

## CHAPTER 2. LITERATURE REVIEW

As mentioned before, the purpose of this study is to examine the impact of income inequality on social welfare spending. Hence, this chapter will first discuss the literature about Gini index, which was used as a measurement of income inequality in this study. Then, previous theoretical and empirical works discuss the impact of income inequality on social welfare spending will be reviewed. Finally, literatures about other determinants of social welfare spending are surveyed.

### 2.1 Gini Index as a Measurement of Income Inequality

There are many measurements can be used to measure income inequality, such as Gini index, Oshima index,<sup>1</sup> Theil index,<sup>2</sup> Kuznets index,<sup>3</sup> quintile ratio and so on.<sup>4</sup> Among those measurements, Gini index and quintile ratio are used to measure income inequality most commonly internationally.<sup>5</sup> This study chooses Gini index as the measurement of income inequality since quintile ratio only considers the income of the highest 20% households and the lowest 20% household, but Gini index concludes income information of every household in the society. Gini index is defined as a percentage with values between 0% and 100%.

<sup>1</sup> Oshima index is also called ten-quantile index. It is defined as the times of the income of the highest 10% household to the lowest 10% household.

<sup>2</sup> The formula of Theil index is  $T = \frac{1}{N} \sum_{i=1}^N \left( \frac{x_i}{\bar{x}} \cdot \ln \frac{x_i}{\bar{x}} \right)$ , where  $x_i$  is the income of the  $i$ th household,

$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i$  is the mean income, and  $N$  is the number of people.

<sup>3</sup> Kuznets index is also called total disparity measure (TDM). Its calculation formula is  $TDM = \sum_{i=1}^N |f_i - y_i|$ , where  $f_i$  is the population proportion of  $i$ th household,  $y_i$  is the income proportion of  $i$ th household.

<sup>4</sup> Quintile ratio is defined as the times of the income of the highest 20% household to the lowest 20% household.

<sup>5</sup> Hsieh (2006), Tsuar (1996), Wu (2007), Huang and Liu (2005), Milanovic (2000), and Mello and Tiongson (2006) are all used Gini index or Gini coefficient as a measurement of income inequality in their articles.

To know more about Gini index, it is necessary to have some idea about Lorenz curve and Gini coefficient since Gini index is the Gini coefficient expressed as a percentage. Theoretically, Gini coefficient and Gini index provide people with the same information. The difference between them is only the unit. The reason why this study choose Gini index, instead of Gini coefficient, is to avoid the estimating coefficient of the regression model become too large.

Lorenz curve is a graphical representation of the cumulative distribution function of a probability distribution. It is often used to represent income distribution, where it shows for the bottom  $x$  % of households, what percentage  $y$  % of the total income they have. The cumulative share of households from lower income is plotted on the  $x$ -axis, and the cumulative share of income on the  $y$ -axis. (see Figure 4) The area between the Lorenz curve and the uniform distribution line is the numerator of Gini coefficient; the area under the uniform distribution line is the denominator of it. So in Figure 4, the Gini coefficient is equal to  $A$  divided by  $(A+B)$ . A low Gini coefficient indicates a more equal income distribution, while a high Gini coefficient indicates a more unequal distribution. 0 corresponds to perfect equality, in this case, Lorenz curve totally overlaps with the uniform distribution line. 1 corresponds to perfect inequality and the Lorenz curve of perfect inequality is made up by the two lower right lines of the frame.

In terms of Gini coefficient, there are various ways to calculate it. In this study, we use the calculation in Song and Chen (1983). By using the concept of Lorenz curve and mean difference in statistics, the calculation formula brought up by them is:

$$G = \frac{2}{N(N-1)} \left[ (N+1) \sum_{i=1}^N (N-i+1)Y_i \right] \frac{1}{2\bar{Y}} \quad (2-1)$$

