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Economic Inequality and Determinants of Earnings in Taiwan in the 2008 Recession*

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Income inequality in Taiwan abruptly increased when the 2008 financial crisis occurred. This paper studied causes of the deterioration by comparing determination processes of earnings before and after the recession. The author analyzed three waves of the Taiwan Social Change Survey (TSCS), collected in 2006, 2008, and 2011. Distributions of average real earnings became more polarized and proportions of workers in the low-income rank increased in 2008 and did not improve after the economy gradually recovered in 2011. The paper found effects of status stratification on earnings when the economy deteriorated. The occupational hierarchy was the most important factor explaining variations of hourly wages when the recession occurred in 2008. Effects of education and gender also remained strong in the recession. The explanatory power of age increased when the recession occurred but became non-significant in 2011. Instead, the effects of organization size and employment status became influential after the recession. The paper concluded that, as the demand for professionals and managerial experts will continue to increase in Taiwan, pay differences between upper white collar workers and the rank-and-file working class will likely enlarge. The trend is likely to further deteriorate income equality in Taiwan unless the state intervenes to assist the working poor.

Keywords: *2008 financial crisis, income inequality, hourly wages, earnings polarization, occupational hierarchy, Taiwan Social Change Survey*

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A number of years have passed since the occurrence of the financial crisis in 2008 in the U.S. Because of the magnitude of the influences of the crisis, it was named the Great Recession from the American perspective (Emmenegger, Häusermann, Palier, and Seeleib-Kaiser 2012, p. 4). As the Global Wage Report (ILO 2010, p. XV) noted: "The years 2008-2009 were characterized by the deepest economic downturn since the 1930s. … (T)he recession spread rapidly from its epicenter to the rest of the world…While unemployment has increased primarily in advanced economies, the impact of crisis in low- and middle-income developing countries … can be seen in the quality of employment and a shift toward more vulnerable forms of employment". Some East Asian industrialized countries also experienced economic setbacks in the 2008 crisis because of the deep economic ties with the American economy (Himanen 2012, p. 158). Taiwan is one of them.

Figure 1 shows the changes of macroeconomic indicators and average earnings in Taiwan since the mid-1990s until recent years based on governmental archival data. The average economic growth rate remained over 6% before the 1997 Asian Financial Crisis. It slipped further to 4.2% in 1998 but soon recovered to the 6% level. Taiwan's economy was hit hard again due to the collapse of the dot-com bubble and the growth rate turned negative (-1.3%) in 2001. Another blow to the economy happened in 2003 when Severe Acute Respiratory Syndrome (SARS) spread in China, Hong Kong, and Taiwan. The growth rate then varied between 6% and 4% in the mid-2000s. The 2008 financial crisis resulted in another abrupt decline in the growth rate, from 6.5% in 2007 to 0.7% in 2008 and further to about -1.6% in 2009.

The negative growth rate and slow recovery affected Taiwan's labor, similar to what *Global Wage Report* observed in other economies affected by the 2008 crisis. As Figure 1 shows, the unemployment rate remained below 4% before the 2001/2002 recession started. It reached 5.2% in 2002 but gradually decreased after the economy recovered in the following years. The unemployment rate climbed to around 6% in 2009 and remained over 5% in 2010.

Besides job loss, individual income was also affected by the recession in Taiwan. As shown in Figure 1, earnings had generally kept pace with economic growth from the 1980s until the mid-1990s. However, average earnings have hardly increased after that. In comparison with wage growth in Korea, Bickenbach, Liu, and Niehues-Jeuffroy (2015) noted the stagnation of earnings since the mid-1990s in Taiwan. Even worse, earnings further declined due to the 2008 recession. Average real monthly earnings were $43,193 Taiwan dollars (NTD; about 1,335 USD) in 2009, which was even lower than the

Source.—a. Earnings: *Yearbook of Earnings and Productivity Statistics* (annually; published by DGBAS of R.O.C.); b. Economic growth rate: National Statistics of R.O.C. (on-line database) (http://ebas1.ebas.gov.tw/pxweb/Dialog/NI.asp); c. Unemployment rate: *Yearbook of Manpower Survey Statistics* (annually; published by DGBAS of R.O.C.).

Fig. 1.—Macro-Economic Indicators and Average Monthly Real Earnings in Taiwan, 1994–2014

amount in 1997 ($44,195; DGBAS 2015).

The 2001 Nobel laureate in economics, Joseph Stigliz (2007, 2013), praised East Asian countries for succeeding in both raising growth and attaining equal distribution of income in the process of development. However, income equality has been deteriorating in the region since the 2008 financial crisis, including Japan and Taiwan (e.g., Wang 2011). Piketty, Saez, and Stantcheva (2011) found that the top 1% increased their share of pre-tax income in Japan during the past several decades. I use governmental statistics to illustrate the deterioration of income equality due to the 2008 recession in Taiwan in the following.

Table 1 lists average household disposable income for five quintiles in Taiwan: the lowest 20%, the next-to-the-lowest, the middle, the next-to-the-highest, and the highest 20%, from 2001 to 2015. Households in all five quintiles experienced a continuous decline in income because of the 2008 recession. Table 1 also shows the time of recovering to the previous earnings among quintiles. Except for the richest 20% of households, Table 1 shows an opposite relation between earnings level and the length of time needed for

TABLE 1
Average Disposable Income Per Household by Quintiles and Measures of Income Inequality in Taiwan
(Unit of income: 1,000 NTD)

Year	Average disposable income per household	Average disposable income per household by quintiles					Highest/ Lowest (b)/(a)	Gini coefficient
		Lowest 20% (a)	2nd 20%	3rd 20%	4th 20%	Highest 20% (b)		
2001	869	279	525	740	1,013	1,786	6.39	.350
2002	876	292	539	744	1,005	1,800	6.16	.345
2003	882	296	545	745	1,021	1,800	6.07	.343
2004	891	297	555	776	1,036	1,792	6.03	.338
2005	895	298	556	779	1,043	1,797	6.04	.340
2006	913	304	565	795	1,074	1,827	6.01	.339
2007	924	312	571	799	1,070	1,867	5.98	.340
2008	914	304	565	796	1,069	1,835	6.05	.341
2009	888	282	545	772	1,049	1,790	6.34	.345
2010	889	289	543	773	1,055	1,787	6.19	.342
2011	908	296	547	786	1,083[a]	1,827	6.17	.342
2012	924	301	567	810[a]	1,094	1,846	6.13	.338
2013	942	309	583[a]	824	1,112	1,883[a]	6.08	.336
2014	957	317[a]	588	831	1,129	1,920	6.05	.336
2015	965	320	588	837	1,140	1,940	6.06	.338

Source.—*Report on the Survey of Family Income and Expenditure* (annually; published by DGBAS of R.O.C.).

