A Quantitative Approach for Examining Female Status and Development Interrelationships: With Application to Pre-Beijing Data from the Philippines[1]

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Abstract

This paper addresses an important policy question, which has been taken for granted in most research: Does development enhance or worsen the status of women? The applicability of the Threshold Hypothesis, which posits a non-linear relationship between development and women's status, was tested using province-level data from a developing country, the Philippines. A contextual measure of female status relative to men, which is measured as gender inequality in education, health, work status, occupation, and industry for each province across time, accounts for the multidimensionality, heterogeneity and time- and context-variability inherent in the female status concept. Development measures spanning the 1960s to the 1980s include year and development level. Composite development level indices, which were comparable across decades, were constructed using factor analysis. A change in development level over two decades was also measured. Pooled multiple-regression and correlation analyses, and regression standardization were employed. Results revealed that women were better off than men in health status but women fell behind men on the other four domains. The Threshold Hypothesis was applicable for education and health. Although thresholds still apply, the reverse pattern was found for work status, occupation, and industry. In addition, the unexpected second threshold found at the extreme right of the development scale for education and health further challenges the Modernization view on the positive linkage between status of women and development. Although findings in the study justify policy calls for continued development improvements for more gender-equitable environments, it is proposed that policies and efforts directed toward improving the status of women be guided by more detailed information on the critical linkages between various dimensions of development and women's status.

Key Words: *female status and development interrelationships* quantitative approach, Threshold Hypothesis, development index construction, Philippines

Introduction

This paper addresses an important policy question which has been taken for granted in most research: Does development enhance or worsen the status of women? The growing scholarship on women and development in developing countries has focused mainly on women's role in the development process. Many studies have focused on the linkages between female status[2] and fertility decline, the role of women in promoting the welfare of the population, and economic and social development (Cornwell & Stokes, 1991; Kelly, 1991). However, on the other side of the issue, how development influences women, has not been given much attention.

Recent policy calls for the improvement of women's status to accelerate national development or policy calls for the acceleration of development to generate a positive impact on the female population appear to sound hollow since the nature of the empirical relationships remain unclear and untested. This concern remains vague despite gender mainstreaming efforts following significant global initiatives in Cairo and Beijing during the 1990s. Many gender and feminist studies to this day still continue to provide spotty coverage and voluminous qualitative data, which leave no room for testing and verification of the above-mentioned propositions.

To address this important issue, the less studied side of the "women and development topic," i.e., the effects of development on women's status, will be examined. The construction of composite development indices is an integral part of this methodological approach, which tests for linear and curvilinear relationships, using provincial-level data over three decades from various censuses and surveys in a developing country, the Philippines. The timeframe of the study is limited to the 1960s to 1980s to be able to measure conditions prior to the 1995 World Conference on Women held in Beijing.

Understanding how the development process conditions the status, roles, and economic behavior of women is important in the study of population processes in view of women's pivotal role in human reproduction.

Various stages of development may correspond to different statuses for distinct types of women. "[A]t certain stages of economic development, women's position is likely to improve, whereas at other stages it may deteriorate" (Boserup, 1990, p. 22). Although status selectivity varies with both women's development context and their individual attributes, the focus of the paper is on the former since both measurement and analysis are at the provincial (macro) level and not at the household or individual (micro) level.

Functionalism, modernization, and feminist explanations for persistent differences between men and women in society are hinged on distributional efficiency, equity, and equality in the access, use, and allocation of important human and material resources. Equality measures are used in the study since it is difficult to get efficiency and equity measures across geographical areas and over time. Female status relative to men is operationalized as gender inequality in health, education, work status, occupation, and industry. These are measured in each province across time. Provincial development measures between 1960s to 1980s were collected from various censuses and surveys for the development index construction.

The paper aims to determine the direction of development effects and to discern shifts in gender inequality at different levels of development. The specific questions addressed are: Is there a positive or a negative linkage between development and gender inequality? Are there relevant development thresholds for understanding gender inequality? Is modernization[3] or general development an important condition for changing the gender environment in developing countries?

Theoretical background

Despite numerous criticisms of Modernization theory, its legacy on sociological discipline remains strong particularly in the social policy domain. Modernization and its development derivatives have left a lasting impression on the study of society, which, in turn, led to, shaped, and steered most gender research to date.

Early sociologists like Spencer, Durkheim, Toennies, and Parsons envisioned the eventual decline in importance of ascribed status, like gender, in societal differentiation as a society takes a unilinear development path.

With the appropriate application of capital and technology from developed countries, developing country economies were anticipated to increase production and generate industrial improvements and, in effect, spawn social changes as experienced by western industrialized countries.

Anything strikingly different from the traditionally held ideas, values, and institutions is often labeled as modern. The adoption of modern values and behavior can take place through exposure to modern economic and political institutions, e.g., factories, or independent exposure to these values in the process of development. The introduction and efficient operation of modern industrial institutions are generally associated with modern work values. Thus, the marked increase in female participation in industrial production during the past decades is equated with greater female exposure to modernizing influences, which affect women's values and behavior. Hence, this meritocratic perspective denotes a positive linkage between women's status and development. Taken to the extreme, this position implies that with development, women will eventually enjoy full equality with men, including opportunities for civil rights, education, and employment (Giele, 1988).

Historically, environment and technology were the prime agents of change in human society's evolution. Egalitarian relations between the sexes were associated with low population pressure and female farming systems, where men cleared the land and women cultivated with hoes (Boserup, 1970). Introduction of the plow made women less productive, and accordingly, their status declined relative to men. But the informal power[4] of women within the family is recognized even in patriarchal societies.

Although positive impacts[5] of industrialization on the status of women have been recognized in several areas, skepticism abounds with contrary accounts in recent scholarship on women. Modest improvements in women's education seem hollow, with females still lagging markedly behind males in Asia, Africa, Latin America, and the Arab States (Curtin, 1982; Sivard, 1985). Another example is the failure of the dramatic post-war increase in the labor force participation of married women in the U.S. (Smith, 1979; Oppenheimer, 1970) to improve women's situation. This is attributed to the persistence of "differential rates among wage contours [between the sexes]... because institutionalized adbministrative rules and procedures of organizations and workers come to regard them as proper" (Marini, 1989, p. 370).

