Fiscal policy, inequality and economic growth: A case study of Japanese prefectures

Kako Ouraga Patricia
Graduate School of Economics, Kyushu University

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Fiscal policy, inequality and economic growth: A case study of Japanese prefectures*

Kako Ouraga Patricia †

Abstract: This paper investigates the joint relationship between economic growth, inequality, and fiscal policy. The analysis focuses on a panel made up of 47 Japanese prefectures for the period 1989-2015. To identify and assess the impact of each variable on the others, we estimate two types of equations systems (a seemingly unrelated regressions system and a simultaneous equation model). The results confirm the detrimental effect of inequality on economic growth and the damaging effect of economic growth on inequality. Regarding the fiscal policy, the results emphasize the fact that distributive expenditures enable to reduce inequality while non-distributive expenditures, direct and indirect taxes contribute to increasing inequality. The results also indicate that distributive and non-distributive expenditures are beneficial to economic growth. In contrast, they show that direct taxes have a deleterious effect on economic growth. Finally, the results confirm the hypothesis stating that more inequality demands more redistribution. Moreover, they confirm that more inequality calls for fewer taxes.

Keywords: Fiscal policy, economic growth, inequality, Japanese prefectures, panel data

1. INTRODUCTION

Achieving economic efficiency through the improvement of economic growth is one of the main goals of economies. However, according to many schools of economic thought, efficiency is achieved most of the time at the cost of equity (Berg and Ostry, 2011; Ostry, Berg, Tsangarides, 2014). In fact, the relationship between economic growth and inequality has been widely analyzed over the decades, and theoretical and empirical studies have demonstrated that the causative relationship between growth and inequality goes both ways. Namely, on the one hand, economic growth appears to be conducive to inequality, and in the same way, inequality seems to promote economic growth. On the other hand, inequality can be detrimental to economic growth (Muinelo-Gallo and Roca-Sagales, 2011).

Therefore, any measure, decision, or policy implemented by governments should take into account

* This paper is based on one chapter of my Ph.D. thesis. I gratefully acknowledge my academic supervisor for providing me with data on economic inequality.

† Graduate School of Economics, Kyushu University

these interactions between economic growth and inequality. For instance, according to Musgrave (1959), in addition to its redistributive function, fiscal policy plays a role in boosting the economy by affecting the aggregate demand, the distribution of income, and the production of goods and services (Muinelo-Gallo and Roca-Sagales, 2011, 2014). Thus, fiscal policy appears as an instrument that can impact both economic growth and inequality (Benabou, 2000, 2002, 2005; Muinelo-Gallo and Roca-Sagales, 2014).

Consequently, in a fragile global economic system hit by several shocks such as the financial crisis in 2008-2009, and where the inequalities are increasing, governments need to carry out effective and well-designed fiscal policies for ensuring both economic stability and a fair redistribution of income. For these reasons, analyzing the interdependence between fiscal policy, inequality and economic growth becomes relevant and essential for sustainable economic and social development.

This paper aims to study the joint relationship between fiscal policy, economic growth, and inequality in Japan. In fact, Japan has seen its public deficits expanding since the 2008-2009 financial crisis and the earthquake of 2011 along with the slowing down of its economic growth rate. Besides, inequality has been increasing since the 1980s (Toshiaki Tachibanaki, 2006; Ohtake, 2008, and 2013). Thus, to cope with the deterioration of its fiscal position and to improve economic growth, the Japanese government implemented several fiscal adjustments over these past decades. It is important to notify that the Japanese administrative system consists of a national government and a local government. And the latter is composed of prefectures (47) and municipalities (1719). Although policies are decided by the national government, prefectures and municipalities can carry out policies due to their status (autonomous administrative entities). According to Cont and al. (2017), the social contract is defined at the national level; consequently, there might be an asymmetric of information between individual needs and government objectives (related to efficiency). Therefore, analyzing the effects of fiscal policy on income inequality and economic growth at a prefectural level appears relevant to shed light on the potential dichotomy that exists between national government objectives and individual needs. In the case of Japan, according to Doi (2011), local (prefectures and municipalities) can be considered as "near" governments because they are in charge of the administrative functions (namely providing public services through expenditures) related to the citizens' daily life (Mochida, 2001). And more importantly, they indicate that local (prefectures and municipalities) government play an important role in redistributing by spending their resources (tax revenues and national government transfers) through medical and long-term care benefits and social assistance for families. Finally, they point out the relevancy to conduct empirical studies that link the local (prefectures and municipalities) public finance to income distribution. And, this conclusion is emphasized by Blomquist and Michelletto (2009) who find that: "decentralized in-kind transfers can help to redistribute income."