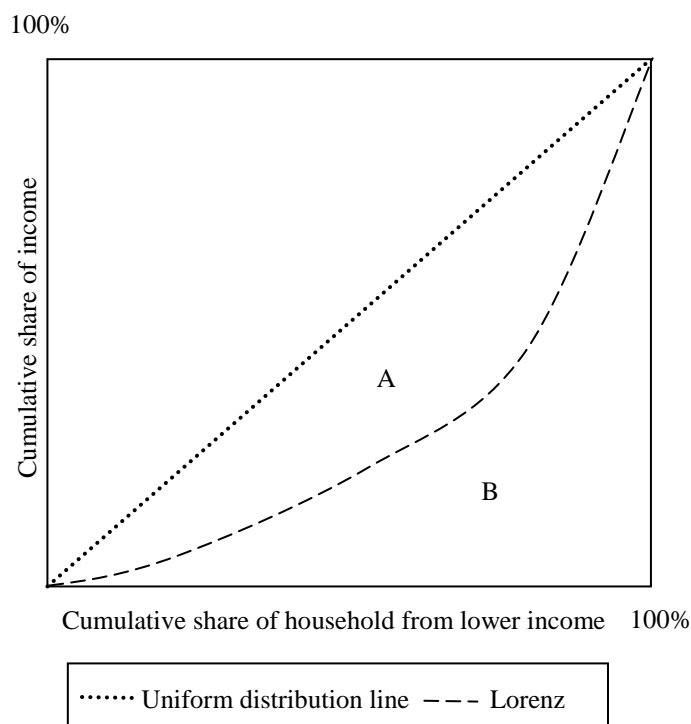


Figure 4: Lorenz Curve

where  $G$  is the Gini coefficient of the household,  $N$  is the total number of households,  $Y_i$  is the income of  $i$ th household and  $\bar{Y}$  is the mean income of all households. Huang and Liu (2005) also used the same formula to calculate the Gini coefficient. The difference of Gini coefficient between this study and Huang and Liu (2005) is that this study takes weight into consideration,<sup>6</sup> but Huang and Liu (2005) did not. Therefore, the data this study uses is closer to the reality.

Moreover, Hsieh (2006) used Gini coefficient to analyze the change in the distribution of family income and the distribution of housing consumption of Taiwan from 1980 to 2000. And he found that there had been an increase in income inequality during 1980-2000. Tsuar (1996) also used Gini coefficient to analyze the structure and the variation of family income inequality of Taiwan from 1980 to 1993. Wu (2007)

<sup>6</sup> The weight means how many households are the same with an observation. Namely, if the weight equals to 10, it means that the observation represents 10 households and the income status of those 10 households are the same.

used Gini coefficient to analyze the effect of income inequality on government's expenditure. He found that the deterioration of income distribution will expand government's spending and increase the fiscal burden on the government.

Milanovic (2000) used factor income Gini index of 24 democracies to test median voter hypothesis and the data supported median voter hypothesis.<sup>7</sup> Mello and Tiongson (2006) used averages over the period 1970 to 1980 for Gini index as independent variable to examine whether more unequal societies spend more on income redistribution than their more equal counterparts. Based on different data sources, the cross-country evidences show that more unequal societies do not spend more on income redistribution than their more equal counterparts.<sup>8</sup>

## **2.2 Theoretical Literature of the Impact of Income Inequality on Redistribution**

The earliest theory of the impact of income inequality on redistribution is the median voter hypothesis brought up by Meltzer and Richard (1981). The median voter hypothesis says that the larger the difference between median voters' income and the mean income of all voters,<sup>9</sup> the greater the pressure on redistribution policies. In other words, the larger the income inequality is, the more the spending on social welfare.

Median voters are defined as those who with the median level of factored income. According to median voter theorem,<sup>10</sup> median voters are decisive voters and the

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<sup>7</sup> Factor income is pre-transfer and pre-tax income. It includes wages, self-employment income, income from ownership of physical and financial capital, gifts etc.

<sup>8</sup> Gini index is the Gini coefficient expressed as a percentage. Theoretically, Gini coefficient and Gini index provide people with the same information. The difference between them is only the unit.

<sup>9</sup> Order all voters' incomes from low to high, and then the median voters' income is the median of those ranked incomes. The mean income of all voters is equal to the sum of all voters' income divided by the quantity of all voters.

<sup>10</sup> The median voter theorem states that as long as all preferences are single peaked; the outcome of majority voting reflects the preference of the median voter. However, with an even number of voters,

outcome of majority voting reflects the preference of the decisive voters. Meltzer and Richard (1981) also addressed that the distribution of income tends to be skewed to the right (see Figure 5), so the median income lies below the mean income. It provides an incentive for median voters to vote for redistribution policies. What is more, if the difference between median income and the mean income gets larger, the incentive for median voters to support redistribution policies will get stronger. This implies that there will be more pressure on redistributive policies, including social welfare policies, in more unequal societies. Thus, more unequal societies will spend more on social welfare spending.

Furthermore, Meltzer and Richard (1981) also said that median voters tend to form leagues with the poor and transfer the income from the rich to the poor (including median voters) by setting a high tax rate. However, median voters will also consider that high tax rate and redistribution might reduce the incentive for the rich to work and thereby lower their earned income, which can be redistributed. Namely, the incomes that can be redistributed will be lowered. Considering that, median voters will not ask for too high tax rate and too much redistribution.

