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Educational Growth in Taiwan and Japan:
Effects of Macroeconomic Change

Shu-Ling Tsai*, Nobuo Kanomata**

Since World War II, higher education systems have expanded rapidly in both Japan and Taiwan. This paper compares the educational growth of women vis-à-vis men in Japan and Taiwan. Using time-series data that cover the experiences of birth cohorts of 1946 to 1985, we find that both societies move toward the direction of a greater gender parity in educational attainment, with different time paths. Taiwan’s increase in women’s average years of schooling across postwar cohorts exhibits an explosive time path, whereas Japan’s time path for the increase in women’s schooling is a stable one. The paper also employs cointegration model to test the positive relationship between change in educational growth and macroeconomic change (the growth in national income, in service sector employment, and in female labor force participation). The results reveal that economic growth exerts a significant impact upon the increase in educational attainment for both sexes in both societies, with stronger impacts upon Taiwanese women. Meanwhile, labor market opportunities in the service sector is closely linked with educational growth. This pattern hold true for both sexes and both societies. Finally, women’s increasing participation in the economy as a driving force of educational growth is especially salient in the case of Taiwanese women.

Key words: educational growth, gender parity, cointegration

1. Introduction

As a consequence of global educational expansion, since World War II women’s mean level of educational attainment has increased dramatically around the world. Nowadays, women are receiving nearly as many years of schooling as men in most industrialized societies (UNESCO 2003), and the

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gender gaps are closing in most developing countries as well (Grant and Behrman 2010). Why did the female disadvantage in educational attainment erode over time? This question raises three issues of concern. First, what are the forces driving women’s educational growth? Second, how does the researcher estimate the potential effects of these forces on the educational growth? And third, in what ways and to what extent do patterns of the closing in the gender gap vary across societies of interest?

In this analysis, we compare two cases in East Asia that showed considerable similarity in educational systems and had a historical connection with one another (Taiwan was Japan’s colony from 1895 to 1945). We test the prevailing hypothesis regarding a positive relationship between economic development and educational growth in industrial societies. It has long been suggested that industrialization not only introduces higher levels of social differentiation necessitating higher levels of education, but promotes the availability of new structural opportunities for access to higher education (Hauser and Featherman 1976; Mare 1981). Education is often viewed as a valuable form of human capital that improves labor force productivity and increases income (Becker 1964). The human capital perspective would lead one to expect close linkages between increases in women’s educational attainment and in their labor market opportunities (Goldin 1990; Goldin and Katz 2008). More and more young women would attain higher education as women’s overall participation in the economy increases. Growth in the tertiary (service) sector of the labor market—which generates more women-friendly professional, clerical, and other white-collar jobs for women—would also lead to growth in higher educational attainments for women.

We hypothesize that women’s educational attainment—as opposed to men’s—are more constrained by socioeconomic and cultural forces, on the one hand, and more responsive to new opportunity structure that is required or facilitated by industrialization, on the other hand. Poverty, high fertility rates, scarce national resources, rationed schooling, discrimination against women, preference of sons’ education over daughters, and low averages years of schooling at both the family and population levels are “traditional” obstacles to women’s access to education, especially higher education. Once “traditional” barriers to women’s participation in higher educational systems are removed, it is expected that women will make educational choices similar to those of men. As a result, women as a group will catch up to men (or even outpace men) in higher education attainment, conditional on gender parity in educational resources and incentives (Buchmann and DiPrete 2006).

Japan and Taiwan are at different stages of industrial development. Prior to World War II, Japan had already become an industrialized society through the succession from primary to secondary and tertiary production. In contrast, Taiwan’s economic system entered the “post-industrial development” stage in the late 1980s, following land reforms, import substitution and export-oriented industrialization in the earlier decades. Similar to the Japanese case, education and educational expansion played a key role in the making of Taiwan as one of the most successful cases of postwar Asian economic growth on record. While Japan’s processes of industrialization, modernization, and educational development substantially preceded those of Taiwan, since World War II both countries had expanded
their education systems and experienced the increase in educational attainment of men and women as well. See Figures 1–2, where country-specific trends in educational attainment across successive birth cohorts under study are depicted.