On its own merits, Modernization theory fails to explain the complexity in the evolution of female status and the perpetuation of gender stratification in societies. By combining it with alternative perspectives (i.e., the Marxist-Feminist[6] view, which draws heavily on dependency explanations, or Lenski's curvilinear[7] view) and delineating a temporal divide for their applicability, a more realistic view of how the status of women changes with development may be provided. This paper tests the applicability of the Threshold Hypothesis. At development levels below the threshold, female status is anticipated to increase with development, which is consistent with the Modernization theory. Beyond the threshold, the status of women is envisioned to either level off or decline with further development. The five dimensions of female status, i.e., education, work status, occupation, industry, and health, are expected to exhibit these patterns.

Data and methods

The variables

The provincial-level secondary data covered the decades of the 1960s to the 1980s (Table 1). The dependent variable is a contextual measure of female status reltive to men, which is measured as gender inequality in education, health, work status, occupation, and industry. Gini coefficients[8] were calculated as indices of time- and context-specific gender inequality on four dimensions: *education, work status, occupation,* and *industry*. For gender inequality in *health*, the ratios of male to female life experiences at birth minus one[9] were obtained. These five measures address the often cited multi-dimensional, contextual, and time-varying concerns in the operationalization of the female status concept (Mason, 1984/1986). Positive-valued gender inequality measures were associated with low female status relative to men, while negative-valued gender inequality measures were taken to indicate high female status relative to men. For all five measures, zero denotes equality between men and women.

A temporal development indicator (year), which is a composite index for development level, and a change in the development level indices over two decades were utilized as summary development measures. Three development level indices for the 1960s to the 1980s were initially

Table 1. Provincial-level data and their sources

Socioeconomic data	Source
Provincial sex distribution of the economically active population by education, Employment status, Occupation, Industry, Proportion of employed population in non-agricultural jobs by province	NSO special tabulations from the 1970 census and from the LFS (1978, 1980-1983)
Sex ratio, Total population, Percent urban, Population density, Population growth rate, Household size, Dependency ratio, Household head population, Household population, Migration rate, Migration flows, Percent of households with nuclear families (1970, 1975, 1980, 1990)	NSO special tabulations from the 1970, 1975, 1980, and 1990 censuses
Expectation of life at birth by sex (1960, 1970, 1980)	Cabigon (1990)
Population density and Population growth rates (1960)	Concepcion (1978)
Percent literate (1960, 1970, 1975, 1980) Percent of populationwith at least (a) Elementary education (b) High school education Percent of households with (a) Electricity (b) Safe drinking water (c) Sanitary toilet	NCSO final reports for the 1960, 1970, and 1980 censuses
Agricultural output per worker (1960, 1970)	Pernia et al. (1983)
Number of hospital beds (1960, 1970, 1980)	NCSO Journal of Philippine Statistics (1961, 1972, 1981)
Road kilometers (1961, 1970, 1982)	NCSO Journal of Philippine Statistics (1963, 1972); NEDA 1978 Regional Development Information, each region (1972-1982)
Number of Registered motor vehicles (1964, 1970, 1982)	NCSO Journal of Philippine Statistics (1968, 1971); NEDA 1978 Regional Development

LFS - Labor Force Survey
NCSO - National Census and Statistics Office
NDS - National Demographic Survey
NEDA - National Economic and Development Authority
NSO - National Statistics Office

constructed using factor analysis from province-level data on fifteen socioeconomic and demographic variables.[10] The index construction is further described in the next section of the paper. Development change, on the other hand, was calculated as the difference between the development level measures for the current and the previous decades.

Analytical methods

The relationship between gender inequality and development was examined at the provincial (macro) level. The baseline model (Model 1) consisted of three development measures, i.e., year, development level, and development change. To determine the timing and pace of change, higher-order effects (quadratic and cubic effects), or splines for the development measures were included in multiple regression models that predict gender inequality for each of the five dimensions. Spline or piecewise regression allow the specification and testing for the point of inflection where development effects shift. The non-linear model, which shows a better fit to the data using the change in R^2 will be reported as Model 2. If the Threshold Hypothesis is true, negative linear and positive quadratic development effects are expected. On the other hand, if splines rather than higher-order effects give better fitting models, gender inequality is expected to decline then shift direction beyond the threshold. The cut-off points used in the spline models are (1) the mean for year and development level, and (2) zero for development change.

Construction of the development level index

To understand the relationship between female status and development, construction of a summary development measure is crucial for development-tracking across time and space. None of the development indicators was categorical so selection of an appropriate statistical technique to summarize provincial level data on family/household, urbanization, communication, education, demography, health, and the economy was straightforward. Factor analysis was employed on fifteen development indicators, which pertain to the past three decades (1960s to 1980s).

Province-level development indicators were first grouped by decade.[11] For data in the 1960s, a varimax solution[12] to factor analysis was employed to estimate a factor score that shall represent development in each province. Provinces with positive-valued factor scores were considered more developed. Negative-valued scores, on the other hand, were associated with provinces that have lower levels of development.

Various criteria[13] for the identification of latent factors in the 1960s data indicated that there was a major common factor that can represent

the development position of the provinces in the 1960s. Kaiser's (1962) "Measure of Sampling Adequacy (MSA)" coefficient is very close to the 0.80 level, indicating that the 1960s data were adequate for factor analysis. Moreover, the high squared multiple correlation coefficient for the major common factor (0.982) suggests that the prediction of factor scores derived from the manifest variables was exceptionally good. The computed factor scales for the decade of the 1960s was also found to have at least 95.8 ([.9788^2] x 100) percent reliability.[14] With nearly all the variables taken from population censuses, the effect of sampling variability on the data was also considerably small.

