Occupational Sex Segregation And Economic Development

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ABSTRACT

Occupational sex segregation is an important measure of equality between men and women in the labor force. As men and women share more occupations and increasingly perform the same jobs in the workplace, occupational sex segregation decreases, indicating a more similar work experience between the sexes, as well as an increase in gender equality. In this paper a cross-national examination of D, an index of dissimilarity, is presented. Data from the International Labor Organization is used to calculate D for various countries. Using the United Nations' classification of countries into least developed, developing, developed, and Eastern European, this paper examines the effect of economic development on occupational sex segregation.

INTRODUCTION

The integration of women into an economy, and their position relative to men in that economy, can be usefully assessed by examining the gender pay gap, female and male labor participation rates (and the related percentage of women in the labor force), and occupational sex segregation. In a previous paper (Swanson 2003) I documented the trends of these labor market outcomes for the United States. In the present paper I extend the analysis to examine these three measures across a number of countries.

The general trend of the integration of women into the U.S. economy is clear. By all three of the above measures, U.S. women have improved in their relative position. The question to be addressed in this paper is whether this is true for other economies. Has the relative economic position of women across the world been improving? Does their position depend on their country's level of economic development?

INTERNATIONAL TRENDS IN THE INTEGRATION OF WOMEN INTO THE ECONOMY

Gender Gap in Earnings

The percentage of female to male earnings (median annual income for year-round full-time workers) in the U.S. declined in the post-War period, reaching a low of 56.6% in 1973. Since then it has increased almost continuously to a rate of 75.6% in 2003 (Swanson 2003, p. 41). As one indicator of gender equality, this narrowing of the gender gap shows an improvement in the position of women in the U.S. economy. It also means that women in the U.S. are becoming increasingly integrated into the economy. However, the gap is still significant, and in the last ten years it has been closing more slowly.

We compare this positive trend in the U.S. to other countries in Table 1. Statistics for two years—1990 and 1995/2002--are shown for 35 countries in addition to the U.S. It can be seen that the gender gap declined during that period for 25 countries, while it increased for the other 10 countries. The average of the most recent ratio of women's to men's earnings for all 35 countries is .716, which is somewhat below the 2002 U.S. ratio of .760. The average in 1990 for the 35 countries was .695, while the U.S. ratio for the same year was a slightly higher .710. Thus the international trend since 1990 is not quite as favorable as the U.S. trend: women's economic position, as measured by this labor market outcome, while improving in most countries, is not improving at the rate that it is in the U.S.

Table 1 presents the ratio of women's wages to men's wages for two of the four categories of the U.N. grouping of countries (least-developed, developed, developing, and Eastern European). Eighteen countries listed are classified as developing countries, and 17 are classified as developed market economies. In calculating averages for the gender gap ratio for the two years shown for these two groups we find significant differences. For the developing countries, the 1990 average is 65.5, while the most recent average is 65.6. For the developed countries, the 1990 average is 73.6 and the most recent average is 78.0.

We see from this that women's pay is much closer to men's pay in the developed economies than in the developing economies. In fact, while it is not an indicator of economic development, the gender gap is an indicator of social development, with the developed market economies being more socially advanced by this indicator. The gender gap in the United States is very similar to that of the developed countries, although is it is considerably wider than it is in Sweden, the developed country with the smallest gender gap in earnings (see Blau and Kahn 2000).

The level of economic development also appears to affect the trend in relative earnings. For the time shown, there has been no movement, on average, in this ratio in the developing countries. Women's pay has remained stagnant at about 2/3 of the level of men's pay for the past ten years. On the other hand, the ratio of women's pay to men's pay has increased 6%, so that women are now paid over ¾ of what men are paid in the developed countries. Again, the economically developed countries are more socially developed than the developing countries.

