis-à-vis men in successive intra-family co-operative conflicts and over successive generations. See paragraph 15 above.

44. Any far-reaching policy responses must therefore operate to assure women a more equitable supply of these instruments of productivity increase and job acquisition in addition to removing outright employment discrimination and unequal pay for equal work. The nature of the precise kinds of measures needed are well-known and have been the subject of discussions and of the plans of action adopted at Mexico City and Copenhagen.^{20/} Progress has been achieved, for example, in extending education and the formation of relevant productive skills to greater numbers of women. Some achievements have also been made in strengthening and enforcement of laws protecting the right of women to inherit, own and dispose of land and capital, and programmes have been implemented by national and international agencies for making credit available to women. The supply and delivery of social infrastructure such as transportation and communications facilities, clean water and health care among those parts of the population in which the most disadvantaged women are concentrated -- the rural and urban poor -- has been increasing very slowly, particularly in developing countries.

45. The importance of these kinds of measures for improving the lot of men and women is widely recognized. What has perhaps been less obvious is the emphasis they need to be given in the formulation of technology plans and policies in which the women's dimension is explicitly incorporated. As demonstrated by research on the Green Revolution, the spread of new techniques and their adoption by men and women is strongly dependent on educational background and on the availability of other resources and inputs needed for their application. Also dependent on this resource base is the ability of male and female workers and entrepreneurs to adjust to and benefit from the international diffusion of new technologies, such as those involving applications of microelectronics, informatics and biotechnology.

46. Valuable work has been done at the national and international levels to develop and disseminate technology to meet women's needs, particularly among the rural and urban poor. Yet, the results of this work will be lost unless it is part of the much larger effort that is required on the demand side to assure the necessary resource availabilities. Moreover, more women obviously need to be involved, not only as the objects of these programmes, but also in their design and implementation at all levels.

^{20/} Report of the World Conference of the International Women's Year, Mexico City, 19 June - 7 July 1975, United Nations publication, Sales No. E.76.IV.1; Report of the World Conference of the United Nations Decade for Women: Equality, Development and Peace, Copenhagen, 14 to 30 July 1980, United Nations publication, Sales No. E.80.IV.3.

47. Second, in giving women improved access to technology through creation of job opportunities, particular attention must be paid to the nature of the created jobs and the effects that they may have on the outcomes of co-operative conflicts. As was discussed earlier, the nature of co-operative conflicts involves ambiguities of perception of respective interests and of respective contributions. Employment opportunities for women have to be judged not merely in terms of the earnings created, important though they are, but also in the context of whether the employment will be seen as "value-producing work". Thus, dole-like employment, such as in certain types of handicraft activities created, on government command, to give women a simple source of income may not have at all the same effect as more "productive" work in transforming traditional relations. Similarly, care must be taken to obtain due recognition for women's effort in a particular job and to avoid its being treated as purely supplementary to the husband's work. In short, job creation has to be assessed in a wider social context involving both the nature of the work that is entailed and the social recognition of the productive contributions that are being made, which affects the rewards of men and women.

48. Third, reproduction is a central co-operative aspect of human life, valued from many perspectives, not just from that of reproducing the labour force. But at the same time, as was discussed earlier, the differential roles of men and women in this process have a profound effect on the "bargaining" outcome, making the resolution of the conflicting aspects inequitable. The negative effects of pregnancy and child-bearing on the woman's "fall-back position", "threat position", and the ability to make "perceived contributions" to economic production and prosperity, tend to effect the nature of the social divisions. While this is obviously not a problem that can be easily resolved, it is important to emphasize the role that family planning can play as one type of technological modernization that would tend to help rather than harm the interests of women in terms of the conflicting as well as the co-operative aspects of household arrangement.

49. Fourth, public discussions and debate have a potentially far-reaching impact in an area in which social illusions co-exist closely with reality, and appalling inequities are cloaked in perceived legitimacy. The importance of information and analysis in breaking the grip of traditional arrangements is hard to exaggerate. The technology of mass communication can and should be enlisted to help eliminate the prejudices surrounding women's status. The first step that has already been taken, especially in films and television programming in many developed countries as a result of pressure from women's groups is the negative one of refraining from the treatment of women in a sexist way. With the advances in communications technology which are making it possible to reach the remotest villages at a steadily diminishing cost, more can be done in all countries through audio-visual means to affirm the rights, needs and interests of women, to give value to women's reproductive and productive functions in society and to sensitize men and women to their joint responsibility for childrearing.

50. Finally, economic development does not necessarily bring with it improved earning possibilities and greater participation of women in the production process unless it is accompanied by the kinds of changes that have been referred to above. Nevertheless, given these preconditions, it is evident that an acceleration of industrialization and structural

transformation in developing countries will have a favourable impact on the status of both men and women. The programme of concerted measures at the international level called for by UNCTAD to revitalize the world economy and reactivate the development process in the third world is obviously of great relevance.^{21/} These measures include inter alia the implementation of the Integrated Programme for Commodities in the area of stabilization and strengthening of commodity markets, modalities for greater participation of developing countries in processing, marketing and distribution of commodities; a halt to protectionism and a strengthening and improvement of the international trading system; improvement in the functioning of the international monetary system so that it fulfils adequately its supportive role in the area of balance of payments financing; and the adoption of a strategy for the technological transformation of developing countries.

^{21/} See Development and recovery: the realities of the new interdependence, Report by the Secretary-General of the United Nations Conference on Trade and Development to the sixth session of the Conference, United Nations publication, Sales No. E.84.II.D.4; and the report by the UNCTAD, "A strategy for the technological transformation of developing countries" (TD/277), to be reproduced in Proceedings of the United Nations' Conference on Trade and Development, Sixth session, Vol. III, Basic Documents (United Nations publication Sales No. E.83.II.D.8.)