In the postwar era both Japan and Taiwan witnessed trends that typically broke down the traditional obstacles to women’s higher educational attainment. These trends include economic growth, the expansion of service sector employment, and increasing female labor force participation. (See Appendix Figures A1–3, where we depict the three trends examined). During the past decades, the two countries had experienced rapid economic growth, but Japan continued to lead Taiwan in per capita
Gross Domestic Product (GDP). Japan's GDP rose from $26,297 in 1990 to $35,687 in 2007, whereas Taiwan's GDP increased from $8,132 to $16,855 during this period of time. Currently, both countries have tiny agriculture sectors, substantial manufacturing sectors and large service sectors. The distributions of the total labor force by sector in 2007 were: Japan (4% agriculture, 27% manufacturing and 69% service) and Taiwan (5% agriculture, 37% manufacturing and 58% service). Japan preceded Taiwan not only in the level of economic development, but in women's participation in the economy. While female labor force participation rate was antecedently higher in Japan, Taiwan has been quickly catching up to Japan in this aspect. To what extent might we expect the linkages between these macoeconomic trends and trends in schooling growth to be homogeneous (or heterogeneous) between the two societies?

Using time-series analysis methods, we compare change in the educational attainment of women vis-à-vis men in Japan and Taiwan. We also estimate the effects of macroeconomic change (the growth in national income, in service sector employment, and in female labor force participation) on the schooling growth for the two sexes in the two countries. Testing for causality between variables implies the specification of the dynamic relationship which links them. We therefore investigate their time-series properties; first, whether the variables have a stable (stationary) or an explosive (nonstationary) time path, using unit-root test, and afterwards whether they have a common trend, using cointegration model.

In what follows, we first compare the institutional contexts of Japan and Taiwan, and then introduce the data, variables, and methods that we use. We next report the results, and finally conclude with discussions of the findings.

2. Institutional Contexts

The global spread of schooling during the nineteenth and twentieth centuries was due largely to nation-building efforts by political leaders endeavoring to establish their peoples and geographic territories as modern nation-stations. This is particularly true in the case of Japan. Japan was the first nation in “the East” that successfully transformed itself from a feudal society into a modern nation-state. Japan did it through two historical phases. First, following the Meiji Restoration in 1868, Japan transformed itself into an industrialized country by directing all its reforms toward the goal of catching up with “the West”, including education reform that played a central role in the making of a modernized Japan. And then, after the war, Japan adjusted itself to a new era by incorporating new democratic institutions and continuing its endeavor to achieve economic parity with the leading western powers, dominated by the U.S. Consequently, the Japanese education system changed from a complex (European) type of old system into a simple (American) type of new system.

Taiwan was ceded to Japan in 1895, when it was a frontier island of the Ch'ing Empire in China. During the 50 years of Japanese colonial rule, the Japanese introduced the first modern education system into Taiwan. Japanese education in Taiwan was initially developed at the level of basic compulsory schooling (common schools). Beyond the common school, schools were differentiated into aca-
demic and vocational tracks. Four of Taiwan’s first modern institutions of higher education—1 imperial university (Taihoku, which became National Taiwan University after the war) and 3 public junior colleges—were established during the first decades of the twentieth century.

In the postwar era, both Japan and Taiwan adopted the then-prevalent American-type system of 6-3-3-4 years of schooling (that is, 6 years of elementary school, 3 years of junior high school, 3 years of senior high school, and up to 4 years of college). Whereas education was compulsory through the junior high school level in Japan, Taiwan extended compulsory education from six years to nine years in 1968. This was a major event in Taiwan’s history of education. Before the extension, the entry to junior high school served as a threshold to further education and thus played a critical screening role for both boys and girls. After the extension, the entry to senior high school became a critical turning point for youth. In Taiwan, students have to compete for a good high school in order to enter a good college. Similarly, Japan’s educational selection occurs at an early age (15). There is a clear ranking of schools—both high schools and universities—with a hierarchical structure reflecting relative degree of competitiveness.