[a]Income that caught up to or surpassed the amount in 2007 is enclosed in a box for each quintile.

recovery. The lower income households took a longer time to return to their prior income level than better-off families after the recession. It took six years (until 2014) for the poorest 20% of households to return to their earlier income level after the 2008 recession occurred. The next-to-the-lowest 20% of households and the middle-income quantile were able to recover in 2013 and 2012, respectively. It took even less time (three years) for the next-to-the-highest 20% of households to get back to the pre-crisis level. The recession

had longer impacts on the poor than the richer families.

As to measures of income inequality, the income ratios and Gini coefficients are listed in the last two columns in Table 1. The highest 20% of households earned 6.39 times more than the lowest 20% in 2001. Income equality had been improving in the 2000s until 2008, when the ratio went up to 6.05. It rapidly climbed to 6.34 in 2009. Gini coefficients generally show a similar trend. However, as the richest quintile had a relatively slow recovery from the recession, income distribution gradually improved after 2009, until 2014. The income equality turned worse again in 2015.

In general, Table 1 shows that household income was negatively affected by the 2008 crisis, and income equality deteriorated. The decline in earnings was not equally distributed among workers. Some Western studies have shown that the 2008 recession and austerity measures taken by states made workers at the bottom of the labor markets even more vulnerable than before (Grusky, McAdam, Reich, and Satz 2013). Hills, Cunliffe, Gambaro, and Obolenskaya (2013) found that low-paid workers suffered greater decreases in wages than better-paid groups in Britain. As to Taiwan's case, many workers took unpaid leave at their employers' request to reduce production costs when the 2008 financial crisis occurred. Employees on unpaid leave at best received only basic earnings, and were mostly those employed in the private sector, the low-income rank, and women (Ho and Hung 2014).

As the recession did affect economic returns of workers and some were worse off than others, this paper aimed to explore which factors are more important than others in explaining earnings differences in the recession. This is accomplished through comparing factors which determine individual earnings before and after the 2008 crisis. Previous studies used a similar approach to examine the impacts of economic crisis on earnings. Kim and Voos (2007), for instance, studied the impacts of the Asian Financial Crisis on female workers by comparing regression analyses on data from the 1997 and 2002 Wage Structure Surveys in South Korea. The present paper used survey data which were collected before and during the recession to show the changes of the determinants of earnings caused by the crisis. The following section discusses the effects of major determinants of earnings when the external economic conditions changed.

Literature Review: Determination of Earnings in Economic Recession

Adopting the perspective of stratification, this paper studied whether the status of individuals became more influential in determining labor market outcomes during the recession, besides human capital factors. Specifically, I emphasized the increasing effects of status differences on earnings during the recession, which thus resulted in deterioration in earnings equality. Status is represented by various dimensions including individual characteristics, job positions, and organizational structure. Factors representing status differences such as gender, age, education, work experience, and occupation have been used in previous studies on determinants of earnings after the 1997 Asian Financial Crisis (e.g., Kim and Voos 2007). Age and gender are basic demographic variables. Education and work experience represent individual human capital. Occupational hierarchy and firm size are measures of structural segmentation. These are major factors determining earnings to be tested in the paper.

Age Effects

Age has been shown in some cross-national studies to have positive effects on earnings, but with a decreasing rate (Fournier and Koske 2012; Mandel and Semyonov 2005). Controlling for the influences of work experience, the positive effects of age on earnings may be interpreted as the results of institutional protection of senior workers from external economic dynamics in the public sector and large enterprises. In contrast, young workers suffered from the economic recession due to the shortage of well-paying jobs.

The unemployment rate in Taiwan reached 4% in 2008 and climbed to about 6% in 2009 (Figure 1). But the unemployment rate for young workers, mostly new entrants in full-time employment, exceeded 10% in the same period (DGBAS 2010). Under pressure to reduce unemployment, the government decided to subsidize businesses to hire new entrants, mainly college graduates. For each successful new employment, in 2010 the state provided NT $22,000 (the so-called '22K') monthly for up to a year. The private sector hired more than 30,000 college graduates through this programme, which the government extended to 2011. The amount of $22,000 was higher than the minimum wage ($17,280) but much lower than the average earnings ($45,888) when it was implemented in 2010. The

effectiveness of this policy to help the younger generation was questioned when it turned out that many employers did not have incentives to pay newly-hired workers more than 22K and felt no obligation to continue employing the subsidized workers after one year (*The China Post* April 9, 2010).

There was a best-seller published after the recession — *BOMB*Generation* (Taiwan Labor Front 2011) — which used various sources of aggregate statistics to illustrate the plight of the younger generation in Taiwan. The book showed that the younger generation had more difficulties starting their own business, finding jobs with decent pay, and affording an apartment in metropolitan areas compared to the times when their parents were young.

Based on the previous discussion, I expect that age effects on earnings increased in the 2008 recession and the younger workers suffered more earnings loss than elderly workers.

Gender Effects

The economic dynamics created different results in earnings between men and women too. A study by Kim and Voos (2007) offered a good example. Controlling for age, education, occupation, and establishment size, they found significant loss of earnings for working women in Korea after the 1997 recession.