Table 1: Women's Wages in Manufacturing as a Percentage of Men's Wages

Developing Countries							
	1990	**1995/2002**	**Δ**		**1990**	**1995/2002**	**Δ**
Bahrain	62	44	-18	Malaysia	49	63	+14
Brazil	54	61	+7	Mexico	50	70	+20
Costa Rica	74	83	+9	Paraguay	66	44	-22
Cyprus	58	54	-4	Republic of Korea	50	56	+6
Egypt	68	71	+3	Singapore	55	61	+6
El Salvador	94	79	-15	Sri Lanka	88	87	-1
Hong Kong	69	64	-5	Swaziland	73	63	-10
Jordan	57	58	+1	Thailand	64	72	+8
Macao	67	54	-13	Turkey	81	97	+16
				Average	65.5	65.6	
Developed Market Economy Countries							
	1990	**1995/2002**	**Δ**		**1990**	**1995/2002**	**Δ**
Australia	82	89	+7	Luxembourg	62	72	+10
Belgium	75	79	+4	Netherlands	77	78	+1
Denmark	85	86	+1	New Zealand	74	80	+6
Finland	77	81	+4	Norway	86	88	+2
France	79	78	-1	Portugal	69	65	-4
Germany	73	74	+1	Sweden	89	91	+2
Greece	78	82	+4	Switzerland	68	72	+4
Ireland	69	74	+5	United Kingdom	68	78	+10
Japan	41	59	+18	United States	71	76	+5
				Average (excluding U.S.)	73.6	78.0	

Source: UN Statistics Division, Table 5.G (2004).

Notes: The column for the second year gives the most recent year available between 1995 and 2002 for each country. The definitions and methods of compiling these statistics on wages vary considerably from country to country. Therefore, comparisons between countries are just rough estimates. The trends, however, should be fairly accurate. All of the percentages are based on wages, except for the U.S., which is based on annual earnings.

Labor Force Participation Rate

Over the last 50 years the labor force participation rate of women in the U.S. increased from 33.9% in 1950 to 59.5% in 2003 (Swanson 2003, p. 39, and Bureau of Labor Statistics, 2004), while the rate for men fell from 86.4% in 1950 to 73.5% in 2003.

Women have become so involved in the economy that they now comprise approximately 47% of the total labor force. Of any indicator of gender equality, the labor force participation rate of women shows

Table 2: Women's Labor Force Participation Rates

Least Developed Countries					
	1990	**1995/2002**		**1990**	**1995/2002**
Afghanistan	46	43	Lesotho	47	56
Bangladesh	66	56	Maldives	20	37
Burundi	91	83	Nepal	56	57
Cambodia	82	74	Senegal	25	61
Cape Verde	41	44	Sudan	24	29
Ethiopia	58	72	average	50.4	55.8
Haiti	49	57			

Developing Countries								
	1990	**1995/2002**		**1990**	**1995/ 2000**		**1990**	**1995/2002**
Algeria	19	7	Georgia	56	56	Peru	29	59
Argentina	29	41	Guatemala	28	23	Philippines	48	53
Armenia	63	35	Honduras	34	43	RepKorea	47	49
Azerbaijan	52	43	Hong Kong	47	52	Serbia	50	50
Bahamas	65	66	Indonesia	45	52	Singapore	50	56
Bahrain	29	24	Iran	21	11	Slovenia	55	52
Barbados	60	62	Jamaica	62	69	South Africa	46	46
Belize	23	34	Jordan	17	22	Sri Lanka	45	37
Bolivia	24	60	Kuwait	38	43	Suriname	44	33
Botswana	66	48	Macao	54	56	Swaziland	40	36
Brazil	44	54	Macedonia	49	42	Syria	24	24
Chile	32	35	Malaysia	45	44	Thailand	76	65
China	73	74	Martinique	54	55	Tonga	36	42
Columbia	46	58	Mauritius	35	41	Tunisia	33	24
Costa Rica	33	42	Mexico	22		Turkey	34	27
Croatia	48	45	Morocco	39	26	Uruguay	43	47
Cyprus	48	53	Nicaragua	40	22	Venezuela	38	55
DomRepblic	34	38	OccupPalestine	6	10	UnitArabEm	29	31
Ecuador	28	53	Oman	13	13	Zimbabwe	67	65
Egypt	27	20	Pakistan	11	3	Aerage	40.5	41.7
El Salvador	51	44	Panama	32	45			
Fiji	27	39	Paraguay	51	35			