However, the resulting factor scores were standardized, i.e., the new development level scale associated with a province reflected a factor score that was centered on its mean and scaled relative to its variance. Information on the average level of development for each decade is, therefore, lost. In addition, the variance is arbitrarily fixed to unity. If the same factor score estimation procedure was applied to the fifteen variables for the 1970s and the 1980s, three seemingly unrelated measures of development would be generated even if the same variables were used for deriving them. To ensure that development measures for the three decades reflected development change over time, development measures for the subsequent decades were anchored on the factor scores of the 1960s. An estimation procedure analogous to Principal Components Analysis was done to generate comparable factor scores over the three decades, with the 1960s as the base. The difference between factor scores across decades, therefore, reflected the desired indication of change. Although all the factor scores were in standard units, they give a crude picture of how development changed over the last three decades.

More formally, let Z be an *nxm* matrix of standardized variables, F an *nxp* matrix of common factors, and Λ an *mxp* general matrix of common factor coefficients. Note that *m* represents the number of observed or manifest variables, *n* represents the number of observations, and *p* represents the number of common factors. Using matrix notation, the General Factor Model can be stated as follows:

$$Z = F\Lambda^T \qquad (1)$$

Through a series of matrix post-multiplications on Equation 1, an estimator of the development measure is derived as:

$$Z\Lambda\Lambda_m^{-1} = \hat{F} \qquad (2)$$

where Λ_m^{-1} is a diagonal matrix of the p factors retained. From Equation 2, the corresponding algebraic form for a factor score F_j is:

$$\hat{F}_j = \sum_i \frac{a_{ij}}{\lambda_j} Z_i \qquad (3)$$

where i = 1, . . . , n and j = 1, . . . , p. First derived by Hotelling in 1939 and generalized by Kaiser (1962), the coefficient for each principal component in terms of the variables is simply the factor loadings divided by their eigenvalues.

In extending the Principal Component solution to the variables for the 1970s and 1980s, the three development measures will be comparable since they are all based on a single factor pattern. To illustrate, let Λ_{60} be the factor structure matrix in the 1960s, and Z_{70} and Z_{80} represent standardized variables in the 1970s and 1980s, respectively. Using Equation 2, the estimate of development measures for each province in the 1970s and 1980s was computed as follows:

$$\hat{F}_{70} = Z_{70}\Lambda_{60}\Lambda_{60,m}^{-1} \qquad (4)$$

$$\hat{F}_{80} = Z_{80}\Lambda_{60}\Lambda_{60,m}^{-1} \qquad (5)$$

Results

Development indicators

Both development level and development change appear to have increased in the 1980s compared to the earlier decade while level of development is positively related with development change (Table 2[15]). These results are consistent with official statistics on Philippine Gross National Product (GNP). The GNP per capita in constant dollars increased by 84 percent from $380 in 1975 to $700 in 1980 despite the slight reduction in the country's per capita GNP to $658 in 1983 (NEDA 1986). During this period, the Gross Domestic Product[16] (GDP) continued to

Table 2. Correlations among development measures

Development measures	(1)	(2)	(3)	(4)	(5)	(6)
(1) Year: 1978	1.00	-0.25**	-0.25**	-0.25**	-0.193**	-0.089
(2) Year: 1980		1.00	-0.25**	-0.25**	0.129*	0.059
(3) Year: 1981			1.00	-0.25**	0.129*	0.059
(4) Year: 1982				1.00	0.129*	0.059
(5) Development Level (DL)					1.00	0.699**
(6) Development Change (DC)						1.00
Means	0.20	0.20	0.20	0.20	0.852	0.625
SD	0.401	0.401	0.401	0.401	1.094	0.654
N	370	370	370	370	370	370

* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)

draw from the service and industrial sectors. Modernization's influence seems to have taken the energy out of the agricultural sector, although agriculture still employs approximately half (52.5 percent) of the Philippine labor force in 1980 (UPPI 1984). Moreover, the number of new business organizations and paid-up capital investments were on the upswing until the economic slowdown in the early 1980s (NSCB 1988). Output and employment in manufacturing establishments as well as infrastructural developments continued to rise.

This economic momentum has a social counterpart. Literacy rates and the proportion of the workforce that was educated increased as a consequence of free public elementary education. However, high birth rates produced a very young population in the Philippines. This young population, together with the movement toward closing the education gap between men and women, constantly pushed a larger segment of the population to the job market every year. Unemployment rates have always been high. College graduates increased at a faster pace than the economy, such that by the 1980s the college educated segment of the population had the highest unemployment rate (Tan & Canlas, 1989).

For Filipinos, especially women, education is the key to social and economic mobility (Andres & Ilada-Andres, 1987; Bacol 1971; Castro 1976). Although higher education delays the period of women's entry into the labor force (Domingo, 1985), it makes non-agricultural jobs more accessible to women (King & Domingo, 1986). "With education, women

are able to make choices and to take advantage of opportunities for improved status. Those opportunities may be broadened by economic development" (King & Domingo, 1986, p. 16).

Gender inequality indicators

The means for the status of women indicators reveal that women fell behind men on education, work status, occupation and industry (Table 3). Only in health were women better off than men. The increasing trend in life expectancy at birth since the turn of the century in the Philippines resulted mainly from rapid declines in mortality of infants and young adults, which generally favored females over males. Zablan (1983) attributed this differential effect by gender to cultural and biological factors. Yet this is not an isolated incident, considering that women in nearly all countries of the world are better off than men in the health sphere. In 1985, women outlived men by four years on average as a result of women's relatively lower mortality at early ages (Sivard, 1985). Decades of liberal reforms in the educational system have also resulted in near zero gender inequality in education in the Philippines. The relatively small variance associated with gender inequality in education (0.057^2=0.003) also attests to the homo-

Table 3. Intercorrelations among female status measures

Gender inequality in:	Education	Health	Work status	Occupation	Industry
Education	1.000	0.118* (363)	-0.151** (363)	-0.109* (363)	-0.175** (362)
Health		1.000	0.082 (365)	0.010 (365)	-0.027 (364)
Work status			1.000	0.461** (365)	0.089 (364)
Occupation				1.000	0.564** (364)
Industry					1.000
Means	0.024	-0.081	0.321	0.285	0.191
SD	0.057	0.027	0.099	0.155	0.179
N	363	365	365	365	364

* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)

geneity in the area of education, which indicates that there is a very small variability in gender inequality in education among provinces.