Japan and Taiwan also show similarities in their higher education systems: both have diversified and stratified systems, of which junior colleges constitute the lowest tier. In the two countries, higher education has been transformed from “elite” education to “mass” education. The transformation of higher education went through a nonlinear process that consisted of three main phases: expansion until the early 1970s, stagnation (Japan: 1976–1985; Taiwan: 1972–1985), and re-expansion since 1986.

There are some differences in recent expansion of higher education between the two countries. Taiwan’s expansion prior to 1972 was due largely to the establishment of new junior colleges (both public and private) at the lower tier of tertiary education for both girls and boys. During the 1980s, Taiwan underwent drastic political changes, moving toward democracy and deregulation. Not only were martial laws lifted in 1987, but educational systems were deregulated. To meet the growing social demand for university education, Taiwan rapidly expanded tertiary education in the 1990s through the upgrading of existing institutions from the lower to the higher tier, in addition to the establishment of some new institutions. The expansion is still in effect. Accordingly, Taiwan’s total number of higher education institutions increased from 105 in 1985 to 150 in 2000, and then increased to 164 in 2007 (Ministry of Education, ROC 2008).

Different from the case of Taiwan, Japan’s rapid expansion of higher education during the last half century was due in large part to the growth of private institutions. Historically, the privatization of higher education systems had been higher in Japan than in Taiwan. Japan had 1,003 higher education institutes in 1985, when the restriction on the expansion of higher education was lifted. As a result of the re-expansion in the 1990s, there were more than enough slots to accommodate all high school graduates—both males and females—who aspired for a higher education. Accordingly, Japan’s total number of higher education institutions decreased from 1,221 in 2000 to 1,190 in 2007 (Ministry of Education, Japan 2008). This decrease was primarily due to Japan’s chronically low birth rate, which led to falling enrollment in schools at the lower tier, and then to reorganization and consolidation of
higher education institutions. It was largely the supply-and-demand market mechanism at work, although state policies also played a role.

Educational expansion exerts a profound impact on gender inequalities of educational opportunities. Recent sociological studies of educational stratification have shown that in both Taiwan and Japan, where preferences for boys’ higher education traditionally exceeded those for girls, gender inequality in educational opportunities had declined across post-war birth cohorts (Ishida 2007; Tsai and Shavit 2007; Tsai and Kanomata 2011). In this analysis, we test whether the two societies move together toward the direction of closing the gender gap in schooling, with close attention on the potential impacts of macroeconomic change.

3. Data and Variables

This study uses aggregate data at both micro and macro levels. Data for the dependent variables (average years of schooling attained by women and men, respectively) are drawn from two sources: the Taiwan Social Change Survey (TSCS) and the Social Stratification and Social Mobility Survey in Japan (JSSM). Both TSCS and JSSM are a series of nationwide surveys, using different representative samples of the adult population in each survey; see (http://www.ios.sinica.edu.tw/sc/) and (http://www.sal.tohoku.ac.jp/21coe/ssm/index.html). We used the most recent data sets available to us at the time this study began. That is to say, the 2000–2006 TSCS data were pooled together, and so were the 1995 and 2005 JSSM data.

We selected those respondents who were born after 1945 and who provided information on educational attainment. The analysis sample thus pertains to birth cohorts of 1946 to 1985, with a total of 21,923 Taiwanese respondents and 7,323 Japanese respondents. Respondents’ educational attainment is measured by the highest level of education attained, which is recoded into years of schooling. We look at group means and calculate average years of schooling by gender for every single-year birth cohort covered by the data.

Three macroeconomic variables are used as explanatory variables to account for the observed educational trends (Figures 1 and 2). These variables are: GDP per capita, percent service sector employment, and female labor force participation rate for female population aged 15 and over (see Appendix Figures A1 to A3 for their trends). Data at the macro level are derived from two government websites: Taiwan (http://www.stat.gov.tw/) and Japan (http://www.stat.go.jp/). We use official statistics data that were collected at the time when the respondents were aged 15. These annual data cover the calendar years from 1961 through 2000. Thus, this analysis contains 40 observation points in time periods.