Accordingly, in order to determine the effects of fiscal policy on economic growth and inequality,

this paper examines the mutual relationship between fiscal policy, economic growth, and inequality in the Japanese prefectures from 1989 to 2015. The objective is first to identify the channels of transmission between these three variables; and second, to bring out and assess the impacts of each variable on another. Several studies have been conducted on the joint relationship between fiscal policy, economic growth, and inequality whether for a panel of countries, a specific country, and at a sub-national level (Muinelo-Gallo and Roca-Sagales, 2014). And most of them have highlighted the trade-off between efficiency and equity through fiscal policies. Hence, our contribution to the literature is to shed light on the nature of the interactions between fiscal policy, economic growth, and inequality by estimating two types of equations systems which are respectively a system of seemingly unrelated regressions (SUR) and a simultaneous equation model (SEM) for the Japanese prefectures over the period 1989-2015.

The results highlight the detrimental effect of inequality on economic growth and the damaging effect of economic growth on inequality. Besides, the results suggest that distributive expenditures reduce inequality while non-distributive expenditures, direct and indirect taxes increase inequality. They also point out that distributive and non-distributive expenditures help to promote economic growth. However, the results of the estimations demonstrate that direct taxes have a deleterious effect on economic growth. Overall, the results confirm that there is a trade-off between inequality and growth; and that fiscal policy through redistribution (distributive and non-distributive expenditures) might mitigate inequality.

The paper is organized as follows. Section 2 presents the literature review on economic growth, inequality, and fiscal policy. Section 3 presents the empirical methodology used to analyze the joint relationship between economic growth, inequality, and fiscal policy; then describes and analyzes the data. Section 4 presents and analyzes the SUR and SEM models' estimations results. Finally, in section 6, we conclude.

2. LITERATURE REVIEW

Numerous studies have been conducted on the relationship between economic growth and inequality, fiscal policy and growth, and the joint relationship between fiscal policy, economic growth, and inequality. This paragraph tries to highlight the theoretical and empirical theories and findings behind the interconnections of these three variables.

2.1 Economic growth and inequality

One of the well-known researches on economic growth and inequality is the study of Kuznets in 1955. In his study, he demonstrated that income inequality is correlated with the level of development (the inverted U hypothesis). In particular, he showed that income inequality increases

with economic growth in the first stage of economic development and then decreases as the economic development progresses (Muinelo-Gallo and Roca-Sagales, 2011; Davtyan, 2016). Later on, Solow (1956) through the neoclassical growth model confirms this relationship between inequality and the level of economic development. In the same line of the Kuznets hypothesis and the neoclassical growth models, the new growth theories reassert the negative impact of economic growth on inequality. According to these theories, economic growth has a detrimental effect on inequality through skill-biased technological progress and globalization (Muinelo-Gallo and Roca-Sagales, 2011).

From an empirical perspective, for instance, Barro (1999) analyzes the relationship between growth and inequality. His findings confirm the negative relationship between those two variables for the poor countries and the positive correlation between economic growth and inequality for the rich countries (Kuznets hypothesis) (Cont and al., 2017; Davtyan, 2016). Besides, as an example, Benhabib (2003) indicates that the relationship between inequality and growth might not be nonlinear. That is to say that, until a certain point of the economic level of development, inequality can promote incentives to growth. However, beyond this point, inequality is more likely to be a hindrance to economic growth (Ostry, Berg, Tsangarides, 2014). Galor and Moav (2004) find the same conclusions for the case of physical and human capital accumulations. They also emphasize, on the one hand, the long-lasting and negative effect of inequality on economic growth, and on the other hand, the short-lasting and positive relationship between inequality and growth (Davtyan, 2016).