On the other hand, in work status, occupation, and industry (in this order of importance) women are worse off than men. This suggests that work status, occupational, and industrial distributions in the provinces are allocated disproportionately by gender with men enjoying the upper hand over their female counterparts. The relatively higher variances for gender inequality in occupation and industry ($0.155^2=0.024$ and $0.179^2=0.032$, respectively) also suggest that some provinces may have experienced situations where women are nearly on equal footing with men, especially in industry.

Each female status dimension is linked to at least one other dimension (Table 3). First, gender inequality in health is positively related to gender inequality in education. This suggests that when women are better off than men in the health domain, women's position relative to men is likely to improve in the area of education. This positive linkage may be a direct result of modernizing influences over the last 30 years. On the other hand, gender inequality in education is negatively related to gender inequality in work status, occupation, and industry. This suggests that the closing of the gender gap in education over the decades could have increased the job competition not only between the sexes but also among women. The resulting manpower resource disequilibrium also can partially explain the direct linkages between gender inequality in occupation and work status and between gender inequality in occupation and industry

Gender inequality in education

This section examines how development factors influence gender inequality in education. Model 1 in Table 4 reveals that gender inequality in education declined in the 1980s net of effects of development level and development change. Partialling for higher order effects[17] of development level and development change strengthen the temporal effect. Clearly, the negative linear and positive quadratic effects of development level on gender inequality in education are in the expected direction. Gender inequality in education is reduced as development level of a province increases, but further declines are constrained after crossing a development threshold. Hence, the Threshold Hypothesis is successfully validated for gender inequality in education.

Table 4. Development factors affecting gender inequality in education

Variables	Model 1	Model 2
Intercept	0.048**	0.055**
	(6.710)	(6.894)
Development factors		
Year (with 1970 as reference)		
1978	-0.018+	-0.019*
	(-1.968)	(-2.114)
1980	-0.027**	-0.031**
	(-2.832)	(-3.142)
1981	-0.026**	-0.030**
	(-2.750)	(-3.016)
1982	-0.031**	-0.034**
	(-3.217)	(-3.517)
Development Level		
Linear Effect	0.011**	-0.036**
	(2.430)	(-2.647)
Quadratic Effect	-	0.030**
		(4.930)
Cubic Effect	-	-0.003**
		(-5.289)
Development Change		
Linear Effect	-0.021**	-0.008
	(-3.366)	(-0.559)
Quadratic Effect	-	-0.019*
		(-2.514)
Cubic Effect	-	0.007+
		(1.719)
Summary statistics:		
F	3.819**	5.633**
R^2	0.060	0.138

+ $p < 0.10$ (two-tailed test)
* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)
Note: Unstandardized regression coefficients are reported followed by the t-statistic.

Unexpected, however, is the curvature at the end of the distribution as reflected in the significant negative cubic effect. This suggests that there are two inflection points[18] contrary to only one hypothesized threshold. As a province comes closer to the mean level of the development of the country, gender inequality in education tends to decline at a slower rate. On the other hand, greater development improvements for a province that crossed the second threshold will lead to more accelerated decline in gender inequality in education. Development impact on educational gender inequalities will also be more noticeable in provinces at the extreme ends of the development scale. Hence, development policy efforts that aim to record remarkable impacts on educational gender inequalities should place greater attention on provinces at the lower and upper ends of the development scale than on

provinces at intermediate levels of development. The significant negative quadratic effect of development change on gender inequality in education, on the other hand, underscores the amplification of this effect in provinces that record higher levels development increments.

The accounted variation in gender inequality in education more than doubled from Model 1 to Model 2. This underscores the importance of higher than linear development level effects in explaining differences in educational gender inequality in the Philippines.

Gender inequality in health

Development level is the most important predictor of gender inequality in health (see Model 1 in Table 5). High levels of development are associated with provinces that have greater health inequality between men and women: Development tends to increase the advantage of women over men. However, development level has declining impact on the female advantage in health over men at intermediate levels of development. This parallels the results found for the effect of development level on gender inequality in education. The main difference between the two results: men have an advantage over women in education, while women have an advantage over men in health.

Development level and development change both have significant non-linear functional effects in Model 2 of Table 5. Net of effects of these two development indicators, temporal effects became inconsequential. Also found is the unexpected swing at the higher end of the development level scale indicating two points of inflection.[19] Once again, support for the Modernization thesis at both the lower and higher rungs of the development level scale is documented.

Development change over the past decade also showed a curvilinear relationship with gender inequality in health. Partialling for the effect of other summary development predictors, the function increases at the lower end of the development change then tapers off at midrange. The significant negative cubic effect of development change on women's advantage over men in the health sphere suggests that the positive effect of development change is significantly reduced when there is a big difference (i.e., either positive or negative) in the development level of a province over two decades. In summary, this model provides support for the Threshold Hypothesis

Table 5. Development factors affecting gender inequality in health

Variables	Model 1	Model 2
Intercept	0.075**	-0.081**
	(-22.324)	(-21.467)
Development factors		
Year (with 1970 as reference)		
1978	-0.001	-0.001
	(-0.117)	(-0.138)
1980	-0.007	-0.000
	(-1.478)	(-0.069)
1981	-0.007	-0.000
	(-1.478)	(-0.069)
1982	-0.007	-0.000
	(-1.478)	(-0.069)
Development Level		
Linear Effect	-0.004*	-0.036**
	(-2.130)	(-5.500)
Quadratic Effect	-	0.012**
		(4.381)
Cubic Effect	-	-0.001**
		(-2.180)
Development Change		
Linear Effect	0.003	0.036**
	(1.042)	(5.310)
Quadratic Effect	-	-0.005
		(-1.367)
Cubic Effect	-	-0.007**
		(-3.448)
Summary statistics:		
F	2.345*	4.847**
R^2	0.038	0.120

* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)
Note: Unstandardized regression coefficients are reported followed by the t-statistic.

but adds another dimension in clarifying the direction of the relationship at the extreme ends of the two development scales used (i.e., development level and development change).