4. Methodology

To test the possible effects of the explanatory variables ($X$) on the dependent variable ($Y$), one might regress $Y$ on $X$. Nevertheless, the relationship between $Y$ and $X$ estimated in this classical regression model may be spurious, because ignoring the fact that $Y$ and $X$ are trending in the same
or opposite directions can lead one to falsely conclude that changes in $Y$ are caused by changes in $X$, when in fact there is no relationship between them (Granger and Newbold 1974). To avoid the problem of spurious causality, we first carry out unit root test, and then estimate the effect of $X$ on $Y$ using cointegration. Below, we illustrate the time-series analysis methods that we use.

First of all, a simple way to characterize an observed $\{Y_t\}$ sequence is to estimate via OLS a static model that adequately captures trending behavior in the series, such as:

$$\ln Y_t = b_0 + b_1 t + \epsilon_t,$$

(1)

where $\ln Y$ is the natural log of $Y$, $t$ denotes time period, $b_0$ is intercept, $b_1$ multiplies time resulting in a linear time trend, and $\epsilon$ is disturbance term. This model assumes that $\epsilon_t$ are identically and independently distributed normal random variables. With aggregate/macro data, it is not unusual to find nonlinearity in rate of change across time periods. To capture the nonlinear time trend, one can easily add a quadratic term into equation (1) or use a polynomial equation. In all forms, the static model assumes the variables to be both deterministic and stationary. Stationarity means that the residuals $\epsilon_t$ have a zero mean, a finite variance, and a distribution function that is independent of time.

However, it is typical to find that a time series contains stochastic elements not only in disturbance components, but in the trend. To identify stochastic processes that produce a random rate of change over time in a series, the general methodology used in time-series econometrics is testing for a unit root using some difference equations. In its simplest form, a stochastic process is a pure random walk model, in which $Y_t$ is expressed solely as a function of its own lag and disturbance term. That is:

$$Y_t = Y_{t-1} + \epsilon_t \text{ (or } \Delta Y_t = \epsilon_t \text{ so that the change in } Y_t \text{ is random).}$$

In this model, the mean is a constant and the variance is time-dependent. Moreover, all stochastic shocks have non-decaying effects on the $\{Y_t\}$ series. In a nutshell, the variable is nonstationary and the process that produces the data is a unit root process.

To determine whether a series $\{Y_t\}$ is stationary or nonstationary, we carry out unit root test using a standard four-step procedure and Dickey–Fuller test statistics (Dickey and Fuller 1979; Enders 2004, chap. 4). We start the test procedure from using the most general of the dynamic model that allows change at time $t$ to be affected by the change at the previous time period, that is:

$$\Delta \ln Y_t = a_0 + \gamma \ln Y_{t-1} + a_2 t + a_3 \Delta \ln Y_{t-1} + \epsilon_t,$$

(2)

where $a_0$ is drift term, $\gamma$ is the autoregressive parameter, $a_2 t$ captures time trend in drift, $a_3$ is a parameter for lagged change, and $\epsilon_t$ is a random disturbance term that has an expected value of zero (i.e., a white-noise term). The parameter of interest is $\gamma$. If $\gamma = 0$, the $\{Y_t\}$ sequence contains a unit root so that each disturbance has a permanent non-decaying effect on the values of $Y_t$. In this case, the null hypothesis of nonstationarity cannot be rejected, and the series $\{Y_t\}$ is said to be integrated of order one or higher. In contrast, if $\gamma < 0$, the effects of past disturbances become successively smaller over time so that the series $\{Y_t\}$ should be convergent. In this case, the variable $Y_t$ is defined as weakly stationary.
In the presence of nonstationary variables, cointegration provides a framework for estimation, inference, and interpretation of causality (Granger 2004). The basic logic of cointegration is that there must exist at least a common trend for two (or more) variables to be cointegrated. Let $Y_t$ and $X_t$ denote two drifting upward nonstationary variables with their own trend. If the two variables are cointegrated and the cointegrating relationship between them can be expressed in the form of $Y_t = \beta X_t$ (with or without an intercept), then some linear combination of them must be stationary. In other words, the error term ($\epsilon_t = Y_t - \beta X_t$) should be stationary for the existence of a common trend in the stochastic elements between the two variables. Within the cointegration framework, the researcher is able to distinguish between the long-run relationship (i.e., the manner in which $Y_t$ and $X_t$ drift together over time) and the short-run dynamics (i.e., the relationship between deviation of $Y_t$ from its long-run trend and deviation of $X_t$ from its long-run trend).