2.2 Regarding the effects of inequality on economic growth

According to the literature, the effects of inequality on economic growth are twofold. Some studies claim that inequality is beneficial to economic growth, while others assert that inequality is detrimental to economic growth.

The first strand of studies affirms that inequality can affect positively economic growth through several channels. The first channel relies on the propensity to save of the well-off economic agents. The idea is that if the propensity of the well-off increases, the economic growth (which is connected to savings) is more likely to benefit from it, and consequently to increase (Kaldor, 1957; Bourguignon, 1981; Galor and Moav, 2004; Muinelo-Gallo and Roca-Sagales, 2011; Ostry, Berg, Tsangarides, 2014). In other words, an unequal economy has more chance to grow faster than an equal one. The second reason (which is investment indivisibilities) relies on the fact that in a more unequal economy, investments are greater than an equal one. As a result, these investments will promote economic growth (Muinelo-Gallo and Roca-Sagales, 2011). And the last reason can be explained by the hypothesis of a trade-off between growth and equality. According to Okun (1975), equality through redistribution harms growth because redistribution lessens the incentives to save and to accumulate wealth. That is to say that in a more unequal economy, people's incentives to save are higher; and this contributes to economic growth.

The second strand of studies asserts that inequality can also be detrimental to economic growth. The first explanation is proposed by Stiglitz (1961) who indicates that when capital markets are imperfect and the returns to capital are decreasing, there is no convergence of wealth. As a result, the aggregate level of output is affected by the redistribution of income (Muinelo-Gallo and Roca-Sagales, 2011). Moreover, the endogenous growth models reaffirm this idea by underlining that in credit market imperfections, given the fact that poor people were not able to invest, a more unequal economy leads to reduce economic growth (Muinelo-Gallo and Roca-Sagales, 2011; Ostry, Berg, Tsangarides, 2014). In line with the first explanation, the second one suggests that as consumers with a low level of income are not able to consume properly due to the imperfections of the markets, the size and the composition of the domestic demand will be reduced. And this will affect negatively the economic growth. The last reason states that inequality causes harm to economic growth through the fertility rate. In fact, richer tend to have fewer children to invest in a good education. In other words, inequality affects positively the fertility rate leading to low human capital investments from the poor people; and as a result, it will impede economic growth (Muinelo-Gallo and Roca-Sagales, 2011; Ostry, Berg, Tsangarides, 2014). Political economic studies also emphasize the negative effect of inequality on economic growth. First, they put stress on the fact that uneven income distribution calls for more distortionary taxes. And these increases in taxes will, in turn, reduce private investments. Thus, economic growth will be negatively affected by the lessening of investments (Meltzer and Richard, 1981; Bertola, 1993; Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Muinelo-Gallo and Roca-Sagales, 2011; Ostry, Berg, Tsangarides, 2014). Second, they point out the fact that if the development of human capital is financed by distortionary taxes, the economic growth will be hampered due to the decrease in net capital returns (Saint-Paul and Verdier, 1993; Muinelo-Gallo and Roca-Sagales, 2011). Overall, these findings highlight the existence of a trade-off between efficiency and equity through fiscal policy.