Gender inequality in work status

Gender inequality in work status has an inverse relationship with time and level of development, but it has a direct relationship with with development change (see Model 1 in Table 6). This suggests that over time and as the level of development increases, gender inequality in work status is expected to decline. However, a province that has experienced an increase in development level over the past decade is likely to have higher work status gender inequality than another province, which did not experience any change. Likewise, a province that experienced a decline in development

level over the same period is more likely to have lower gender inequality in work status relative to a province that did not experience a development change at all.

Table 6. Development factors affecting gender inequality in work status

Variables	Model 1	Model 2
Intercept	0.392**	0.400**
	(33.840)	(28.873)
Development factors		
Year (with 1970 as reference)		
1978	-0.089**	-0.089**
	(-5.846)	(-5.879)
1980	-0.090**	-0.092**
	(-5.778)	(-5.957)
1981	-0.089**	-0.091**
	(-5.727)	(-5.905)
1982	-0.094**	-0.096**
	(-6.034)	(-6.213)
Development Level	-0.021**	0.095
	(-3.242)	(0.603)
Development Level with "spline at the mean"	-	-0.027
Development Change		(-1.576)
	0.032**	0.057*
Development Change with "spline at zero"	(3.117)	(2.112)
	-	-0.053
		(-1.436)
Summary statistics:		
F	12.715**	10.358**
R^2	0.176	0.1896

* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)
Note: Unstandardized regression coefficients are reported followed by the t-statistic.

Thresholds in the relationship between gender inequality in work status and the three development measures were examined using splines.[20] Results show that partialling for splines renders the relationship between gender inequality in work status and development level spurious. Model 2 in Table 6 shows that time has a significant negative influence on gender inequality net of other development factors. After 1978, gender inequality in work status decreased relative to the 1970 level. This suggests that after the economic slowdown in the 1970s there was a weakening of the gender stereotype for work, which is often associated with men, as more women entered the labor force tipping the work status gender inequality scale in the Philippines. This result is consistent with the global structural pattern of women's surge to the work place.

In the same manner, development declines over the past decade are associated with significant increases in gender inequality in work status, but increases in development level over the same period are associated with marked reductions in the gender inequality in work status. Apparently, a positive development change in a province over a decade guarantees greater access of women to work outside the home perhaps resulting from industrial expansion and diversification which creates higher demand for women's work.

Gender inequality in occupation

Model 1 in Table 7 shows that development level is the most important predictor of gender inequality in occupation among the three development variables and that development level has a positive effect net of temporal and development change. When the form of the relationship[21] between the development variables and gender inequality in occupation was specified (see Model 2 in Table 7), development level exhibited a positive linear effect while a negative quadratic effect was observed for development change. This suggests that development level tends to increase with occupational gender inequalities but significant development improvements across decades amplify reductions in gender inequality in occupations. As level of development increases, gender inequality in occupation also increase because larger numbers of women often enter the labor force initially *via* traditional female occupations to complement service needs generated by industrial expansion. Significant development improvements across decades are needed to enable women to attain higher educational qualifications and increase their human capital endowment, which are instrumental for women to enter male-dominated jobs (Castro, 1976; Cabigon, 1979; De Guzman, 1979), and, in turn, reduce occupational gender inequalities.

Again, the higher demand for labor connected with development progress in a province can open up opportunities for women's entry to non-agricultural jobs or occupations traditionally held by men (King & Domingo, 1986). If a province has significantly improved compared to the previous decade, gender inequality in occupation may even favor women over men as the negative linear and significant quadratic effect of development change suggests. It is clear that both decadal and annual improvements in development are vital in transforming to a more gender equitable occupational distribution. Model 2 more than doubled the explanatory power of Model 1 (6.1 percent *vs.* 16.0 percent, respectively),

Table 7. Development factors affecting gender inequality in occupation

Variables	Model 1	Model 2
Intercept	0.267**	0.284**
	(13.742)	(13.247)
Development factors		
Year (with 1970 as reference)		
1978	-0.021	-0.022
	(-0.863)	(-0.894)
1980	-0.013	-0.035
	(-0.501)	(-1.337)
1981	-0.028	-0.050+
	(-1.096)	(-1.925)
1982	-0.044	-0.027
	(-0.170)	(-1.010)
Development Level		
Linear Effect	-0.028**	0.137**
	(2.678)	(3.722)
Quadratic Effect	-	-0.017
		(1.054)
Cubic Effect	-	-0.006
		(0.364)
Development Change		
Linear Effect	0.013	-0.022
	(0.741)	(-0.578)
Quadratic Effect	-	-0.080**
		(-4.047)
Cubic Effect	-	0.018
		(1.585)
Summary statistics:		
F	3.869**	6.742**
R^2	0.061	0.160

+ $p < 0.10$ (two-tailed test)
* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)
Note: Unstandardized regression coefficients are reported followed by the t-statistic.

which underscores the importance of non-linear development variables in the specification of its relationship with gender inequality in occupation.

Gender inequality in industry

Year is the most important predictor of gender inequality in industry. Model 1 accounts for 43.0 percent of the variation in industrial gender inequality with only three explanatory development factors. In both Models 1 and 2 of Table 8, the significant positive effect of each coefficient for year dummies suggests that gender inequality in industry markedly increased since 1978 compared to 1970. This may be taken to indicate

that job retrenchments associated with economic uncertainties after 1970 have constrained women entry to traditionally male-dominated industries.