We employ the Johansen methodology introduced in Enders (2004, chap. 6) to test whether or not the long-run relationship between two vectors of time-series data constitutes a cointegration relationship. Formally, the bivariate cointegration model estimated in this analysis can be specified as

$$
\Delta \ln Y_t = \alpha_y \left( \ln Y_{t-1} - \beta \ln X_{t-1} \right) + \epsilon_{yt} \tag{3}
$$

$$
\Delta \ln X_t = \alpha_x \left( \ln Y_{t-1} - \beta \ln X_{t-1} \right) + \epsilon_{xt} \tag{4}
$$

where $\alpha_y$ and $\alpha_x$ are parameters for short-run dynamics, $\beta$ is a cointegration parameter that captures the long-run effect of $X$ on $Y$, and $\epsilon_{yt}$ and $\epsilon_{xt}$ are white-noise disturbances which may be correlated with each other. The main concern of this study is on the $\beta$ coefficient for the long-run relationship.

In the cointegrating system, all variables are treated as joint endogenous, allowing for feedback effects from the dependent variable on covariates. Cointegration has a representation of vector error correction. The upshot is that the problem of spurious regression disappears. In this sense, cointegration model is a more convenient tool than conventional methods of time series analysis, such as OLS regression analysis.

## 5. Results

### 5.1. Differential Patterns of Closing the Gender Gap

Visual inspection of Figure 1–2 suggests that Taiwan’s change in educational growth is much more dramatic than change in Japan. Indeed, although the average level of educational attainment was initially higher in Japan, Taiwan had surpassed Japan in most recent cohorts covered by the data, irrespective of gender. Regarding gender disparity, Taiwan shows a pattern of women’s declining disadvantage in educational attainment, closing the gender gap, and then coming to outpace men; see Figure 3, where we present patterns of trends in the gender gap (=women’s mean schooling/men’s mean schooling). The figure also suggests that Japan had a greater gender parity in schooling than Taiwan in older birth cohorts, but this pattern no longer holds in younger generations.
Figure 3. Trends in the gender gap across birth cohorts of 1946 - 1985: Japan and Taiwan.

Table 1. Results of unit root test: Taiwan and Japan.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test Statistics</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 1</td>
<td>Step 2</td>
</tr>
<tr>
<td><strong>I. Taiwan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schooling Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>− .767</td>
<td>− .719</td>
</tr>
<tr>
<td>Men</td>
<td>− 1.062</td>
<td>− 2.054</td>
</tr>
<tr>
<td>Gender Gap</td>
<td>− 1.070</td>
<td>− 2.148</td>
</tr>
<tr>
<td>Macroeconomic Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>− 722</td>
<td>.511</td>
</tr>
<tr>
<td>Service Sector</td>
<td>− 1.850</td>
<td>− 1.548</td>
</tr>
<tr>
<td>Female LFP</td>
<td>− 3.044</td>
<td>− 2.481</td>
</tr>
<tr>
<td><strong>II. Japan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schooling Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>− 3.063</td>
<td>− 3.865*</td>
</tr>
<tr>
<td>Men</td>
<td>− 2.162</td>
<td>− 3.291</td>
</tr>
<tr>
<td>Gender Gap</td>
<td>− 4.284*</td>
<td>−</td>
</tr>
<tr>
<td>Macroeconomic Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>− 2.50</td>
<td>.025</td>
</tr>
<tr>
<td>Service Sector</td>
<td>− 2.715</td>
<td>− 1.448</td>
</tr>
<tr>
<td>Female LFP</td>
<td>− 2.460</td>
<td>− 2.602</td>
</tr>
<tr>
<td><strong>III. Critical Value (5%)</strong></td>
<td>− 3.548</td>
<td>− 3.544</td>
</tr>
</tbody>
</table>