Annesley and Scheele (2011) showed that men had a higher unemployment rate during the 2008 recession, but were able to find good jobs after the recovery in Western industrialized countries. In contrast, reemployed women usually could find only low-paid jobs when the economy improved. Comparing gender differences of wages in different percentiles, Hills et al. (2013) found that on average the gender wage gap increased, especially in the highest income category, after the 2008 recession in Great Britain. Rubery and Rafferty (2013) noted the interaction effects of employment sector and gender, and found that the income of female workers, particularly those in part-time jobs, was less affected if they were employed in the public sector than the private sector when the austerity measures were taken. Peng (2012) studied the impacts of the 2008 recession on both job security and other labor market outcomes in East Asian countries by using a segmentation perspective. She argued that the economic downturn after the 2008 crisis resulted in the consolidation of the privileges of elite employees (insiders of labor markets) at the expense of marginal workers (outsiders) in Japan. The privileges included job security, wage protection, and welfare benefits. The elite workers were mostly middle-aged, full-time male workers in large

companies. These findings can be seen as the continued practices of the Japanese permanent employment system, which covers mostly male employees (Westney 2001, p. 109).

In Taiwan's case, a study by Ho and Hung (2014) indirectly demonstrated the gender effects on earnings during the recession. Analyzing the unpaid-leave practices prevalent in 2008 and 2009, they found that women were more likely than men to be on the list of those taking temporary leave. Most on-leave employees received only the basic wage at best.

I thus expect stronger impacts of gender on earnings in the 2008 recession, controlling for human capital resources and structural factors including occupation and employment status.

Human Capital Effects

School education has been shown to have direct and important effects on earnings when controlling for individual and country-level factors (Mandel and Semyonov 2005). The global competition for technological innovation has increased the value of knowledge and skills, and the competition for recruiting the highly educated has become more intense than ever (Shen 2014). Autor, Katz, and Kearney (2008) showed that demand has increased for workers with more years of education. Specifically, the growth rate of earnings in these jobs has been higher than those needing not more than high-school degree. However, Kim and Voos (2007) found that the return rate of education on earnings decreased for all educational levels in 2002 compared to 1997 in Korea. For men, the advantages of having a high-school or two-year-college education over the least educated workers clearly decreased after the recession (ibid., p. 198).

With the ever increasing global competition for technological innovation and creativity, employers likely tried to keep workers with higher degrees at the expense of the less-educated working class. I expect that educational effects on earnings increased in the recession.

In the discussion of earnings determination, Mincer (1974) also argued for the importance of work experience as another element of human capital investment. While education represents self-investment before entering the labor market, work experience increases labor productivity through on-the-job training. Thus, controlling for age differences, I expect the positive effects of work experience on earnings to have been increasing when economic conditions deteriorated.

Occupation Effects

In addition to educational requirements, occupational differences contain other dimensions including prestige, skill certifications, authority, and power of decision-making. The disproportionately high income received by top CEOs has been argued to account for the increasing income inequality in the U.S. (Gottschalk and Moffitt 2009). Studying the impacts of computerization of labor process on the wage structure in the early 2000s in Taiwan, Wang (2008) found a trend of polarization of wage growth between professional/skilled workers and lower non-manual workers. She attributed the increasing occupational differences of earnings to the development of computer technology and the information economy in Taiwan since the 1990s, which is similar to the arguments made by Autor et al. (2008) as discussed earlier. Kim and Shirahase (2014) grouped detailed occupations into classes and found that professionals/managers and semi-professional workers earned significantly more than unskilled manual labor in Korea, Japan, and Taiwan using data collected in 2005.

As to the effects of occupation on earnings in the recession, Kim and Voss (2007) classified occupations of the respondents by skills and found that skilled blue-collar workers earned more than unskilled blue- and white-collar workers in 1997. This paper hypothesizes that, controlling for education and other factors, differences of earnings between the upper white-collar and other workers increased during the economic recession.

Effects of Other Variables

In addition to factors discussed above, the paper includes other individual-level factors and organizational characteristics in the analysis to provide a more specified model of earnings determination. The individual-level factors include marital status, residential location, and employment status. I expect that earnings of the married (or cohabitating) workers, compared to those remaining single or once married (divorced, separated, or widowed), were less affected by the recession, as they are seen as a stable labor force, and employers are willing to invest in them.

As opportunities of regular jobs were generally slack in the rural areas, the recession may have worsened employment prospects. Working outside cities is expected to negatively affect earnings.

Unlike Korea and Japan, regular workers are still the major labor force in

Taiwan. Over 30% of workers hold non-standard employment in Japan and Korea (Lue, Hsiao, and Lee 2015, p. 109). The comparable percentage is below 10% in Taiwan. Still, regular workers have more stable employment and higher wages than temporary or part-time workers in Taiwan (ibid., p. 110). I expect that work outcomes of non-regular workers deteriorated in the 2008 recession.

Characteristics of organizational structure include establishment size, employment sector, and economic sector. Kim and Voos (2007) found that earnings are positively related to firm size for both men and women in Korea. The two authors also found that effects of size were stronger in 1997 than in 2002. They explained that this may have been partly due to the increasing usage of non-regular workers in large enterprises, such as banks. In the present paper, it is expected that the effects of size on earnings would have increased in the recession in Taiwan, as large companies were more able to adjust to the ups and downs of the economy than small ones.

It is also expected that working in the public sector, including government agencies and state-owned enterprises, has positive effects on earnings than those working in the private sector, as the former's employment and compensation have institutional protections and are thus less affected by recession.

As to the effects of the economic sector, average earnings in the service sector are higher than in the industry sector (including manufacturing, construction, and utilities) in Taiwan, based on governmental statistics. For instance, the average monthly earnings were $42,507 in the industry sector and $44,350 in the service sector in 2006. However, the differences enlarged slightly after the 2008 recession (DGBAS 2016). I thus expect that workers in the service sector earned more than those in other economic sectors when the economic crisis occurred.

