**Cross-Time and Cross-National Comparisons of the Transition to Adulthood:**
**Brazil, Mexico, and South Korea, 1970-2000**

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**ABSTRACT**

Using census data from Brazil, Mexico, and South Korea in 1970 and 2000, we conduct cross-time and cross-national comparisons of the transition to adulthood. The three countries, which showed relatively similar levels of demographic, economic, and educational development in 1970, have, since then, followed considerably different trajectories of economic and educational models. We examine how these different national "scenes" produced very different patterns of transition to adulthood. To measure the timing and complexity of the transition to adulthood as a whole, we apply entropy analysis that provides a single measure summarizing combinations of multiple demographic statuses held by young people. We compare the age distributions of entropy measures across countries in each year to identify which countries show more heterogeneity in status combinations at specific stage of life course, how the patterns have changed over time, and how they relate to the economic development trajectories of these three countries.

A growing body of research on the transition to adulthood has taken a cross-national comparative perspective in order to better understand how structural features of social institutions – such as schools, families, labor markets, and welfare states – are linked to national-level variation in the transition to adulthood (Corjin and Klijzing 2001; Breen and Buchmann 2002; Cook and Furstenberg 2002; Lloyd 2005). Recent cross-national research on the transition to adulthood has applied a method with which to consider simultaneously multiple markers of adulthood instead of examining each status separately (Fussell, Gauthier, and Evans 2007; Grant and Furstenberg 2007). The strategy of these cross-national comparisons is to describe the timing of change and heterogeneity in status combinations during the transition to adulthood and relate differences in the structure of the young adult life course to that society's institutions.

To examine cross-national differences in the transition to adulthood, many cross-national studies have dealt with advanced industrialized countries in Europe and North America (except for Grant and Furstenberg 2007). Therefore, our understanding of how social institutions shape the transition to adulthood as a whole is somewhat limited to experiences of young people in advanced industrialized countries. Moreover, many cross-national studies have examined patterns of the transition to adulthood only at a fixed time point using cross-country data collected in a comparable year. This research design is useful to address how cross-national differences in current arrangements of social institutions are related to different patterns of the transition to adulthood. However, it has limitations in exploring how historical changes in social institutions affect the processes of becoming adult within countries and how differences across countries in historical changes result in different patterns of the transition to adulthood as currently seen. Even a similar social change such as modernization and industrialization may

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result in different patterns of the transition to adulthood, depending on how the process is filtered through specific local contexts.

**RESEARCH QUESTIONS**

In this study, we examine differences in the timing and pattern of the transition to adulthood as a whole in both historical and cross-national perspectives by applying a comparative and historical research design to census data at two historical time points, 1970 and 2000 in Brazil, Mexico, and South Korea (Korea, hereafter). Our research design and selection of countries maximize our ability to address how the processes of becoming adult have been shaped differently across countries, depending on pathways through which social institutions have evolved. In 1970, as developing countries, Brazil, Mexico, and Korea showed relatively similar levels of demographic, economic, and educational development. All three were experiencing significant fertility declines so that members of relatively large birth cohorts had fewer children, and therefore both the nation and individuals would have smaller child dependency ratios. These cohorts came of age during periods of significant educational expansion so they potentially received greater collective investments in their human capital. However, Brazil and Mexico on the one hand, and Korea on the other hand, have followed considerably different trajectories of development during the last three decades. Both Brazil and Mexico experienced the "lost decades" of the 1980s, and 1990s in the Mexican case, so that this large educated youth cohort faced a contracting labor market, while young adults in Korea confronted an expanding labor market (at least until the 'economic crisis' that began in December 1997). We expect that these different national "scenes" produced very different patterns of transition to adulthood.

In measuring the timing and complexity of the transition to adulthood as a whole, we apply entropy analysis that provides a single measure summarizing combinations of multiple demographic statuses occupied by young people (Billari 2001; Fussell 2005). In regard to status combinations, we consider four transition markers: school attendance, employment, marital status, and household headship. Using census data, we calculate the entropy index (joint entropy), which summarizes the extent of heterogeneity in status combinations, for each single-age group from 6 to 30 years old. We consider age-specific entropy measures as those followed by a synthetic cohort (Fussell, Gauthier, and Evans 2007). By comparing age-specific entropy measures between two census years within countries and also across countries, we can identify which countries show more heterogeneity in status combinations at which specific stage of life course, and how the patterns have changed over time. Demographers understand heterogeneity in status combinations to indicate the degree of standardization in young people's life course, arguing that processes of the transition to adulthood have become increasingly diversified and de-standardized over time in most advanced industrialized countries (Bruckner and Mayer 2005). Comparing age-specific entropy measures over time and across countries, we can address to what extent the process of de-standardization in the transition to adulthood has evolved in our three countries. The entropy analysis, furthermore, allows us to assess the extent to which each of school attendance, employment, marital status, and household headship contributes to the heterogeneity in status combinations. Across countries and over ages, the contribution of each status to total heterogeneity will vary and this information will help understand sources of heterogeneity. Finally, we calculate entropy measures for men and women separately so to examine gender differences in the transition to adulthood.