Table 2 Women's Labor Force Participation Rates (Continued)

Countries in Eastern Europe					
	1990	**1995/2002**		**1990**	**1995/2002**
Albania	58	50	Poland	57	9
Belarus	61	46	Republic of Moldova	61	3
Bulgaria	60	46	Romania	55	6
Czech Republic	61	51	Russian Federation	60	2
Estonia	63	51	Slovakia	63	3
Hungary	48	46	Ukraine	57	8
Latvia	63	51	average	59.1	9.9
Lithuania	60	46			

Developed Market Economy Countries					
	1990	**1995/2002**		**990**	**1995/2002**
Australia	52	55	Japan	50	49
Austria	43	50	Luxembourg	34	42
Belgium	37	43	Netherlands	53	54
Canada	59	61	New Zealand	54	57
Denmark	62	74	Norway	62	70
Finland	65	57	Portugal	50	54
France	46	48	Spain	33	42
Germany	44	49	Sweden	71	76
Greece	35	38	Switzerland	49	48
Iceland	66	79	United Kingdom	53	56
Ireland	36	48	United States	58	60
Italy	36	36	Aerage	49.9	54.2

Source: United Nations Statistics Division, Table 5.D (2004).

Note: The column for the second year shows the most recent year available between 1995 and 2002 for each country. the largest gain. Although not quite equal yet, the U.S. work force is becoming more diverse by sex, with almost as many women as men working.

Table 2 shows female labor participation rates for 112 countries, grouped according to the U.N. classification of countries. The 1990 average for all 112 countries was 45.8%, and for 1995/2002 it was 46.8%. Worldwide there was no significant change, on average, in female labor force participation rates for the past 10 years. This is similar to the U.S. trend for the same time period, where there was only a slight increase from 58% to 60%. However, the rate at which women are currently engaged in the labor force is considerably higher in the U.S. than it is worldwide—60% compared to an average of 46.8%, or 28% higher. For a corresponding indicator of gender equality, the percentage of women in the labor force, the difference in current rates is similar—47% for the U.S. compared to an average of 39% for the rest of the world.

It is much more illuminating to look at these data disaggregated by the U.N. classification. For the lowest level of economic development, the least developed countries—the averages for the two years are 50.4% and 55.8%, respectively. Here there was a modest increase for women, approaching the U.S. level. However, since the male labor force participation rate is very high for the LDCs, the average percentage of women in the labor force is significantly lower (40%) than it is in the U.S. (47%).

There was no significant change for the developing countries between the two years listed. The average female labor force participation rate stagnated at about 41%, considerably below the U.S. rate of 60%. This also means that the average percentage of women in the labor force was a low 35.6% for the developing countries

The average for the labor force participation rate in developed economies was 49.9% in 1990 and 54.2% in 2002. These rates are nearly identical to the rates for the least developed countries. There appears to be no strict relationship between levels of economic development and this indicator of gender equality. There is some difference between the average percentages of women in the labor force for the LDCs and the developed countries, with the former having a current rate of 40% and the latter having a current rate of 44%.