However, Benabou (2000) interpreted that there are two mechanisms which will arise naturally in the absence of complete capital market. First, redistribution which would increase ex ante welfare gains less support in an unequal society than in a homogenous society. It is because the redistribution will bring positive ex ante welfare to those who will get benefit from the redistribution, but negative ex ante welfare to those who will lose because of the redistribution. Therefore, in an unequal society, those who can get positive ex ante welfare, usually the poor, will support redistribution policies, but those who get negative ex ante welfare, usually the rich,

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there may be a tie between two median voters, which must be broken arbitrarily. (Rosen (2002))

will oppose to redistribution policies. However, in a homogenous society, people feel the same about redistribution since everyone is the same in a homogenous society, so no one will oppose to redistribution policies. Second, capital market imperfections make it easier for the rich to become richer and then make the society more unequal. Consequently, the political support on redistribution will decrease with inequality in the societies with capital market imperfections.

Apart from the negative impact of income inequality on redistribution, Benabou (2000) also addressed a nonlinear relationship between income inequality and redistribution. He said in his study that as inequality rises, the proportion of those who will lose ex ante welfare from redistribution, usually the rich, increases at the same time. As we mentioned above, the income distribution is right-skewed as depicted in Figure 5, so the mean income is above the median income and the increase of the proportion of the rich will raise the mean income. As a result, the proportion of those with endowments below the mean increases. There is no doubt that those with income endowment below the mean income will support redistribution.<sup>11</sup> Thus, redistribution will take place with the support of them. So when the inequality is large enough, the skewness effect finally dominates.

To summarize, when inequality is not too large, there is a negative impact of income inequality on redistribution. However, as the inequality rises to some extent, the skewness effect dominates, negative impact of income inequality on redistribution weakens, and finally there will be a positive impact of income inequality on redistribution. To conclude, redistribution is U-shaped with respect to inequality.

In addition, Rodriguez (2004) also addressed a negative impact of income

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<sup>11</sup> The redistribution is defined as a complete redistribution in Benabou (2000). That is, resources are pooled and redistributed to individuals equally.

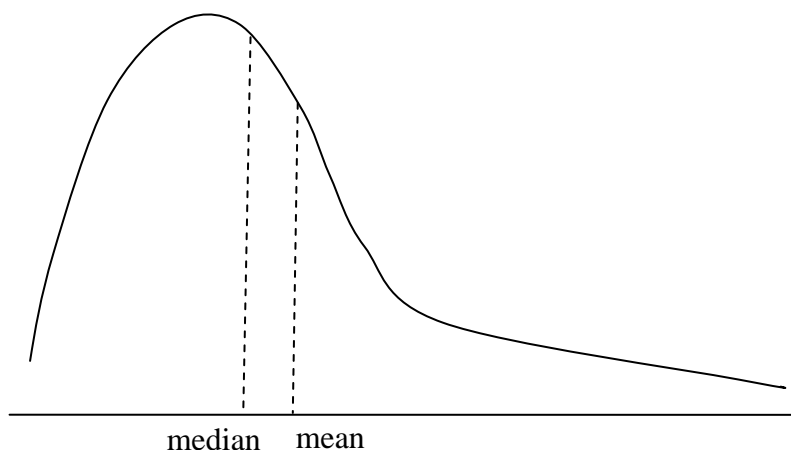


Figure 5: Skewness Effect

inequality on redistribution. In the model of Rodriguez (2004), increased inequality is synonymous with a transfer of economic resources from the poor to the rich. Such a transfer will cause increased access to political power by the rich, and it will also cause a reduction in the political power of the poor. Therefore, by bargaining with interest group and politicians over exemptions, people with sufficiently high income will not pay taxes in equilibrium. Furthermore, voters are not naive; they know the workings of political process and react to it. So they will set a low tax rate to control the incentives for the unproductive rent-seeking. As a result, an increase in inequality, by putting more income to those who can buy exemptions, will leads to lower equilibrium redistribution. That is to say, greater inequality will end up with less redistribution.

### **2.3 Empirical Literature of the Impact of Income Inequality on Redistribution**

There are a lot of foreign papers examine the impact of income inequality on redistribution empirically. However, there has been no paper in Taiwan discussed this issue yet. And that's what this paper will do. Before examining this issue by using the data of counties and cities of Taiwan, it is necessary to review other empirical

literatures about this issue.

Meltzer and Richard (1983) tested the hypothesis they had addressed in 1981, median voter hypothesis, by using time series data of United States, covering from 1937 to 1977. In the study, they treat the people with median income as decisive voters and use the income of them as a proxy for the income of median voter.<sup>12</sup> And the result of the study is in favor of the positive impact of inequality on redistribution.