**DIFFERENT TRAJECTORIES OF SOCIAL CHANGES**

Table 1 presents selected indicators of economic and educational development for both 1970 and 2000 (1998 for Gini) in each country.  In regard to economic development, Korea had a lower GDP per capita than the two Latin American countries in 1970.  However, over the last three decades, GDP per capita in Korea increased six times, while GDP per capital in Brazil and Mexico increased less than two times.  In the result, the economic level of Korea in 2000 considerably surpasses the levels of Brazil and Mexico.  The statistics highlight rapid economic growth in Korea, which must have increased economic well-being and opportunities of population including young people.  Interestingly, Korea could achieve the fast economic growth with low levels of economic inequality (World Bank 1993), while the two Latin American countries are amoung the most unequal in the world.  In 1998 the Gini values, widely used to indicate the level of income inequality, are  .31 in Korea, .52 in Mexico, and .59 in Brazil.

Changes in educational opportunities in Korea between 1970 and 2000 are as remarkable as economic changes during the period.  The gross tertiary enrollment ratio increased more than ten times from 7 percent in 1970 to 78 percent in 2000.  In contrast, the increase in tertiary enrollment was much more moderate in both Brazil (from 5 percent to 16 percent) and Mexico (from 5 percent to 20 percent).  Although the net secondary enrollment ratio increased substantially in Brazil and Mexico as well as Korea, the current level of secondary enrollment in the former two countries is still considerably lower than the level in Korea.

The expansion of education enables more young people to stay in school for a longer period, and thus tends to standardize young people's life course at least during school ages. Therefore, the fact that educational expansion was substantially larger in Korea than in Brazil and Mexico suggests that the transition to adulthood may be more homogenous in Korea than in

Brazil and Mexico. Moreover, along the relatively low level of economic inequality, young people from lower social classes in Korea should have benefited more from the expansion of education than those from lower social classes in Brazil and Mexico, contributing to more homogeneity in the transition to adulthood in the former country.


## DATA AND METHOD

### Entropy Analysis

Using the entropy transformation, researchers have developed measures of inequality in the distribution of continuous or ordinal variables such as income, population distribution, and occupation (Allison 1984; Gorard and Taylor 2002; Magidson 1981). Applying a similar idea to nominal variables, Billari (2001) used Theil's entropy index to measure heterogeneity in the sequences of statuses that young Italian held during the life course. We apply Billari's approach, which examined status combinations of cohorts across life courses, to calculate the entropy index for each age from cross-sectional census data. We calculate the index for men and women separately in each country and each census. In other words, to address cross-time and cross-national differences in the timing and complexity of the transition to adulthood, we compare the distribution of the entropy index by age across the three countries in 1970 and 2000, respectively, for men and women separately. Following our previous work (Fussell 2005), we consider our entropy measures across ages from cross-sectional data to constitute a synthetic cohort which is assumed to follow the pattern across life courses as seen in the age-specific distribution of status combinations from cross-sectional census.

We consider four major statuses in the transition to adulthood: school attendance, labor force participation, ever-married status, and status as head of household or spouse of the head.