Table 8. Development factors affecting gender inequality in industry

Variables	Model 1	Model 2
Intercept	-0.052**	0.020
	(-2.973)	(-0.984)
Development factors		
Year (with 1970 as reference)		
1978	0.280**	0.279**
	(12.229)	(12.373)
1980	0.316**	0.313**
	(13.531)	(13.529)
1981	0.281**	0.278**
	(12.047)	(12.028)
1982	0.308**	0.304**
	(13.163)	(13.157)
Development Level	-0.007	0.040+
	(-0.073)	(1.699)
Development Level with "spline at the mean"	-	-0.210
Development Change		(-0.809)
	0.005	0.110**
Development Change with "spline at zero"	(0.353)	(2.714)
	-	-0.175**
		(-3.158)
Summary statistics:		
F	44.795**	36.099**
R^2	0.430	0.449

+ $p < 0.10$ (two-tailed test)
* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)
Note: Unstandardized regression coefficients are reported followed by the t-statistic.

Development change, on the other hand, has a significant positive effect net of year and development level. Development stability or a decline in development level between the current and the previous decade has a positive impact on gender inequality, while a positive change in the level of development between consecutive decades has a diminishing effect. This is perhaps due to industrial diversification and subsequent higher labor demand often associated with development.

Comparing group means

To better understand how gender inequality varies with development change, two groups of provinces were identified: provinces that experienced development improvements over the past decade (The Progressive Group) and provinces that experienced decline or no change at

all (The Non-progressive Group). The former, on average, has significantly lower gender inequality in education than the stable or degenerate group (Table 9). This indicates that in provinces that experienced development progress over the past decade, the gender gap in education has been significantly reduced in contrast to the still relatively high gender gap in education in provinces that did not experience development change. This may be due to industrial improvements in progressive provinces that create higher demand for female labor and selectively attract better-educated females to migrate from non-progressive provinces.

Table 9. Means of gender inequality measures by development change groups

Gender inequality measure	Progressive group (Unadjusted means)	Non-Progressive group (Unadjusted means)	Non-progressive group (Standardized means)
Education	0.019	0.051**	-3.455
Health	-0.018	-0.080	-1.012
Work status	0.328	0.291*	0.525
Occupation	0.303	0.192**	2.098
Industry	0.190	0.179	0.235

* $p < 0.05$ (two-tailed test)
** $p < 0.01$ (two-tailed test)
Note: Standardized means are computed by using the Progressive Group as the standard

The unadjusted means for gender inequality in work status and occupation, however, were found to be significantly higher in the progressive group. This suggests that women's relative position to men in work status and occupation are worse off in provinces that experienced development change than in non-progressive provinces. Possible explanations for this may be attributed to gender role socialization, human capital investments, individual preferences, household rationalization, labor market dualism, and the prevalent economic system of production (Compton & Sanderson, 1990). Women in progressive provinces with high human capital investments would more likely adhere less to the domestic work role for women and therefore seek for work in the labor market. But the more capitalistic mode of production in progressive provinces and the duality of the labor market may provide a limited range of jobs to women resulting in highly unequal gender distribution in work status and occupation in progressive provinces.

In health and industry, unadjusted gender inequality means are not significantly different between the two groups. This shows that gender

inequalities in health and industry are relatively similar between the two groups.

The efficacy of comparing unadjusted means, however, is suspect due to differences in the group means (or first moments) for exogenous variables. Therefore, a controlled comparison of group means is performed to determine whether differences in group means for gender inequality would persist when the means for the exogenous variables are fixed to the means for the standard or progressive group.

Results from regression standardization[22] reveal that provinces in the non-progressive group would have a significantly higher magnitude of gender inequalities on all five dimensions of female status if the means of the progressive group were held constant (see last column of Table 9). This suggests that when the means for development variables are equated to those of the progressive group, the gender inequalities in occupation, work status, and industry of the non-progressive group will tend to strengthen men's advantage over women, while gender inequalities in education and health[23] will reinforce the favoring of women over men. In particular, the group difference for gender inequality in health increases the gender inequality gap between the two groups by more than a thousand times—([-1.012]-[-.080]/[-.080]-[-.018)]*100=1006). This suggests that standardization increases female advantage over men in the health domain when the means of structural predictors for the progressive group are applied to the non-progressive group. In the same vein, group differences in gender inequalities in education, work status, occupation, and industry are increased by 108, 6, 17, and 5 times, respectively. The expected intensification of gender inequality gaps between the two groups for all the five dimensions after standardization underscores the potential detrimental influence of social engineering or even advocacy initiatives. Therefore, efforts that would equate structural conditions in the provinces to standard levels (i.e., the progressive group's means) should be cautiously planned due to their potential for aggravating the current gender imbalance in the five dimensions studied here.

Summary and discussion

The multidimensional nature of both development and women's status has often constrained social research operationalization. The critical

linkages that should be discerned are therefore left unexplored. By using summary development measures, allowing female status to exhibit its various dimensions, and employing a simple modelling strategy, this study has provided newer insights and directions on the issue. The macro concept of the status of women was measured as gender inequality in a province at a specific year. The time component in the constructed development scale allowed the simultaneous investigation and comparison of changes in both development and gender inequalities in five dimensions (i.e., education, health, work status, occupation, and industry) across time and space.

Using Philippine data, results revealed a non-linear relationship between female status and development. Modernization Theory precepts on the positive linkage between the status of women and development are supported only at lower and intermediate levels of development.

In the education, work status, occupation, and industry dimensions, the study has shown that women in the Philippines were relatively worse off than men. Only in the health sphere were women better off than men. These may be attributed to structural contexts tempered by gender biases resulting from cultural norms/values and biological factors.

Tested and empirically supported is the Threshold Hypothesis for two dimensions of female status: education and health. The Threshold Hypothesis proposes that development is positively related to female status at initial development stages, but the relationship reverses or levels off at later stages. Pooled multiple regression results based on the curvilinear functions estimated for these domains suggest that gender inequality continued to decrease at extremely high levels of development in the education and health domains. This brings another unexpected but important finding: a second threshold at the extreme right of the development scale for gender inequality in education and health. This clearly challenges modernization's precept of unidirectional linkage.