2.3 Regarding the effects of fiscal policy

Numerous studies investigated the effects of fiscal policy on economic growth. However, there is not a consensus on whether the fiscal policy has a good or negative impact on economic growth due to the differences between countries and between fiscal policy per se (Muinelo-Gallo and Roca-Sagales, 2011). For instance, according to Muinelo-Gallo and Roca-Sagales (2011), several studies attempt to link fiscal policy with economic growth by using the neoclassical growth models. However, they could only underline the transitory effects of fiscal policy on economic growth. Moreover, they point out that according to the endogenous models, the effects of fiscal policy on economic growth might become permanent by considering the choices of the economic agents (Barro, 1990; Barro and Sala-i-Martin, 1992). Under these circumstances, according to Persson and Tabellini (2000), fiscal policy is seen as the voters' preferences for income distribution. Therefore, redistribution (from richer

economic agents to poorer economic agents) is more likely to reduce the aggregate saving rate which might in turn impact detrimentally the investment and economic growth (Cont and al., 2017). Also, Okun (1975) indicates that redistribution of income could undermine economic growth because of the reduction in incentives to invest due to higher taxes and subsidies (Alesina and Rodrik, 1994; Ostry, Berg, Tsangarides, 2014).

On the other hand, public finance endogenous growth models argue that the nature of the relationship between fiscal policy and growth depends on the type of policies carried out by governments. For instance, Kneller et al. (1999) investigate the effects of fiscal policy on economic growth for a panel of 22 OECD countries over the period 1970-1995. They find that distortionary taxation harms economic growth, while non-distortionary taxation has no impact on economic growth. However, at the same time, redistribution can contribute to enhancing economic growth. In fact, redistribution through progressive taxes is more likely to promote public investments which, in return, contribute to stimulating economic growth (Benabou, 2000; Ostry, Berg, Tsangarides, 2014).

Concerning the relationship between fiscal policy and inequality, once again, the literature is abundant. However, the relationship between inequality and redistribution is quite unclear due to the difficulties to find relevant instruments for assessing redistribution (Ostry, Berg, Tsangarides, 2014). For instance, according to Milanovic (1999), unequal countries redistribute more by using direct measures of redistribution. Therefore, higher inequality calls for redistribution (Meltzer and Richard, 1981). In particular, the reasoning behind this hypothesis (Meltzer and Richard, 1981) relies on the fact that in a democratic economy, as political power is more equally distributed than economic power, a majority of voters will have the power and the incentives to vote for redistribution. Besides, several studies highlight the fact that redistribution through health, social insurance, or education spending can contribute to lessening inequality (Benabou, 2000; Saint-Paul and Verdier, 1993; Wolff and Zacharias, 2007; Ostry, Berg, Tsangarides, 2014).

Concerning the relationship between fiscal policy, economic growth, and inequality, Persson and Tabellini (1994) show that in a democratic society, the unequal income distribution generates redistribution through fiscal policies. However, this decreases investments and reduces economic growth (Davtyan, 2016). In their study, Garcia-Penalosa and Turnovsky (2007) confirm these findings. They highlight the fact that policies aiming to enhance economic growth rate (such as a subsidy or an investment) lead to unequal pre-tax income. Also, they point out that these policies, at the same time, alleviate the post-tax inequality (Muinelo-Gallo and Roca-Sagales, 2011). Furthermore, Chatterjee and Turnovsky (2008) indicate that government spending in public capital increases inequality despite the way it is financed. They emphasize the fact that the way inequality will be affected depends on the fiscal policy implemented. They suggest that government investments financed by taxes might decrease inequality in the short-term, but they might increase it in the long-term. Besides, they also point out the fact that public expenditures financed by capital or labor

income taxes could lead to an increase in inequality (Muinelo-Gallo and Roca-Sagales, 2011).

Overall, the literature underscores the existence of a trade-off between inequality and economic growth through fiscal policy (Calderon and Serven, 2004; Muinelo-Gallo and Roca-Sagales, 2011 and 2013). More particularly, Ramos and Roca-Sagales (2008) highlight that a rise in public spending and direct tax incomes lessens economic growth and income inequality, while a rise in indirect tax income increases inequality (Davtyan, 2016; Liu and Martinez-Vazquez, 2015).