To obtain these four transition markers for a large number of young people by age, we rely on census data in each country. For Brazil and Mexico we use one-per cent samples of U.S. census data for 1970 and 2000 made available from the Integrated Public Use Microdata Series (IPUMS) Database (Ruggles, Sobek, Alexander, Fitch, Goeken, Hall, King, and Ronnander 2004). For Korea, we use the one-per cent Census for 1970 and 2000. To maximize comparability in measurements across census data, we treat each of the four statuses as dichotomous. In each census, we distinguish people who are currently attending schools from those who are not. For labor force participation, we separate those who hold any job regardless of whether it is full or part time from those who do not hold a current job (both those unemployed and not in the labor force). For ever-married status, we code those who are currently married, divorced, or widowed as 1 and those who have never been married as 0. Brazilian and Mexican census data have another category of cohabiters which we coded as married. Reflecting the very low prevalence of cohabitation, the separate category for cohabiters does not exist in Korean census data. Finally, we distinguish those who are the head of household or the spouse of the household head from those who are not either. Considering these four dichotomous statuses, in principle at an age individuals can be distributed into one of 16 potential status combinations. The four-dimensional entropy index can be calculated as (Cover and Thomas 1991):

$$H(S,W,M,H) = -\sum_{s=S}\sum_{w=W}\sum_{m=M}\sum_{h=H} p_i(s,w,m,h)\log_2 p_i(s,w,m,h)$$

where S, W, M, and H are the four dichotomous variables representing statuses held at any age (school attendance, labor force participation, ever-married, and household headship), p is the joint distribution of individuals in each of 16 status combinations, and i indexes age. With a total of 16 status combinations, the entropy index contains a value from 0 to 4 indicating the degree of

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heterogeneity in status combinations at a specific age (a higher value indicates a higher degree of heterogeneity).

In addition to joint entropy that includes all four statuses (schooling, labor force participation, ever-married status, and household head or spouse of head), we calculate joint entropy that excludes one status. The difference between the two entropy measures indicates the extent to which the excluded status contributes to total heterogeneity at a specific age. Finally, to test whether cross-national differences in the distribution of entropy index by age are statistically significant, we calculate 95 percent confidence intervals of the distribution using a bootstrap method (Stine 1989/90).

## RESULTS

### Joint Entropy in 2000 Census

Figure 1 graphically displays joint entropies for each male single-age group from 6 to 30 across three countries from all 2000 Census data, while Figure 2 shows joint entropies for women. Dashed lines represent 95 % confidence intervals for each country. As described in detail in the method section, the joint entropy measures the overall heterogeneity in status combinations. A higher value indicates a higher degree of heterogeneity. For men in Figure 1, Brazil and Mexico present a very similar pattern in joint entropy across ages, which is quite distinctive from the pattern in Korea. Joint entropy starts to increase at much earlier ages in Brazil (around at age 10) and in Mexico (age at 12) than in Korea where it starts to increase at age 17 – 18, which is the age for completion of high school. In other words, in Korea there is little heterogeneity in status combinations until high school graduation, reflecting almost universal enrollment for secondary education. The earlier onset of transition to adulthood in

Brazil and Mexico than in Korea is also reflected in the fact that entropy peaks at the early 20s in the two former countries, while it peaks at the mid-20s in Korea. After the peak at the early 20s, entropy starts to decline in Brazil and Mexico (slightly more substantially in Mexico). Consequently , status combinations in the late 20s become more heterogeneous in Korea than in Brazil and Mexico.

Cross-national differences in heterogeneity in status combinations seem more substantial among women than men. In Figure 1, Brazilian and Mexican young men show a very similar pattern, while their female counterparts display some divergence after age 17 in the extent of heterogeneity. After age 17, Brazilian young women continue to show much more heterogeneous status combinations than Mexican counterparts and even Korean counterparts. Although the level of heterogeneity seems to vary more across countries among women than men, the age at which entropy peaks seems comparable between men and women. Similar to men, entropy is the highest at the early 20s among Brazilian and Mexican women, while it peaks at the mid-20s among Korean women. Finally, it is notable that the level of heterogeneity is generally higher among women than men in all three countries. For instance, the entropy values at the peak are around 2 for men in all three countries, while the corresponding values for women vary between 2.5 in Korea and 3.5 in Brazil.

**Joint Entropy in 1970 Census**

To be analyzed

**Contribution of Each Status to Total Heterogeneity**

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To be analyzed

**DISCUSSION**

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Table 1.Some Macro Indicators by Country and Year

| | GDP per capita (I \$, 2005)[a] | | Gini[b] | Net secondary enrollment ratio (%)[c] | | Gross tertiary enrollement ratio (%)[d] | |
|---|---|---|---|---|---|---|---|
| | Year = 1970 | Year = 2000 | Year = 1998 | Year = 1970 | Year = 2000 | Year = 1970 | Year = 2000 |
| Brazil | 4761 | 8405 | 59.1 | 17 | 68 | 5 | 16 |
| Mexico | 6169 | 10360 | 51.9 | 17 | 57 | 5 | 20 |
| Korea | 3030 | 18608 | 31.6 | 38 | 91 | 7 | 78 |

[a] Heston, Summers and Aten (2009): Penn World Table Version 6.3.