There does appear to be a stronger connection with the *type* of economic system, however. In all but two of the countries in Eastern Europe the labor force participation rate for women dropped. On average, the rate fell from 59.1% to 49.9%, a significant drop of 16%. This parallels a similar drop for the male labor force participation rate in the same countries (74.1% to 61.9%, or 16%). These countries, which have been faring quite poorly by most economic indicators since the end of socialism, are experiencing an overall decline in work by all segments of society. The level of economic development, not measured by GDP or other direct indicators of economic development (as it is for the other three country classifications), but by (former) type of economic system, has had a significantly negative effect on the labor force in these formerly socialist countries. From a similar position to the U.S. in 1990, they have fallen to a considerably lower female labor force participation rate in 2002. Looking at the corresponding indicator of gender equality, the percentage of women in the labor force, however, a different picture emerges. In the Eastern European economies this rate has remained at a high level of 47% (because both women's and men's labor force participation rates have fallen by the same percentage), equal to the rate in the U.S. This indicator of gender equality shows no connection to levels of economic development.

It is interesting to note that whether a country is predominantly Muslim has a larger effect on labor force participation rates than the level of economic development. If we control for this variable for the least developed countries, we see that the seven non-Muslim countries have average female labor force participation rates of 60.6% and 63.3% for the two years. The five Muslim countries, on the other hand, have very low average rates of 36.2% and 45.2%, respectively. Controlling for this variable for the developing countries gives us similar results. The 47 non-Muslim countries average for the female labor force participation rate is 45.0% and 47.6% for the two years, while the sixteen Muslim countries have extremely low average rates of 27.3% and 23.8%. Women in Muslim countries are poorly integrated into their economies as indicated by their low labor force participation rates (and comprise a correspondingly low 25% of the labor force).

OCCUPATIONAL SEX SEGREGATION

A third indicator of gender equality is the degree of occupational sex segregation in an economy. Men and women are not distributed proportionally among the various occupations, with men dominating some occupations, while women dominate others. The degree of occupational sex segregation is an indicator of how unequal this distribution is, of how men and women are integrated in the workplace, and how separated they are by the work that they do.

A standard measure of the degree of occupational sex segregation is the Duncan index of dissimilarity (Duncan and Duncan, 1955). This index gives a number between 0 and 100, which can be conveniently interpreted as the percentage of all females (males) who would have to shift occupations so that the percentage of all males would be equal to the percentage of all females in each occupation. An index of 0 would indicate perfect equality, while an index of 100 would mean that all occupations were either exclusively male or exclusively female. The number for the index is derived from the formula,

$D = 50 \cdot \Sigma \left| \frac{f_i}{f_T} - \frac{m_i}{m_T} \right|$, where f_i and m_i equal the number of females and males, respectively, in occupation *i*, and f_T and m_T equal the total number of females and males, respectively. Because of perceived shortcomings in the Duncan index of dissimilarity other measures of occupational segregation have been used in several studies (see Charles 1992, Jacobs and Lim 1992, Rawlston and Spriggs 2002, and Bridges 2003). Although some of these measures suggested can be useful in analyzing occupational sex segregation, only the Duncan index will be presented here. Because of its

clear-cut interpretation and its generality in measuring segregation, the Duncan index is quite useful for understanding segregation.

Table 3 Occupational Segregation for 29 Countries

	Duncan Index of Occupational Segregation	Female % of Total Labor Force	Female % of Male Earnings	Per Capita GDP	Urban Population (% of Total Population)	Infant Mortality Rate per 1000 Live Births
Developing Countries						
Columbia	53.3	47	--	1924	75	26
Ecuador	49.2	37.8	--	1444	63	41
Hong Kong	50.2	44	64	23499	100	4
Malaysia	44.8	37.8	63	3390	57	10
Philippines	51.3	39	80	925	59	29
Slovakia	62.8	46	--	3662	57	8
Slovenia	54.0	46	--	9109	49	6
Eastern European Countries						
Bulgaria	55.1	47	68	1556	67	15
Czech Republic	60.9	44	65	5008	75	6
Estonia	62.7	49	--	3760	69	9
Hungary	56.7	45	71	4662	65	9
Poland	51.0	46	--	4238	62	9
Ukraine	54.9	49	--	629	68	14
Developed Market Economy Countries						
Austria	53.7	44	68	23545	67	5
Belgium	50.4	43	79	22242	97	4
Denmark	56.1	47	86	29772	85	5
Finland	60.1	48	81	23177	59	4
France	54.7	46	78	22066	75	5
Greece	45.3	40	82	10403	60	6
Iceland	57.5	47	--	29659	92	3
Ireland	55.8	41	74	24824	59	6
Italy	46.3	39	--	18651	67	5
Luxembourg	53.8	41	72	45117	92	5
Netherlands	52.2	43	78	23332	89	5
New Zealand	49.2	45	80	13662	86	6
Portugal	53.4	46	65	10629	64	6
Sweden	57.7	48	91	27072	83	3
Switzerland	53.1	45	72	33478	67	5
UK	53.0	45	78	24502	89	5