3. METHODOLOGY AND DATA

3.1 Methodology

This paper aims to investigate the joint relationship between economic growth, inequality, and fiscal policy in the Japanese prefectures from 1989 to 2015 in order to assess the effects of fiscal policy on economic growth and inequality. The main hypothesis we want to test is specified as follows: "is there a trade-off between inequality and economic growth through fiscal policy." To do so, we follow the method proposed by Muinelo-Gallo and Roca-Sagales (2013). In their paper, the authors adopt a three equations system for estimating jointly the link between economic growth, inequality, and fiscal policy. These three equations consist of a growth equation, an inequality equation, and a fiscal policy equation.

The first equation is the growth equation. In their paper, the authors consider as benchmark equation the models of Barro (1990) and Barro and Sala-i-Martin (1992). Based on the approach proposed by Kneller and al. (1999), this benchmark equation is augmented by the introduction of fiscal variables to avoid biases arising from an incomplete specification of the government budget constraint. Thus, the growth equation is a function of fiscal variables and growth control variables which can be written as follows:

$$\Delta y_{it} = \alpha + \beta \sum_{k=1}^{K} X_{it}^{k} + \sum_{j=1}^{m-1} (\gamma_j - \gamma_m) FP_{it}^{j} + u_{it} \qquad (1)$$

where Δy_{it} denotes the economic growth rate, X_{it}^{k} represents the growth control variables and FP_{it}^{j} refers to the fiscal policy variables[1)]. Besides, i and t stand respectively for the prefectures and the period, and u_{it} for the error term.

To avoid perfect collinearity, one element of the fiscal variables vector is excluded from the growth and economic inequality equations. And this element is assumed to be the compensating element within the government budget constraint. According to Muinelo-Gallo and Roca-Sagales (2013) and Cont and al. (2017), the interpretation of the estimated coefficient of each fiscal variable is the effect of a unit change in the relevant fiscal variable offset by a unit change in the omitted fiscal variable.

1) See in appendix

Furthermore, for avoiding endogeneity problems, the one-year lagged fiscal variables are used in the growth equation (Cont et al., 2017).

The second equation is the inequality equation. In this part, the benchmark equation considered by Muinelo-Gallo and Roca-Sagales (2013) comes from the works of Castello and Domenech (2002); Li and Zou (1998); Li et al. (1998) and Lundberg and Squire (2003). Thereby, the inequality equation is written as follows:

$$Net\ Inequality_{it}=\delta+\phi\sum_{l=1}^{L}Z_{it}^{l}+\sum_{j=1}^{m-1}(\zeta_j-\zeta_m)FP_{it}^{j}+\varepsilon_{it} \qquad (2)$$

where $Net\ Inequality_{it}$ refers to the Gini coefficient of income after tax, Z_{it}^{l} denotes the inequality control variables and FP_{it}^{j} represents the fiscal policy variables[2]. And finally, the error term is expressed by ε_{it}.

The third and last equation of the system is the fiscal policy equation. The benchmark equation retained by Muinelo-Gallo and Roca-Sagales (2013) stems from the works of Persson and Tabellini (2000, 2003). This fiscal policy equation is a function of the j-th fiscal policy outcome omitted previously, the one-year lagged of the gross income inequality (which is the Gini coefficient before tax) and fiscal policy variables. So, this equation can be written as follows:

$$FP_{it}^{j}=\chi+\lambda Gross\ Inequality_{i,t-1}+\phi\sum_{g=1}^{G}W_{it}^{g}+\eta_{it} \qquad (3)$$

where FP_{it}^{j} represents a specific policy outcome j, W_{it}^{g} represents the fiscal control variables and η_{it} is the error term. In the context of this analysis and following Benabou (2000), we retain four types of fiscal policy variables which are on the expenditures side, the distributive and non-distributive expenditures; and on the tax side, the direct and indirect taxes[3].

In order to assess the interrelationship between these endogenous variables, we proceed to estimate two types of equations system which are the seemingly unrelated regressions (SUR) and the simultaneous equation model (SEM).