Note: Variables are measured in the logarithm form. Models estimated are:

Step 1: $\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \alpha_1 t + \varphi \Delta Y_{t-1} + \epsilon_t$
Step 2: $\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \alpha_1 t + \epsilon_t$
Step 3: $\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \epsilon_t$
Step 4: $\Delta Y_t = \gamma Y_{t-1} + \epsilon_t$

* Significantly smaller than the Dickey–Fuller critical value at the level of $\alpha = .05$. 
Table 2. Estimated effects of macroeconomic change on change in the educational growth.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(1) Economic Growth</th>
<th>(2) Service Sector Expansion</th>
<th>(3) Female Labor Force Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women’s Schooling</td>
<td>.240* (.007)</td>
<td>.918* (.042)</td>
<td>.763* (.030)</td>
</tr>
<tr>
<td>Men’s Schooling</td>
<td>.212* (.011)</td>
<td>.923* (.037)</td>
<td>.704* (.008)</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women’s Schooling</td>
<td>.221* (.011)</td>
<td>.610* (.003)</td>
<td>.660* (.004)</td>
</tr>
<tr>
<td>Men’s Schooling</td>
<td>.219* (.012)</td>
<td>.608* (.004)</td>
<td>NC*</td>
</tr>
</tbody>
</table>

II. Contrasts in Coefficients^b

- Gender Difference within Country
  - Taiwan (Women–Men) .029* (.013) – .005 (.056) .060 (.031)
  - Japan (Women–Men) .002 (.016) .003 (.005) –
- Country Difference by Gender
  - Women (Taiwan–Japan) .019 (.013) .308* (.042) .104* (.031)
  - Men (Taiwan–Japan) – .008 (.016) .315* (.038) –

Note: Variables are entered into cointegration models in the logarithm form. Numbers in parentheses are standard errors.

* Significant at the level of α=.05.
*b Standard errors and estimated by using bootstrapping method.

5.2. Testing for Stationarity in Schooling Series

Unit-root test results reported in Table 1 confirm that Taiwan’s three schooling sequences—women, men, and the gender gap—are all nonstationary. The presence of stochastic trends is evident for Taiwan. In contrast, the test result for Japan is mixed: Japanese men’s schooling is nonstationary, whereas Japanese women’s schooling is (weakly) stationary, with stable change in the gender gap.

5.3. Effects of Macroeconomic Change on Schooling Change

Inspection of Table 1 also indicates that most macroeconomic variables used in this analysis are nonstationary. We therefore use cointegration model to estimate the potential impacts of macroeconomic change upon the educational growth, as shown in Table 2. In the case of Taiwan, each aspect of macroeconomic change examined exhibits a stable link with schooling growth for the two sexes. As for Japan, we also find evidence in support of a positive relationship between macroeconomic change and change in educational attainment of women. In the case of Japanese men, however, not every aspect of macroeconomic change examined is linked with the increase in educational attainment, as there is no significant relationship between men’s educational growth and women’s increasing labor force participation rate. This finding is different from the case of Japanese women (or the cases of Taiwanese men and women).
Overall speaking, we find that the influence of macroeconomic change on educational growth are stronger for Taiwan, as opposed to Japan. We also find that, as opposed to Japanese women, Taiwanese women’s educational growth is linked with women’s increasing participation in the economy to a greater extent. Taken together, these findings suggest that while macroeconomic trends demand the growth of higher educational attainment of both sexes in both countries, Taiwanese women—who used to be most structurally constrained—are most responsive to new opportunity structure among the four groups examined.

6. Conclusion and Discussion

There are six main findings. First, whereas it was once the case that women in Japan attained more education than women in Taiwan, this pattern no longer holds. Second, in the postwar era, Taiwan took an explosive time path for women’s educational growth, whereas in Japan women’s increase in educational attainment occurred at a stable time path. Third, both societies move toward the direction of a greater gender parity, with different time paths. Fourth, economic growth exerts a significant impact upon the increase in educational attainment for both sexes in both societies, with stronger impacts upon Taiwanese women than the other three groups. Fifth, labor market opportunities in the serve sector is closely linked with educational growth. This pattern hold true for both sexes and both societies. Sixth, women’s increasing participation in the economy as a driving force of educational growth is especially salient in the case of Taiwanese women, but it has nothing to do with Japanese men’s educational growth.