Sources: The Duncan index of dissimilarity was calculated for each country by the author from ILO statistics (International Labor Organization 2004). The percentage of women in the labor force is from United Nations Statistics Division, Table 5.D, 2004, and table entitled "Millennium Indicator", 2004. Female percentage of male earnings is from United Nations Statistics Division, Table 5.G, 2004. Per capita GDP is from United Nations Statistics Division, Estimates of Per Capita GDP in US Dollars, 2004. Urban population and infant mortality are both from United Nations Conference on Trade and Development, Table 7.4A, 2004.

Notes: All of the statistics are for 2000, except for the following countries: Columbia, Hong Kong, and Philippines (all for 2001), Ecuador (1990), Malaysia (1991) and New Zealand (1996). The number of occupations reported varies within a small range for most of the countries. Between 95 and 115 occupations were used for 21 countries, in 4 countries between 76 and 83 occupations were used, and in the remaining 4 countries between 125 and 135 occupations were used.

Table 3 shows values of D (and several indicators of development) for 29 countries. The number of occupations used to calculate D ranges from 76 to 135, depending on the data available for each country. This is somewhat disaggregated data, particularly compared to many studies which use only 7 very broad occupational

classifications. On the other hand, it is more aggregated than some of the data available, as 400 or more occupations are reported for many countries for some years. The advantage of using disaggregated data is that more occupations reveal a more accurate picture of the actual work experience of men and women. It is also true that the value of D declines with more aggregation, making it appear, in studies with highly aggregated data, that there is less segregation than there really is.

The means for the index of dissimilarity are quite similar for the three categories of countries listed. For the developing countries the mean is 52.2, for the Eastern European countries the mean is 56.9, and for the developed market economy countries the mean is 53.3. This would indicate that there may be more segregation in the Eastern European countries, but this is not a very strong conclusion.

Another way to test for a connection between occupational sex segregation and levels of development is to analyze the index D in relation to particular indicators of development. This was done using per capita GDP, urban population as a percentage of total population, the infant mortality rate, and various measures of educational attainment for the countries listed in Table 3. None of the measures of educational attainment appeared to any have relationship with the index D, so they were dropped from further consideration. I searched for relationships between the remaining three variables within each of the three country classifications, as well as in combined country classifications.

Overall, the results obtained were not particularly promising. There appeared to be no significant relationships between occupational sex segregation and any of the three indicators of development, except when looking at developed economies as a separate group. However, this could be due to the insufficient data set used for the analysis of the Eastern European and developing economies. For the former only 6 countries were considered and for the latter only 7 countries were considered. This is a quite limited data set for the approximately 100 countries classified as developing by the UN, and for the 14 countries classified as Eastern European. On the other hand, the number of countries considered is larger for the developed countries, and is more representative, as 16 of the 27 economies so classified are considered. It is for this group of countries that significant results were obtained.

Table 4 presents the regression equation,

$$D = \beta_0 + \beta_1(\text{per capita GDP}) + \beta_2(\text{urban population \%}) + \beta_3(\text{infant mortality}),$$

That attempts to explain the differences in occupational sex segregation among the developed economies. The independent variables are per capita GDP, urban population as a percentage of total population, and the infant mortality rate.