Data, Variables, and Methods

Data

Taiwan Social Change Survey (TSCS) is conducted annually, using a nationwide, stratified representative random sampling method, coordinated by the Institute of Sociology and Center for Survey Research at Academia Sinica in Taiwan.[1] TSCS conducted two modules in each survey year with respective samples. This paper used the data of the 2006 (the module of

[1] The official website of TSCS: http://www.ios.sinica.edu.tw/sc/en/home2.php.

Family), 2008 (Culture and Globalization), and 2011 (Health) survey years to compare factors determining earnings before and after the crisis. All three surveys have comparable variables for the analysis.[2]

The original sample size of the three modules was 2,102 in 2006, 2,067 in 2008, and 2,199 in 2011. The analysis included only employees aged 18 to 65, excluding employers and the self-employed. Employees receiving no monetary compensation for their labor input or not reporting earnings when interviewed were also dropped from the study sample.[3]

Dependent Variable

All three surveys included the question of monthly earnings from work (pre-tax salary, year-end bonus, and allowances from employers), which was measured by category. The midpoints of each category were taken to represent the respondents' earnings. For respondents in the highest category, the starting amount of that category was used, and half of the midpoint of the second highest category was added to it to represent the approximate earnings of this group. Considering the inflation during the study period, earnings were deflated by the consumer price index of the respective year.[4] To control for the variations in work hours, the real monthly earnings were further divided by hours (weekly hours multiplied by 4). Natural logarithms were then used in the value transformation of hourly wages.

Independent Variables

Based on the previous discussion, age, gender, education, work experience, and occupation were the major variables tested in the analysis. The model also controlled other individual variables, including marital status, employment

[2] The paper does not use the TSCS data collected in 2007 because one module asked about work conditions of full-time workers only, and the other module did not ask about earnings from work. Neither of the two modules conducted in 2009 asked about work earnings. As to the 2010 surveys, one module did not ask work earnings and the other did not ask the number of children, which is the instrumental variable predicting women's employment status in the Heckman selection model in this paper.

[3] Together there are 3,062 employed respondents aged 18 to 65 in Taiwan after combining the three surveys' data. Among them 127 (about 4% of the employed sample) reported no earnings or refused to disclose their earnings. One case in the 2006 data was excluded because this worker claimed to have a full-time job but worked only two hours every week.

[4] The consumer price index of Taiwan for each respective survey year is: 100 (2006), 105.388 (2008), and 106.978 (2011).

status, and the degree of urbanization of residence, as well as structural variables including establishment size, employment sector, and economic sector. Operationalization of variables is discussed below.

Taking a decade as a generation, the sample was divided into five age groups: 18-25, 26-35, 36-45, 46-55, and 56-65. The educational background is measured by the highest degree, which contains four levels: junior high school or below, senior high school, junior college, and university or above. Most people had their first formal job only after completing school education. The accumulation of work experience started at the age when they obtained the degree (Mincer 1974, p. 75). The three TSCS surveys used in this paper did not ask respondents about their actual work experience or the age when finishing all school education. In this paper the work experience is measured by taking age minus 6 (the year starting primary education) and minus years spent to obtain the highest degree. The variable of occupation adopted the typology used in Charles and Grusky (2004), which classified respondents into four strata based on the dimensions of hierarchy and job nature: upper manual and non-manual, and lower manual and non-manual. Upper non-manual workers include senior government officials, top level managers, and professionals. Technicians and skilled blue-collar workers are the upper manual stratum. Clerks and service workers are treated as lower non-manual. All unskilled labor as well as agricultural, forest and fishery workers are categorized as the lower manual level.

As to control variables, respondents' marital status is composed of three categories: never married, married or cohabiting, and ever married but with no cohabiting partner (divorced, separated, or widowed). Regular workers are those having full-time jobs. All other part-time or temporary laborers are treated as non-regular. The rural and urban difference is measured by the self-reported degree of urbanization of the current residence. TSCS asked respondents to report the size of the establishment with which they were affiliated. It is used as a continuous variable in the analysis. A dummy variable was used to test the different effects between being employed in the public and private sectors. The economic sector includes industry (manufacturing, construction, and the utilities companies), service, and primary (agriculture and mining).

Methods

An ordinary least squares regression model was used in the analysis, as the dependent variable is a continuous measure. In addition to comparing

changes of significance level and size of coefficients among three survey years, I used contributions by each variable (in proportions) to the adjusted R^2 of the full model to test the explanatory power of the major factors in variations in earnings.

To correct for the selection bias of employment choice, especially for women, in studying earnings differences, Heckman selection equations were included in the analyses for the whole sample. The dependent variable was employed or not. Independent variables used in the bias-correction model were the number of children, marital status, and urbanization level of respondent's residence.