In addition, Milanovic (2000) tested the median voter hypothesis by using 79 observations drawn from household budget surveys from 24 democracies,<sup>13</sup> including Taiwan.<sup>14</sup> Milanovic (2000) used Gini index as the key independent variable and the extent of redistribution as the dependent variable. The extent of redistribution is measured by the share gain of the bottom half and the bottom quintile, which are ranked by factor income,<sup>15</sup> from redistribution. That is, how much the bottom half and the bottom quintile gain, including social welfare transfers, when they move from factor income to disposable income.<sup>16</sup> Finally, the study reported that countries with more unequal distribution of factor income redistribute more. The study also found that the middle income groups gain more or lose less through redistribution in those countries where initial income distribution is more unequal.

Above studies all support the positive impact of income inequality on redistribution. However, there are also literatures which support the negative impact of them. They will be introduced in the following. Gouveia and Masia (1998)

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<sup>12</sup> Because of using time series data, Meltzer and Richard (1983) can not locate the data on the distribution of voters' earned income.

<sup>13</sup> Because median voter hypothesis is only valid in democracies, many empirical studies on the relationship between income inequality and redistribution are all be done on the basis of democracies.

<sup>14</sup> Taiwan is the only non-Western country in the 24 democracies.

<sup>15</sup> Factor income is pre-transfer and pre-tax income. It includes wages, self-employment income, income from ownership of physical and financial capit, gifts etc. (Milanovic (2000))

<sup>16</sup> Disposable income is equal to gross income minus mandatory employee contributions minus income taxes. Gross income is equal to factor income plus social insurance transfers plus social assistance transfers. (Milanovic (2000))



subjected the spirit of Meltzer and Richard's (1981) model. They used panel data for the 50 U.S. states from 1979 to 1991 and employed two-way fixed effect model. They also incorporated fiscal federalism and migration issues into their study. They found little support for Meltzer and the hypothesis of Richard (1981), the median voter hypothesis. In fact, the evidence they found in some cases are completely inconsistent with the finding of Meltzer and Richard (1981).

Bassett, Burkett and Putterman (1999) reported a positive impact of income "equality" on social welfare spending generally. Namely, they reported a negative impact of income "inequality" on social welfare spending generally. Various values for the income share of the middle quintile are the main explanatory variables they used.<sup>17</sup> The dependent variable they used is the average ratio of transfers, which is defined as expenditure on social security and welfare, to GDP. Moffitt, Riber and Wilhelm (1998) posited that the decline of welfare benefits is related to the increase of wage inequality and to the reduction in the wage rate at the lower end of the income distribution. They used 1969-1992 state-level panel data of U.S. to test the hypothesis. Their analysis provides considerable support for their hypotheses.

Mello and Tiongson (2006) defined dependent variable as social security and welfare spending in percentage of GDP and government transfers in percentage of GDP in 1981-1998 respectively in two models. And averages over the period 1970 to 1980 for Gini index are defined as independent variable. The main finding of Mello and Tiongson's (2006) study is that countries with low per capita income and high inequality redistribute less through public policies. That is, it supports imperfect capital markets hypothesis. Apart from the negative impact, the study also found that

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<sup>17</sup> Bassett, Burkett and Putterman (1999) used various data set of the income share of the middle quintile, including the data set used in Paukert (1973), Persson and Tabellini (1994), Perotti (1996), and the data set reported by the World Bank for each country in the year closest to 1960 and 1970.

Table 2: Empirical Literature

Author	Sample Period	Methodology	Conclusions
Meltzer and Richard (1983)	1937-1977	Ordinary Least Square	The study used the income of people with median income as a proxy for the income of median voter. The result of the study is in favor of the positive impact of inequality on redistribution.
Gouveia and Masia (1998)	1979-1991	Fixed effects model	The study incorporated fiscal federalism and migration issues. And it found little support for median voter hypothesis.
Moffitt, Riber and Wilhelm (1998)	1969-1992	Fixed Effect Model	The decline of welfare benefits is related to the increase of wage inequality and to the reduction in the wage rate at the lower end of the income distribution.
Bassett, Burkett and Putterman (1999)	1970-1985	Ordinary Least Square	The study reported a negative impact of inequality on redistribution generally. Only when the inequality measurement was defined as the income share of the highest 5% bracket did it reported a positive impact of income inequality on redistribution..
Milanovic (2000)	1967-1997	Fixed effects model	Countries with more unequal distribution of factor income redistribute more. The study also found that the middle income groups gain more or lose less through redistribution in those countries where initial income redistribution is more unequal.
Mello and Tionson (2006)	1981-1998	Ordinary Least Square and Tobit	Countries with low per capita income and high inequality redistribute less through public policies. In addition, the study also found that the relationship between inequality and redistribution is U-shaped.