The findings of this study support the hypothesis regarding a positive relationship between economic development and educational growth in industrial societies. In both Taiwan and Japan, the increase in women’s education is closely linked with the increase in their labor market opportunities, and so is the increase in men’s education. This pattern is consistent with the literature that stresses the transformation of the labor force as an important causal force in raising the overall level of education (Goldin and Katz 2008; Hauser and Featherman 1976; Mare 1981). We also find that women’s participation in the economy matters more for change in educational attainment of Taiwanese women, as opposed to Japanese women. Some of these findings merit more discussions.

First of all, Taiwan’s “leapfrogging” over Japan in educational growth contradicts the conventional prediction of the negative late-development effects. Dore (1976), for example, contends that the differences in educational conditions between Japan and Britain can be attributed to the fact that Japan started industrialism later than Britain as part of a deliberate, state-directed, policy of “catching-up” modernization. If a country that develops later than another were to forever suffer from the disadvantages of late development, then it would be very difficult for Taiwan to catch up with Japan. The findings presented here, however, suggest that late-development no longer explains the contrast between Taiwan and Japan.

How, then, is it possible for Taiwan to converge with Japan in the worldwide movement toward the direction of increasing women’s education? In particular, both countries had largely expanded their
educational systems in the postwar era, yet the expansion of school systems seems to be an effective route to eliminating the female disadvantage in education for Taiwan, but not that effective for Japan. Why?

Likely explanations may lie in the intersection between economic development and gender stratification. In a global economy where knowledge is the driving force of economic growth, the expansion of higher education systems is a necessity, not a luxury, for both men and women in both Japan and Taiwan. Nevertheless, educational expansion per se does not necessarily imply a greater gender parity, because educational expansion also increases the mean level of education attained by men. If men’s educational growth rate is faster than women’s, it will be difficult for women to catch up to men, let alone to achieve a greater gender parity. In other words, closing the gender gap is not determined by educational conditions alone, but contingent on how these conditions are embedded in their societal and cultural contexts.

**Japanese Style of Gender Essentialism**

Prior to World War II, Japan had already become an industrialized modern-state. During recent decades Japanese society was relatively stable in several aspects, including educational developments and cultural norms governing differential educational paths for the two sexes. Brinton (1993) observed in Japan that, although a degree from a “good” university was viewed as a ticket into a large company and a secure job for men and women as well, a “good” marriage before age 25 was viewed more important for women. Even the most highly educated women were under normative pressure to withdraw from the labor force and attended to the socialization and education of their children. Accordingly, parents’ educational aspirations were lower for daughters than for sons, and parents also differed as to the types of occupations they thought were appropriate for their sons and daughters.

More recently, Charles and Grusky (2004) showed that Japanese women’s participation in the labor force was lower than Western industrialized societies (USA, Sweden, and Switzerland), but, surprisingly, so was the overall degree of Japanese occupational sex segregation. They suggest that in Japan the female disadvantage in socioeconomic achievements takes the form of “gender essentialism”—i.e., a package of “stereotypes” about gender differences—rather than gender discrimination against women.

Japan’s sex segregation in higher education by type of institution is part of its traditional norms of gender stratification. Although general trends toward greater gender equality have played out in Japan, these norms are still at work: Japanese men still prefer four-year universities to junior colleges, and Japanese women are still disproportionately concentrated in two-year junior colleges. As a result, Japan’s women’s average years of schooling is growing at a stable pace, and so is its closing the gender gap. That is to say, while educational expansion facilitates women’s access to higher education, differential educational paths for the two sexes continue to maintain gender disparity in schooling, albeit a small gap.

**Taiwanese Style of Gender Egalitarianism**

By contrast, Taiwan is an immigrant society in which a variety of foreign and out-group cultures
had ever emerged and mixed with local ones. Taiwanese society was rapidly changing over recent decades, with recent expansion of higher education systems being more aggressive on the one hand, and norms governing gender difference in higher education attainment being more obscure on the other.