Findings

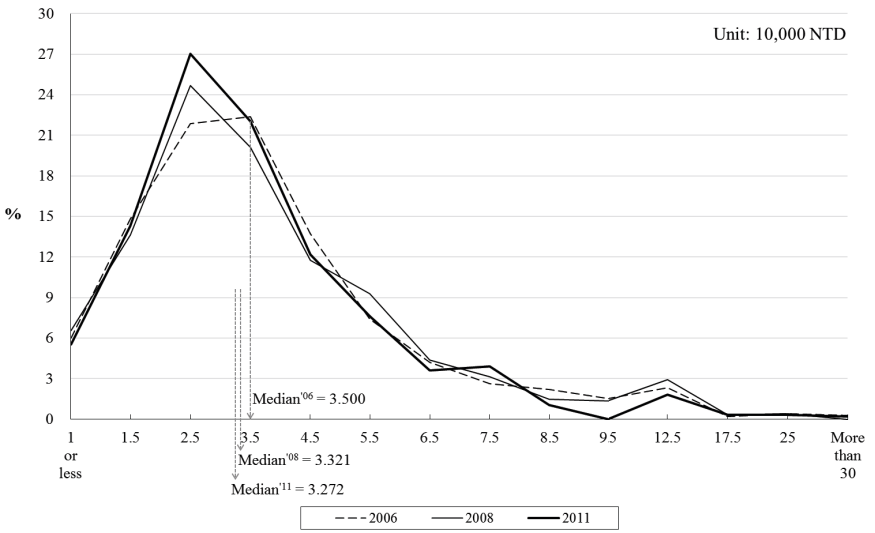
Descriptive Statistics

The distribution of average earnings of respondents in the three surveys is shown in Figure 2. All curves are skewed to the right and resemble an L shape. The distribution became more polarized when the 2008 crisis occurred, and again in 2011. Median earnings were about $35,000 in 2006. The amount dropped to $33,210 during the recession year and was even lower in 2011. The earnings distributions also showed a high proportion of the working class concentrated in the low salary rank. More than 42.7% of respondents earned less than $30,000 in 2006, which is about the three-fourths of the median earnings. The comparable statistics rose to 44.9% in 2008 and 46.9% in 2011. The increasing income inequality during the recession, as shown in Table 1, may thus partly be explained by the retreat of earnings of the poorly-paid workers.

Table 2 shows descriptive statistics of the variables used in the regression. The first row lists medians and means of monthly real earnings. The changes in median earnings have already been discussed above, and the average earnings showed a trend of decline similar to that of medians.

As to gender differences, both men and women experienced income reduction after the 2008 recession. Women's average earnings dropped from $34,425 in 2006 to $30,095 in 2008 and further to $27,970 in 2011. Men's earnings also decreased in 2008 and 2011 but to a smaller extent. The gender gap of earnings was higher in 2008 (women earned 69.4% of what men did) and 2011 (67.7%) than 2006 (77.7%).

Younger workers earned less than older ones but not in a linear trend



Source.—Taiwan Social Change Survey 2006, 2008 and 2011.

Note.—a. Paid employees and family business workers between age 18 and 65; b. The value on the X-axis represents the mid-point in each category of earnings.

Fig. 2.—Distribution of Average Monthly Real Earnings in Taiwan: 2006, 2008, 2011

with time. The group aged between 46 and 55 had the highest earnings among all, while the youngest group earned the least. Earnings differences among age groups became smaller in 2011 except for the group aged 18 to 25, who earned far less than all senior workers.

Earnings were positively correlated with education level in all three study years. However, respondents with the least educational achievements reported improvements of their earnings in 2011 compared to 2008, but the income loss for all the better-educated continued in 2011.

Workers in all occupational strata experienced earnings loss in 2008 compared to 2006. Lower manual workers earned more in 2011 than 2006. Still, their average earnings were the lowest among the four occupational groups. Upper manual workers had the greatest reduction of earnings among the four occupational strata, as the income dropped 16.7% from 2006 to 2011. However, they still earned much more than lower manual or non-manual employees.

Married or cohabiting couples earned more than those of other marital status. Earnings of the never-married group were hardly affected by the recession, as their earnings were already lower than the median earnings

TABLE 2
Descriptive Statistics of Variables[a]

Variables	2006		2008		2011		F-test/ χ^2-test
	% (cases)	Monthly earnings (NTD)[b]	% (cases)	Monthly earnings (NTD)[b]	% (cases)	Monthly earnings (NTD)[b]	
Median of monthly earnings (NTD)[b]	(997)	35,000	(960)	33,211	(943)	32,717	
Mean of monthly earnings (NTD)[b]	(997)	39,378	(960)	36,937	(943)	34,952	5.5**
Predicting variables							
Gender	(997)	-	(960)	-	(943)	-	.9
Female	50	34,425	49	30,095	48	27,970	
Male	50	44,281	51	43,391	52	41,298	
Age (years old)	(997)	-	(960)	-	(943)	-	18.7*
18-25	17	22,235	16	21,365	18	19,488	
26-35	30	40,600	32	36,342	30	37,257	
36-45	30	43,851	26	42,981	24	38,128	
46-55	18	46,005	19	42,385	21	40,920	
56-65	5	39,468	7	37,616	8	36,633	
Education level	(996)	-	(960)	-	(943)	-	17.9**
Junior high school or lower	16	25,248	17	21,112	13	23,443	
Senior high school	32	33,213	29	31,802	28	29,849	
Junior college	20	45,725	19	42,461	18	37,608	
University or higher	32	48,829	35	45,801	40	41,096	
Work experience (years)	(996)	-	(960)	-	(943)	-	.3
Mean	18.05	-	18.29	-	17.88	-	
S.D.	12.13	-	12.93	-	13.21	-	
Occupation	(997)	-	(960)	-	(943)	-	5.5
Upper non-manual	17	64,441	20	62,090	17	58,879	
Lower non-manual	29	29,420	29	25,792	30	26,115	
Upper manual	34	43,805	32	39,655	33	36,508	
Lower manual	20	24,795	19	22,322	20	25,767	
Control variables							
Marital status	(997)	-	(960)	-	(943)	-	10.0*
Never married	37	30,984	38	30,740	42	29,450	
Married or cohabiting	56	45,072	57	41,490	51	39,980	

TABLE 2
(Continued)

Variables	2006		2008		2011		F-test/ χ^2-test
	% (cases)	Monthly earnings (NTD)[b]	% (cases)	Monthly earnings (NTD)[b]	% (cases)	Monthly earnings (NTD)[b]	
Divorced, separated or widowed	7	38,358	5	31,692	7	31,091	
Degree of urbanization[c]	(997)	-	(959)	-	(941)	-	158.9***
Mean	3.04	-	3.73	-	3.76	-	
S.D.	.93	-	1.07	-	1.05	-	
Employment status	(997)	-	(960)	-	(941)	-	2.3
Non-regular	10	15,288	13	15,656	12	14,760	
Regular	90	42,184	88	39,977	88	37,753	
Size of establishment (persons)	(913)	-	(935)	-	(786)	-	55.0***
10 or fewer	25	27,841	31	25,778	29	26,219	
11-30	23	35,728	17	32,449	18	31,557	
31-99	21	42,964	15	41,061	13	35,725	
100-999	22	52,100	26	44,836	24	39,828	
1,000 or more	9	54,360	11	53,913	16	51,004	
Employed sector	(997)	-	(959)	-	(941)	-	.7
Private	86	36,978	85	35,199	86	33,930	
Public	14	54,071	15	46,813	14	41,700	
Economic sector	(995)	-	(960)	-	(938)	-	8.2+
Industry	39	36,460	40	35,819	37	36,388	
Service	60	41,538	58	38,345	61	34,376	
Primary	1	26,000	2	16,869	3	28,433	

+ p<.1, * p<.05, ** p<.01, *** p<.001.