Models using splines on the work status, occupation, and industry domains of gender inequality in the Philippines demonstrated the reverse pattern: gender inequality tends to increase at early stages of development, then declines at higher levels. While thresholds still apply, this suggests that development has a depressing influence on female status at early stages of development, which provides partial support for the Marxist-Feminist view on the negative effect of development on the status of women below

the threshold. But once a province has crossed the development threshold, women's status improves. Hence, this result questions the validity of the Marxist-Feminist view beyond the threshold.

In general, the applicability of the threshold effect in all dimensions of female status suggests that reduction or reversal of initial effects of development on women's status is possible over time, at higher development levels, or when decadal improvements are recorded in a province. But the effects of year and development level were not consistent across various female status dimensions. Temporal development had a significant negative influence on gender inequality in education and work status, but it had a positive effect on gender inequality in industry. Development level, on the other hand, recorded significant direct linear influence on gender inequalities in occupation, while it inversely affected gender inequality in education and health. Development change appeared to have consistent positive linear influence on the gender inequality in health, work status, and industry measures net of time and development level effects. However, the threshold effect indicates that greater development improvements across decades significantly reduce or buffer the negative effect of development on the status of women in the health and education spheres. Hence, this finding justifies policy calls for the continued development improvements for more gender-equitable environments in these areas.

Comparison of group means, however, suggests potential detrimental effects of social engineering or even advocacy activities if done without due attention to interrelationships between development and the various dimensions of women status. Policies and efforts directed toward improving the status of women, therefore, must be guided by more detailed information about critical linkages between various dimensions of development and female status.

Finally, contributions of the paper to the scholarship on women and development and their implications are worth mentioning. First, the special methodology developed in the paper for studying the relationship between development and the status of women uses basic statistical techniques, which can directly test what would otherwise seem implausible and not testable. In particular, the development index construction discussed in the paper can even be applied to other development-related studies that require accounting of how development varies and compares over time. Although the modelling and index calculation was relatively

rigorous, the level of data detail required for the estimation technique is likely to be available in most developing countries like the Philippines. Besides, the macro-level measures of women's status used in the paper illustrate how multiple dimensions and variations across time and place can be reflected in the operationalization of women's status for future research in this field.

Second, the non-linear relationship found between development and female status using Philippine data can be seen as a challenge not only for supporters of the simplistic positive or negative linkage (Modernization and Marxist-Feminist advocates, respectively), but also for proponents of the curvilinear view (e.g., Lenski). Replication of this study both in developed and developing countries for cross-national comparison is crucial for better understanding of women's position in the light of economic and labor globalization initiatives.

End Notes

[1]This paper was presented at the KATIPON-KAPP Lecture Series of the College of Social Sciences and Philosophy, University of the Philippines, Diliman, Quezon City on 9 July 1999. Initial versions of this paper were presented at the International Symposium on Population and Sustainable Development held on 27-29 September 1995 at Beijing, China, and the 1995 Annual Meetings of the Population Association of America held on 6-8 April 1995 at San Francisco, CA. The author is indebted to Nancy S. Landale, Sara R. Curran, Meg Greene, and Ana L. Tabunda for their insightful comments and suggestions for the improvement of earlier drafts. This paper is dedicated to a great mentor and model, Clifford C. Clogg, who passed away in May 1995. The Population Research Institute (PRI), Pennsylvania State University, the Institute for Population and Social Research (IPSR), Mahidol University, and the UP Population Institute are also acknowledged for logistical support during the preparation and several revisions of the paper.

[2]The terms *status of women, women's status, and female status* will be used interchangeably to represent an aggregate-level construct (Mahadevan, 1989; Mason, 1984) denoting women's location in the stratification system in relation to men.

[3]*Modernization* is an agency of change which transforms social relations and enhances economic opportunities. It is a phased, systematic, irreversible, progressive, and immanent process (So, 1991) characterized by structural differentiation. The modernization theory is based on Western European experience. The theory grew out of the need to guide development efforts in Third World countries and to prevent the latter from taking the Soviet and Chinese non-market-economy path to development (So, 1991).

[4]Women's contribution was often undervalued or unacknowledged, but they managed property and negotiated between kin groups (Ward, 1984).

[5]Huber (1990) summarized industrialization's positive impact on the status of women by citing the following sequential macro trends: (a) the decline in infant mortality, which reduced the number of births to be replaced; (b) the spread of mass education that redirected family wealth flows within the family and made children less attractive as an old-age investment; (c) the rapid economic growth between 1860 and 1910 in the West, which expanded economic opportunities and fueled individual ambitions; (d) the introduction of safe methods for artificial feeding, which enabled women to work outside the home without endangering the life of the baby; and (e) the increase in demand for women workers, which drove up women's labor force participation and later became the launching pad for women's movements.

[6]The Marxist-Feminist researchers' reinterpretation of the dependency theory as it applies to gender stratification suggests that development has no beneficial effect on women. The tenacity of occupational sex-segregation (Bielby & Baron, 1986; Roos, 1985), the gender-gap in returns to labor (Madden, 1985; O'Neill, 1985), the lack of significant changes in the division of labor in households and in women's labor market attachment (Hewlett, 1986), and the high representation of women among the poor, illiterate, unemployed, and underemployed attest to the dependency assertion.

[7]Another approach that slightly modifies the modernization precepts is Lenski's (1966) curvilinear representation of the relationship between societal complexity and social inequality. Lenski found more egalitarian class structures at both simple (hunter-gatherer and horticultural) societies and in more complex modern economies, while class inequalities peaked in peasant agricultures, empires, and contemporary pre-industrial societies where surplus was concentrated on the relatively few.