[b] OECD (2003, Table 1.4)

[c], [d] The World Bank Group (2009): EdStats Query

Figure 1. Joint Entrophies for Men in Brazil, Mexico, and Korea: Census 2000
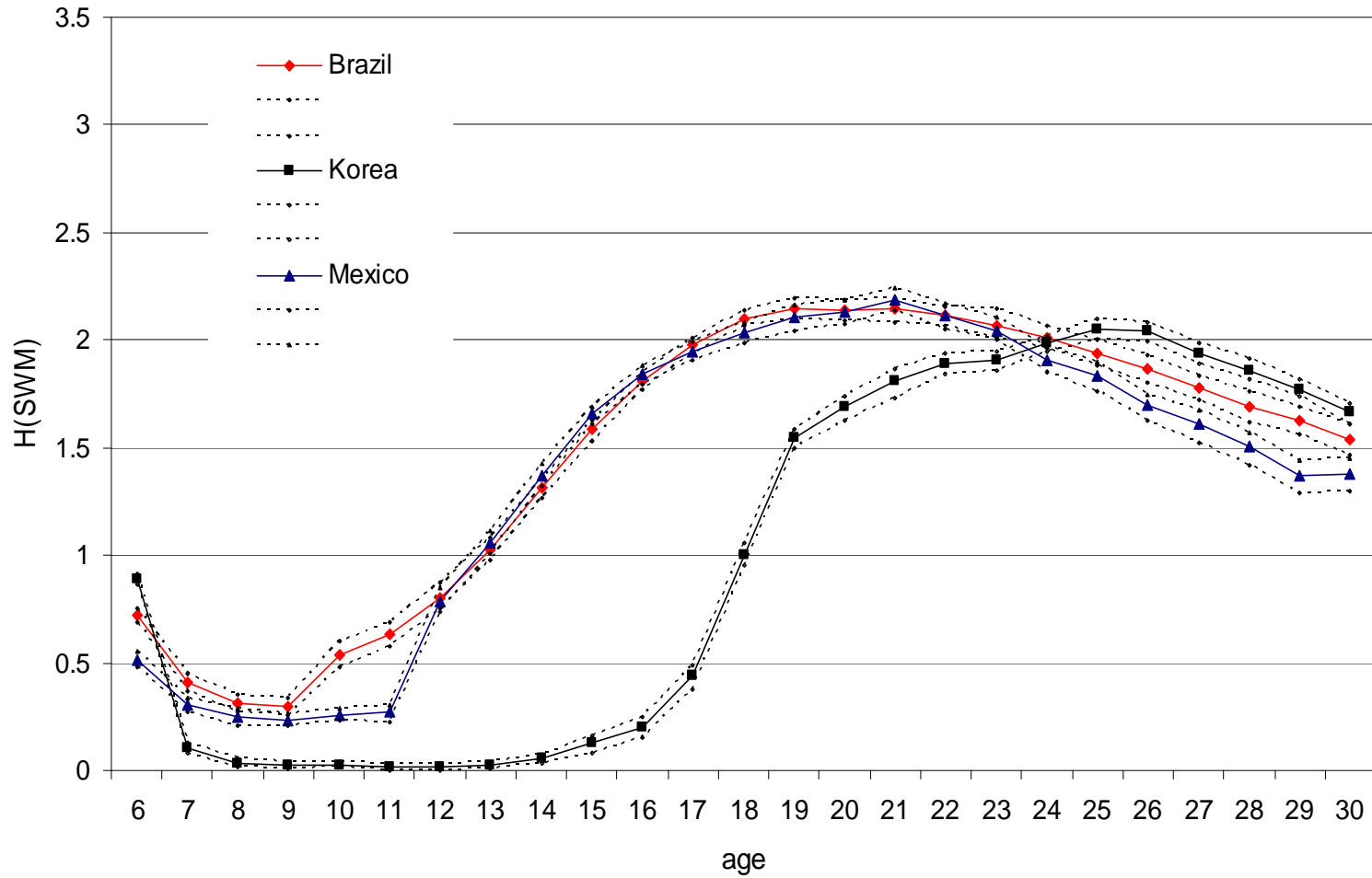
Figur 2. Joint Entropies for Women in Brazil, Mexico, and Korea: Census 2000