Source.—see Figure 2.

[a]Paid employees and family business workers between age 18 and 65.

[b]Adjusted by consumer price index (base year=2006).

[c]Scaled from 1 to 4 in 2006, and from 1 to 5 in 2008 and 2011.

before the recession started. In contrast, the ever married with no cohabiting partners suffered the most in terms of their income in 2008.

As to differences in employment status, about 10 to 13% of respondents were non-regular workers in the analytical samples. This group earned less than 40% of regular workers did in all three time points.

The size of establishment is a continuous variable in the analysis. To illustrate the differences of earnings between small and medium enterprises versus large enterprises in Taiwan, I classified the results into five categories: 10 or fewer employees, 11-30, 31-99, 100-999, and 1,000 or more. The percentage of employees in establishments with fewer than 100 workers was 60 (2011) to 69 (2006). However, the comparable statistic was lower than 15% in Korea (Kim and Voss 2007, p. 207). Large enterprises were not the major source of labor hiring in Taiwan. The results in Table 2 indicated that, even though workers in large companies were also affected by the recession, their income loss was weaker than that of those in smaller companies.

The proportion of workers employed by the public sector was between 14% and 15% according to the surveys, and they were on average paid better than the employees in the private sector. However, when the 2008 crisis occurred, the public employees experienced more significant loss of earnings than the private ones. As salaries are less likely to be adjusted downward in the public sector, the loss of earnings of these workers might be due to the reduction of overtime pay and/or year-end bonus.

The last variable in Table 2 is economic sector. Overall, industrial workers were less affected by the recession than those in service or primary sectors. Respondents in the service sector earned more than those in the industry sector in 2006 and 2008. The conditions were reversed in 2011, when mean earnings in the industry sector were higher than those in the service sector.

Results of Ordinary Least Squares Regression

Correction of sample bias

The results of OLS regression are shown in Table 3. The coefficients presented are the results after controlling for selection bias using Heckman's model. The dependent variable in the Heckman model was being employed or not for all respondents. The results (listed at the bottom of Table 3) show that respondents with no cohabiting partners or those with children are less likely to be in the labor market.

Effects of predicting variables

In the earnings regression model, the dependent variable is natural logarithms of real hourly wages of employees. It is not surprising to find that women earned significantly less than men during the study period. In the previous discussion about the descriptive statistics shown in Table 2, the author noted

TABLE 3
Results of OLS Regression on LN Hourly Earnings by Year[a]

Dependent variable: Hourly earnings (natural log; NTD)[b]	Regression coefficients		
	2006	2008	2011
Predicting variables			
Female	-.171 (.04)***	-.169 (.04)***	-.198 (.04)***
Age (56-65=0)			
18-25	-.488 (.24)*	-.678 (.22)**	-.276 (.23)
26-35	-.444 (.20)*	-.556 (.18)**	-.098 (.19)
36-45	-.419 (.17)*	-.458 (.15)**	-.072 (.16)
46-55	-.211 (.12)+	-.334 (.10)**	-.061 (.11)
Education level (University or higher=0)			
Junior high school or lower	-.508 (.09)***	-.431 (.09)***	-.592 (.09)***
Senior high school	-.392 (.06)***	-.274 (.06)***	-.285 (.06)***
Junior college	-.187 (.06)**	-.124 (.05)*	-.159 (.05)**
Work experience (years)	.045 (.01)***	.040 (.01)***	.018 (.01)+
Square of work experience	-.001 (.2e-3)***	-.001 (.2e-3)***	-.1e-3 (.2e-3)
Occupation (Upper non-manual=0)			
Lower non-manual	-.405 (.06)***	-.520 (.06)***	-.478 (.06)***
Upper manual	-.149 (.06)**	-.200 (.05)***	-.287 (.05)***
Lower manual	-.450 (.07)***	-.615 (.07)***	-.509 (.07)***
Control variables			
Marital status (Married or cohabiting=0)			
Never married	-.071 (.06)	-.045 (.05)	.013 (.05)
Divorced, separated or widowed	-.2e-3 (.08)	.022 (.08)	-.119 (.07)+
Degree of urbanization[c]	.036 (.02)+	.037 (.02)*	.049 (.02)**
Non-regular worker	-.120 (.07)+	-.066 (.06)	-.363 (.06)***
Size of establishment (1,000 persons)	.206 (.06)**	.238 (.06)***	.231 (.05)***
Private sector	-.117 (.06)*	-.062 (.05)	-.123 (.06)*
Economic sector (Industry=0)			
Service	.001 (.04)	.015 (.04)	-.045 (.04)
Primary	-.124 (.20)	-.209 (.13)+	.076 (.11)
Constant	5.990 (.27)***	6.026 (.25)***	5.643 (.26)***
Inverse of Mill's ratio	-.264 (.13)*	-.259 (.16)	-.173 (.12)
Adjusted R^2 (%)	39.87	46.66	43.72

TABLE 3
(Continued)

Dependent variable: Hourly earnings (natural log; NTD) [b]	Regression coefficients		
	2006	2008	2011
Heckman selection model *(Currently having a job=1)*			
Marital status (Married or cohabiting=0)			
Never married	-.801 (.12) ***	-.652 (.12) ***	-.614 (.12) ***
Divorced, separated or widowed	-.291 (.14) *	-.345 (.14) *	.008 (.14)
Number of children	-.345 (.04) ***	-.280 (.04) ***	-.385 (.05) ***
Degree of urbanization [c]	.049 (.04)	.033 (.03)	-.018 (.03)
Constant	1.074 (.16) ***	.944 (.16) ***	1.090 (.18) ***
Sample size	1,385	1,415	1,282
Censored	473	481	505
Uncensored	912	934	777

+ p<.1, * p<.05, ** p<.01, *** p<.001.