Source: this study arrange

Note: the list of the literatures order according to the publish year.

the relationship between inequality and redistribution is U-shaped, and which is consistent with Benabou (2000).<sup>18</sup>

## **2.4 The Determinants of Social Welfare Spending**

As mentioned before, the purpose of this study is to examine whether more unequal societies spend more on social welfare than less unequal societies. Before analyzing this issue, this study reviews literatures associated with social welfare spending.

As we know, Mello and Tiongson (2006) found that countries with low per capita income and high inequality redistribute less through public policies. Apart from the negative impact of income inequality on redistribution, their study also found that GDP per capita and population over 65 years of age are significant and positive determinants of redistributive government spending,<sup>19</sup> which is defined as the social security and welfare spending in percentage of GDP and government transfers in percentage of GDP. However, population over 65 years of age in Milanovic (2000) is barely significant in a few models and insignificant in others. What is more, Perotti (1996) and Bassett, Burkett and Putterman (1999) both declared that when population over 65 years of age is included as a regressor, the coefficient of inequality variable is no longer significant.<sup>20</sup>

Wang (2003) used 1994-1997 county-and-city data in Taiwan to discuss social

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<sup>18</sup> Details about Benabou (2000) are explained in section 2.2.

<sup>19</sup> GDP per capita and population over 65 years of age are significant at the 5 percent level in some models, and significant at the 1 percent level in other models of Mello and Tiongson (2006),.

<sup>20</sup> Income inequality was measured by the share in income of the third and fourth quintiles in Perotti (1996). And it was measured by the income share of the middle quintile in Bassett, Burkett and Putterman (1999). The dependent variables of the models of Perotti (1996) include average share of government expenditure on social security and welfare in GDP, average share of government expenditure on health and housing in GDP and so on. Dependent variable of Bassett, Burkett and Putterman (1999) is the average ratio of transfers, which is defined as expenditure on social security and welfare, to GDP.

welfare issues by using multiple regression analysis and canonical correlation analysis. He concluded that factors like the proportion of dependent population,<sup>21</sup> scale of local finance,<sup>22</sup> degree of autonomy and degree of industrialization are positively related to the share of social welfare spending.<sup>23</sup> And he also concluded that social welfare spending is much more in areas governed by Pan-Green Coalition than those governed by Pan-Blue Coalition in Taiwan.

Moreover, Wu (2007) also held that areas governed by Pan-Green Coalition spend more on social welfare spending than those governed by Pan-Blue Coalition in Taiwan. Because most supporters of the Pan-Green Coalition are blue-collar, blue-collar people prefer more social welfare spending. Apart from that, almost all people who live in the regions, which mainly focus on conventional industries, are supporters of Pan-Green Coalition.

In addition, Lindert (1996) used 1960-1981 cross-country data to discuss the issue about different kinds of government expenditures, including social welfare expenditure. And he found that the level of social spending may be governed by the relative sizes of age groups, the income distribution, electoral conditions and the income level. In the next section, the real situation of income inequality and social welfare spending in Taiwan will be introduced.

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<sup>21</sup> The dependent population factor in Wang (2003) had took the population of handicapped people, low-income people and people over 65 years of age into consideration.

<sup>22</sup> Scale of local finance factor is defined as the total expenditure of local governments in Wang (2003).

<sup>23</sup> Degree of autonomy factor is measured by the autonomic financial resource divided by total expenditure of local government. And the degree of industrialization factor had took education level, income level, non-agriculture employees and the degree of urbanization in Wang's (2003).

Table 3: Social Welfare Spending Literature

Author	Sample Period	Methodology	Conclusions
Lindert (1996)	1960-1981	Generalized Least Square Regression	The level of social spending may be governed by the relative sizes of age groups, the income distribution, electoral conditions and the income level.
Milanovic (2000)	1967-1997	Fixed effects model	Population over 65 years of age in Milanovic is barely significant in a few models and insignificant in others
Wang (2003)	1994-1997	Ordinary least square and Canonical Correlation analysis	Factors like the proportion of dependent population, scale of local finance, degree of autonomy and degree of industrialization are positively related to the share of social welfare spending. And social welfare spending is much more in areas governed by Pan-Green Coalition than those governed by Pan-Blue Coalition.
Mello and Tiongson (2006)	1981-1998	Ordinary Least Square and Tobit	GDP per capita and population over 65 years of age are significant and positive determinants of redistributive government spending.

Source: this study arrange

Note: the list of the literatures order according to the publish year.