This analysis shows that although the baseline of education for women in Taiwan was low, their educational attainments—as opposed to men’s—are more responsive to new opportunity structures. Not only is educational expansion more beneficial for women in Taiwan, but macroeconomic change is more favorable to them. In particular, the improvement of economic conditions matters more for the increase in educational attainment of women, as opposed to men. In early phases of industrialization, higher education was valuable, yet national resources were scarce, and so were family resources. When under economic constraints, families in Taiwan would sacrifice the educational opportunities of female (older) siblings and transfer their resources to improve the educational outcomes of male (younger) siblings (Greenhalgh 1985; Parish and Willis 1993). Nevertheless, Taiwan has changed rapidly since the late 1980s.

On the supply side, Taiwan’s educational pie has largely enlarged. In 2007, 87.8% of female and 87.6% of male high-school graduates moved on to the tertiary level (Ministry of Education, ROC, 2008), making Taiwan one of the most highly educated societies in the world. Tsai and Shavit (2007, p. 163) report that net of class and ethnic effects, gender inequalities in education generally, and in higher education specifically, have been completely eliminated and even seem to have reversed slightly in Taiwan. The elimination of gender inequality in educational opportunities can be attributed to the fact that Taiwan’s higher education system expanded in a gender-neutral way. Taiwan’s emergence of “gender egalitarianism” in education is not due to the influence of feminism, but largely because Taiwan’s recent developments—be it educational or socioeconomic—have been heavily influenced by power struggles and conflicts over political issues, which have little to do with gender. These political processes led to democratization and the “loosening-up” of higher education systems in the late 1980s.

Taiwan’s recent expansion of higher education systems did not dilute the market value of higher education over recent decades, due to the demand for skills driven by technological advances (Tsai and Xie 2008). There are incentives for women to pursue a higher education, especially because the return to higher education is higher for women than for men (Tsai and Xie 2011). In this study, we find that in both Taiwan and Japan, the increase in women’s education is closely linked with the increase in their labor market opportunities, and so is the increase in men’s education. This finding is consistent with the literature that stresses the transformation of the labor force as an important causal force in raising the overall level of education (Goldin and Katz 2008; Hauser and Featherman 1976; Mare 1981).

We also find that women’s participation in the economy matters more for change in educational attainment of Taiwanese women, as opposed to Japanese women. Such may be the case because, different from the Japanese case, in Taiwan there is a strong positive relationship between women’s education and their labor force participation (Brinton et al. 1995). The relationship between changes
in women’s educational attainment and in their labor market behavior involves a dynamic process in which family formation plays an important role. Although change in family formation practice is not included in this analysis, it is safe to say that in Taiwan most families had experienced profound inter-generational educational mobility. When the better-educated postwar generations became parents, they desired that their children would go further in school than they themselves did. Middle class families had recently lost interest in the education provided by two- or three-year junior colleges and preferred the education provided by good (public) universities for their sons and daughters as well (Tsai and Shavit 2007). In particular, the better-educated mothers—who tend to marry better-educated men, have a small number of children, and continue to participate in the labor force—may influence daughters’ educational attainment in many ways, such as by serving as role models, setting specific goals for them to achieve, and providing intellectual, cultural, social, and financial resources for them to make the grade. All in all, the traditional female disadvantage in educational attainment has eroded in the face of the educational expansion of the 1990s and 2000s.

To conclude, nowadays, higher education is no longer a limited supply for both men and women in both Japan and Taiwan, just like in economically advanced Western countries. While the findings of this study support a positive relationship between macroeconomic change and educational growth in a modern-state, every society has its own idiosyncratic mechanisms through which educational stratification by gender works and varies over time, reflecting its history, culture, norms, and institutions.

References
Educational Growth in Taiwan and Japan: Effects of Macroeconomic Change


Appendix

Figure A1. Trends in economic growth: Taiwan and Japan.

Figure A2. Trends in percent service sector employment: Taiwan and Japan.
Figure A3. Trends in female labor force participation rates: Taiwan and Japan.