Source.—see Figure 2.
[a, b, c] see Table 2.

that on average women earned even less than men in 2008 and 2011 compared with the results before the recession. The results of regression analysis further show that women suffered more in the recession after controlling for other variables.

As discussed above, generational disparities became heatedly debated issues in Taiwan as the unemployment rate of the young workers rose during the 2008 recession. Using respondents aged 56 to 65 as the reference group in the analysis, differences of earnings among age groups were statistically significant in 2006 and 2008. The biggest difference appeared between the youngest group and the reference group (over 55) in 2008. The worries by the young about their job prospects seem to be confirmed by the regression results. Overall age effects turned to be non-significant in 2011.

To test the effects of school education, I used respondents with a university or higher degree, the most privileged group, as the reference group. The effects of education on earnings were significant in all three survey years, and the effects ascended linearly with the degree obtained by employees. The influences of education became smaller in 2008 than in 2006 or 2011, which differs from the hypothesis. Differences of return rates of earnings between

the least educated and the most educated were enlarged in 2011. The least educated workers became more vulnerable after the 2008 crisis in Taiwan.

Work experience and the squared term as a whole were another indicator of human capital. Table 3 shows that work experience had significantly positive effects before and during the recession, but became much less significant in 2011.

As to the effects of occupational hierarchy I also used the most privileged group, upper non-manual workers, as the reference group. Table 3 shows that upper non-manual workers earned significantly more than those holding other positions in all three years. The earnings gap between upper non-manual and lower manual workers was the largest among all occupational strata. Even though the earnings gap between upper non-manual and upper manual workers was the smallest, the gap increased when the recession began. The results support the hypothesis that differences of earnings between elite workers and lower rank workers increased during the recession.

Effects of control variables

Control variables used in the analysis include both individual and structural factors. The results of individual variables are discussed first. In general, marital status had no significant effects on earnings during the recession. Only the ever-married respondents with no spouse or partners present earned significantly less than those married who were living with their spouse or cohabiting in 2011. Respondents living in more urbanized areas earned more than those in rural areas. These effects were slightly smaller in 2006 than in 2008 and 2011. As to the effects of employment status, earnings differences between regular and non-regular workers increased and became especially significant in 2011. Back to the descriptive statistics shown in Table 2, the percentage of non-regular workers did not change much during the study period. Results of cross-tabulations between earnings and employment status were not significantly different at the three time points. Technically speaking, employment status replaced age and work experience to become an important factor in explaining wage differences in 2011. The vulnerability of non-regular workers in the labor market indicates the necessity to include employment status in future studies of earnings in Taiwan.

Structural factors treated as control variables in the paper include establishment size, employment sector, and economic sector. The effects of number of employees on earnings were significant in 2006 and became even more so in 2008 and 2011. Working in large organizations seems to have offered better protection against economic recession. As to employment

sector, the paper used the public sector as the reference group. Differences of earnings between working in the public and private sectors were significant in 2006 and 2011 but not in 2008. The last control variable in the model is economic sector, and the industry sector is used as the reference group. Only differences between industrial and primary sectors had statistical significance in 2008. Unskilled workers in the agriculture and manufacturing earned low income and were also the most vulnerable group in the recession.

Contributions to the adjusted R^2

Table 3 shows the significant effects of gender, age, education, work experience, occupation, and some control variables on earnings during the study period. Results of the adjusted R^2 indicate a high explanatory power of the OLS regression model in explaining earnings variations. The model produces the best estimates in 2008. The major independent variables used in the regression analysis, that is, age, gender, work experience, education, and occupation, together explained 39% of the variance in earnings in 2006, 45% in 2008, and 37% in 2011.

To find factors contributing the most in explaining earnings variations, the contributions of each variable in explaining the variance in earnings were calculated. Table 4 shows increases in the proportions of adjusted R^2 after adding each specific variable into the model, controlling for all other variables. Occupational segregation was clearly the most important factor in the model. It contributed 16% of the adjusted R^2 in 2008 and was also the dominant factor in 2006 and 2011. Other factors among the top five contributors to earnings determination in 2008 were education, work experience, gender, and establishment size. Education and gender remained among the top five contributors in 2011. Work experience had important contributions in explaining earnings variations in 2006 and 2008, but not in 2011. Employment status replaced work experience to be one of the five most important explanatory factors of earnings in 2011.

Conclusions and Discussion

Regarding the effects of the 2008 financial crisis on labor outcomes, Taiwan is a good case to study, as it had been able to achieve both growth and equality in the process of development before the mid-1990s (Bourguignon, Fournier, and Gurgand 2001). However, later studies indicated increasing income inequality and stagnation of earnings in the last decade of the 20th century in

East Asia (Bickenbach et al. 2015; Wang 2011). Governmental data (Table 1) show that income inequality increased again in 2008 and reached a peak in 2009, when the highest 20% of households earned 6.34 times the amount earned by the lowest 20%. The 2008 recession thus clearly deteriorated income equality in Taiwan.

Analyzing repeated surveys conducted in 2006, 2008, and 2011, the present paper showed that the average earnings of employed workers declined after 2006. Even though a polarized earnings distribution already existed before 2008, the recession made the low-income earners even poorer. As earnings contribute a large share of disposable income of most households, the decline in real earnings of the rank-and-file workers should partly account for the increasing income inequality observed in 2008 in Taiwan (see Table 1).