[8]A Gini index was computed using the formula:

$$G_i = \Sigma_{i=1}^{n} X_i Y_{i+1} X_{i+1} Y_i$$

where Xi and Yi are cumulative percentage distributions and n is the number of class intervals or units. This measures the proportion of the area between the diagonal and the Lorenz Curve in relation to the total area under the diagonal (Shryock & Siegel, 1976). The male (Xi)/female (Yi) sex dichotomy was cross-classified with three employment statuses, eight education categories, seven occupational classifications, and nine industrial classifications. Four gini indices were computed for each province *i* and year *t* out of these cross-classifications to represent four dimensions of female status specific to each province and time period.

[9]The gender inequality for health was derived as follows:

$$\frac{e^0_{0,\,\text{males}}}{e^0_{0,\,\text{females}}} - 1.00$$

where e_0^0 = expectation of life at birth. Consistent with the other (Gini) inequality measures, a zero value indicates absence of inequality. However, values above and below zero for this index indicate the magnitude of unequal distribution between genders where women are disadvantaged relative to men.

[10]Only the following 15 socioeconomic and demographic variables were measured over three decades so they were used for the index construction: the total population, the population density, percent of urban population, percent of the literate population, percent of population with at least elementary education, percent of population with at least high school education, percent of households with electricity, percent of households with safe drinking water, percent of households with sanitary toilet, road density, number of registered motor vehicles per 10000 population, population per hospital bed (public and private), infant mortality rate, ever-use rate of contraceptive methods, and contraceptive prevalence rate. Potential endogeneity bias is minimized since the development indicators used for the constructed indices were lagged by several years relative to the women's status dependent variables.

[11]Thurstone recommended a ratio of at least three variables for each factor extracted (Kim & Mueller, 1978a). Since not enough variables were collected for each year, the variables were grouped by decade.

[12]To obtain a unique solution from an infinite number of possible solutions given a set of manifest variables, constraints have to be placed. The usual practice is to rotate the initial solution to the most "simple structure" through varimax or promax rotation. Varimax obtains orthogonal factors while promax obtains oblique factors. The ideal solution is for one variable to strongly relate with only one latent factor (Bohrnstedt, 1983); a simple structure has as few common factors as possible extracted from a set of manifest variables (Kim & Mueller, 1978a/1978b). A varimax solution was employed to ensure that factors extracted are orthogonal or uncorrelated.

[13]Kaiser's eigenvalue greater than one criterion identified nine factors in the data. Significance tests using maximum likelihood estimation procedures and the Akaike Information Criterion (AIC) coefficients point to a greater than one factor solution. However, only the first factor accounted for more than five percent of the common variance. A scree plot of eigenvalues also shows that only one factor should be retained since eigenvalues dropped then began to level off. Cattell's (1966) guideline that calls for retaining factors above the "elbow" or "the point below which factors explain relatively little variance and above which they explain substantially more" (DeVellis, 1991, p. 98) leaves one factor for the 1960s.

[14]When the rotated factor structure is unequal or factor loadings differ for each variable, the "reliability of the scale is at least as good as the square of the highest factor loading" (Kim & Mueller, 1978b, p. 66).

[15]None of the correlations among the development indicators is high, which rules out the possibility of multicollinearity in the data.

[16]Philippine data from the National Statistical Coordination Board (1988) on GDP can be disaggregated by source:

Sector	1975	1980	1985
Agriculture	29.0%	23.3%	26.5%
Industry	33.2%	36.6%	32.7%
Services	37.8%	40.2%	40.7%

[17]The curvilinear function was chosen as a better model than piecewise regression since the latter explained only 9.3 percent of the variation in gender inequality in education in comparison with an R2 of 0.138 in Model 2.

[18]The first threshold is estimated to be slightly below the mean level of development and the second threshold is approximately three standard deviations from the mean.

[19]The "best" spline model explained 6.2 percent of the variation in gender inequality in health in contrast to the curvilinear model with an R2 of 12.0 percent.

[20]Model 2 in Table 6 uses a spline at the mean level of development, which is about 0.852, and a spline at zero for development change. This model was preferred over the functional form model, which has an R^2 of 18.4 percent, compared to the 18.9 percent coefficient of determination for Model 2.

[21]The functional form model has an R^2 of 0.160 and was considered a better fit to the data than the piecewise-regression model, which has a coefficient of determination equal to 15.7 percent.

[22]The standardized means of the endogenous variables are adjusted for moments of the exogenous variables (Clogg & Eliason, 1986).

[23]The significantly lower standardized mean for gender inequality in health signifies that as female advantage over men in the health sphere increases, gender inequality in health increases. On the other hand, increases in gender inequality for the other four domains suggest that men have an advantage over women.

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Appendix A
Data Coverage

Resolved were two important issues that may influence the study results: the classification scheme to be used, and the inclusion of Manila in the analysis. Administrative changes in the Philippines resulted in the fragmentation of "big" provinces. The number of provinces, therefore, varied over the decades. On the other hand, Manila's developmental advantage over most provinces in the Philippines during the past three centuries has been well documented. Hence, it is essential to check for Manila's potential developmental "outlier" effect. Holding the 1960s provincial classification constant shifts the mean and standard deviation for the 1970s and 1980s to slightly higher values. However, excluding Manila from the analysis shifts the means and variances in the opposite direction. This suggests that when Manila is not included in the analysis, development experiences of provinces across decades become more homogeneous. Moreover, taking Manila out of the analysis may not give a representative picture of Philippine development. By placing a higher premium on the representativeness of the data, subsequent analyses shall pertain to *all the provinces including Manila.*

Appendix B
Handling of Missing Data

Listwise deletion in SAS prevented calculation of factor scores for 17 provinces (i.e., seven, one, and nine provinces in the 1960s, 1970s and 1980s, respectively). The missing factor scores represented 12.73 percent, 1.37 percent, and 12.33 percent of the provinces in the 1960s, the 1970s, and the 1980s, respectively. These represent a big proportion of the

provincial populations, so, factor scores were predicted from the regression models fitted to calculate the factor scores based on the fifteen variables. However, only the non-missing data in the fifteen variables for the 17 provinces were used. Therefore, the predicted factor scores may be considered lower bounds of the true factor scales, but they were considered sufficient for purposes of the study.

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