Since the F-statistic is 3.268 (p-value=.059), we are able to reject the hypothesis that all of the β parameters are zero. Thus the equation appears to be useful in explaining D. In looking at each independent variables, we see that only the infant mortality rate is significant at the .10 level of significance. Per capita GDP is significant at the .20 level of significance, while the urban population percentage is almost significant at that level. The fairly weak results of this regression are that all three of the independent variables influence occupational sex segregation.

So how does the level of economic development affect occupational sex segregation? Our results show contradictory relationships between the three indicators of development and the index of dissimilarity. First, per capita GDP is positively related to D, meaning that as a country develops (per capita GDP increases), there is an increase in occupational segregation. Second, urban population as a percentage of total population is inversely related to D, meaning that as a country develops (this percentage increases), there is a decrease in occupational segregation. And third, the infant mortality rate is inversely related to D, meaning that as a country develops (this rate decreases), there is an increase in occupational segregation. Thus two measures indicate a positive relation between segregation and development, while the third indicates a negative relation. A similar mixed result, using highly aggregated data, was found by Jacobs and Lim (1992).

One would expect a negative relation between occupational segregation and economic development. However, both per capita GDP and the rate of infant mortality appear to be positively related to segregation (this result was noted in Charles 1992 and Jacobs and Lim 1992). At least among developed countries there seems to be a counterintuitive (albeit quite weak) positive connection between development and segregation.

Table 4: Regression Equation for Occupational Sex Segregation, Developed Countries

R .671	R Square .450	Adjusted R Square .312	Standard Error of the Estimate 3.313	F 3.268	Significance F .059
	Coefficient Estimates		**Standard Error**	**t**	**p-value**
Constant	66.749		9.077	7.354	.000
Per Capita GDP	.0001865		.000	1.646	.126
Urban Population %	-.09844		.073	-1.348	.203
Infant Mortality Rate	-2.125		1.034	-2.054	.062

In addition to examining the effect of economic development on occupational segregation, I also checked for a relationship between measures of gender equality. Table 5 presents the results of a correlation analysis between the Duncan index of dissimilarity and the percentage of women in the total labor force for the countries listed in Table 3.

For developing countries alone, developed countries alone, and for Eastern European, developing, and developed countries combined, a quite strong positive correlation was found between these two measures of gender equality. In the first case it was significant at the .10 level, and in the latter two cases it was significant at the .01 level. Since many commentators consider the percentage of women in the total labor force (and the corresponding female labor force participation rate) as not only an indicator of gender equality, but also as an indicator of economic development, this is a similar result to the one above regarding a positive relation between economic development and occupational sex segregation. This counterintuitive result that the more involved women are in the labor force, the more sex segregation there seems to be, is statistically quite strong. It also supports the conclusion that more development leads to more segregation, not less. This does not say, of course, that more women in the labor force *causes* more segregation, only that they are correlated. There does appear to be something about the way economies have actually developed, however, that results in more occupational sex segregation

Table 5: Correlations Between Occupational Segregation and Female Percentage in the Labor Force

	Developing	**Developed**	**Developing, Developed, & Eastern European**
Pearson Correlation	.703	.742	.683
Significance	.078	.001	.000

CONCLUSIONS

The trends in both the gender gap in earnings and the female labor force participation rate point to increasing gender equality throughout the world. There are many exceptions to these trends, which appear to have no relation to economic development, but overall the economic position of women in the world seems to be improving.

While the gender gap is larger, on average, in developing economies than it is in developed economies, the female labor force participation rate does not seem to have any relation to economic development. Occupational sex segregation appears to be positively related to some indicators of development, but negatively related to others. Thus we get mixed results concerning gender equality and development: as economies develop, sexual equality improves by some indicators of gender equality, but worsens by other indicators of gender equality.

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