Adopting the perspective of stratification, this paper took gender, age, human capital resources, and occupational hierarchy, the variables commonly used in previous research on earnings (e.g., Mandel and Semyonov 2005), as the major variables to be tested. Even though these variables had significant effects on earnings, as previous studies have demonstrated, gender and education were less effective in 2008 than in 2006 and 2011. As for gender effects, the largest gap between men and women appeared in 2011 after the economy gradually recovered. The results are consistent with what Annesley and Scheele (2011) found in other industrialized countries, that male workers recovered from bad employment conditions sooner than female ones. Kim and Voss (2007) found that educational returns were lower for women than men after 1997 in Korea. They used this result to explain the increase in the gender wage gap in 2002. The results of adding interaction terms showed that return rates of education as a whole did not have significant differences between men and women in 2011 in Taiwan.[5]

Although consequences of the expansion of advanced education and devaluation of college degrees have been found (Lin 2016), the present paper showed that education continued to be the main factor deciding earnings in Taiwan. However, the role of education diminished to some extent in 2008, which differs from what the author expected. As the Taiwanese government adopted the 22K policy in 2008, which lowered the average earnings of university graduates and narrowed the wage gap between the latter and those with lower educational achievements. However, the advantages of obtaining

[5] The interaction results are not shown in Table 3 since gender wage gap is not the main subject of the paper.

TABLE 4

CONTRIBUTIONS OF ADJUSTED R^2 EXPLAINED BY THE SPECIFIC VARIABLE, CONTROLLING FOR OTHER VARIABLES

(w/o: without)

Independent variable	Adjusted R^2								
	2006			2008			2011		
	w/o the specific variable (a)	Full model (b)	Contributions by the variable (%) ((b-a)/b)	w/o the specific variable (a)	Full model (b)	Contributions by the variable (%) ((b-a)/b)	w/o the specific variable (a)	Full model (b)	Contributions by the variable (%) ((b-a)/b)
Gender	.3852	.3987	3.39 ③	.4542	.4666	2.66 ④	.4170	.4372	4.62 ⑤
Age	.3962		.63	.4617		1.05	.4359		.30
Education level	.3711		6.92 ②	.4512		3.30 ②	.4084		6.59 ③
Work experience	.3858		3.24 ④	.4519		3.15 ③	.4358		.32
Occupation	.3599		9.73 ①	.3906		16.29 ①	.3793		13.24 ①
Marital status	.3989		-.05	.4672		-.13	.4365		.16
Degree of urbanization	.3973		.35	.4644		.47	.4320		1.19
Employment status	.3974		.33	.4664		.04	.4137		5.38 ④
Size of establishment	.3937		1.25 ⑤	.4567		2.12 ⑤	.3967		9.26 ②
Employed sector	.3964		.58	.4664		.04	.4347		.57
Economic sector	.3998		-.28	.4661		.11	.4391		-.43

SOURCE.—see Figure 2.

more advanced education reappeared when the economy gradually recovered in 2011.

Results of the OLS regression analysis showed that only age and occupation effects were stronger in 2008 than before the recession started. Younger workers earned even less than older workers when the recession occurred. The results seem to support the claims of labor activists about the plight of the young labor force in Taiwan (Taiwan Labor Front 2011). Age effects became non-significant in 2011 when the economy gradually recovered from the 2008/2009 recession.

Occupational segregation of jobs was the most important factor explaining wage differences in 2008 in the regression model. Specifically, upper non-manual workers clearly earned much more than those in other occupations, and the gap became enlarged in the recession. The findings about occupational differences are consistent with what Häusermann and Schwander (2012) observed in the United States, that top business managers and professionals were less affected by the 2008 economic recession than employees in lower positions. That the upper non-manual workers gained more in labor markets in all three survey years is also consistent with the findings about job and income polarization of the labor force in the U.S. and Britain due to task-biased technological changes (Autor et al. 2008; Machin 2011). This paper showed that skilled workers occupied a stable share of the labor force before and after the recession, but in the meantime, their earnings kept declining from 2006 to 2011. As Taiwan has also been moving toward a knowledge-intensive economy requiring more and more upper non-manual labor (Wang 2008, p. 74), skilled blue-collar workers were left behind in terms of demand and their pay. If the trend continues, wage stagnation of the blue-collar and lower non-manual workers will continue, as will the trend of income inequality. The Taiwanese state should not only rely on economic growth to increase the number of good jobs for workers and to lift the pay for the lower-rank working class. The stagnation of real earnings has existed for a long time, and the present paper has shown that many workers still earned less than the 2008 level in 2011. The basic wages are $17,880 per month in 2011, which is 55% of median earnings and 51% of mean earnings of employees surveyed in that year (shown in Table 2). Raising the basic wage can be the first step to maintain the basic living standard for the working poor.

A couple of limitations should be noted for this paper. First of all, the analysis included only workers who had paid jobs during the survey periods. Those who were laid off or forced to take unpaid leave were not included in

the analysis. Their earnings conditions were even worse than the workers studied in the paper, and the overall impacts of the recession may have been underestimated because of the selection of the study sample. Secondly, since earnings are not the major economic sources for either capitalists or small business owners, this paper excluded these respondents from the analysis. The failure to examine earnings distribution from a class perspective may also overlook important determinants of income such as the ownership of means of production. Studies analyzing the changes of labor's share of a firm's total sales or profits during this period may be able to shed light on this point.

The analysis of this paper is based on cross-sectional data collected at three time points. The findings provide explanations of earnings differences among respondents with various personal background and structural characteristics. However, in order to help those in the most disadvantaged positions in the labor market, as was found from the analysis, including the least educated, the younger generation, and non-regular workers, it may be necessary to collect more data concerning the job history of these individuals and/or to follow their job trajectories for a certain period of time to design a better policy to help those who suffered due to the 2008 recession and to reduce overall inequality.

Work and life cannot be separated from each other, and health and family conditions also affect the career development of individuals and vice versa. Future studies of income inequality and earnings determination should include the perspectives of demography, family sociology, and health to understand more about the consequences of economic conditions on workers' well-being.

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