SUR model:

$$\begin{cases} \Delta y_{it}=\alpha+\beta\sum_{k=1}^{K}X_{1,it}^{k}+\sum_{j=1}^{m-1}(\gamma_j-\gamma_m)FP_{1,it}^{j}+u_{1,it} \\ Net\ Inequality_{it}=\delta+\phi\sum_{l=1}^{L}Z_{2,it}^{l}+\sum_{j=1}^{m-1}(\zeta_j-\zeta_m)FP_{2,it}^{j}+\varepsilon_{2,it} \\ FP_{it}^{j}=\chi+\lambda Gross\ Inequality_{3,i,t-1}+\phi\sum_{g=1}^{G}W_{3,it}^{g}+\eta_{3,it} \end{cases}$$

SEM model:

2）See in appendix
3）See in appendix

$$\begin{cases} \Delta y_{it} = \alpha + \kappa Net\ Inequality_{1,it} + \beta \sum_{k=1}^{K} X_{1,it}^{k} + \sum_{j=1}^{m-1} (\gamma_j - \gamma_m) FP_{1,it}^{j} + u_{1,it} \\ Net\ Inequality_{it} = \delta + \varpi \Delta y_{2,it} + \phi \sum_{l=1}^{L} Z_{2,it}^{l} + \sum_{j=1}^{m-1} (\zeta_j - \zeta_m) FP_{2,it}^{j} + \varepsilon_{2,it} \\ FP_{it}^{j} = \chi + \lambda Gross\ Inequality_{3,i,t-1} + \phi \sum_{g=1}^{G} W_{3,it}^{g} + \eta_{3,it} \end{cases}$$

On the one hand, the SUR model enables the simultaneous analysis of these three variables; and also it enables to assume that the error terms are correlated due to common unobservable factors. Therefore, this method makes full use of the efficiency gains derived from the interdependence of the error terms (Cont and al., 2017; Muinelo-Gallo and Roca-Sagales, 2013). On the other hand, the SEM model enables us to fully analyze the mutual relationship between these three dependent variables by introducing in the first two equations of the system two supplementary variables which are economic growth and net inequality. Besides, the specific fiscal policy outcome is included as an explanatory variable in the two equations (Muinelo-Gallo and Roca-Sagales, 2013).

Moreover, each equation contains control variables which are depicted respectively by X, Y, and W. And each vector of control variables is selected based on the literature. First of all, concerning the vector X of the growth equation, the following control variables have been considered: the initial income, the population growth, the human capital, the international trade, and the inflation rate[4] (Barro, 1991; Lundberg and Squire, 2003; Mendoza and al., 1997; Muinelo-Gallo and Roca-Sagales, 2013).

Secondly, as for the vector Z of the inequality equation, a measure of human capital, the investment ratio, the fertility rate, the population density and the population ratio (15-64 years old) are included[5]. And thirdly, as regards the vector W of fiscal policy equation, institutional, demographic, and economic variables have been included (Persson and Tabellini, 2000 and 2003).

For the institutional variables[6], we use the number of members of the House of Councilors and Representatives per million inhabitants. To capture the effects of the demographic structure on the size of the government, we also include the percentage of the population aged 65 years old and more and the prefecture population[7]. As for the economic variables[8], we consider first, the level of development of each prefecture by including the initial per capita income. The objective is to test the Wagner's law stating into account that government spending raises along with national income (Wagner, 1977). Second, we include the international trade variable to test the hypothesis suggesting that more open economies have larger governments (Muinelo-Gallo and Roca-Sagales, 2013). In fact, according to Cont and al. (2017), trade openness has a twofold impact on public expenditures:

4) See in appendix
5) See in appendix
6) See in appendix
7) See in appendix
8) See in appendix

efficiency and compensation. Based on the efficiency effect, trade openness is more likely to reduce taxes and social expenditures, while maintaining the core of the public goods functions such as defense, security, and safety. However, based on the compensation effect, trade openness is more likely to increase social expenditures. And third, to test the bureaucracy theory (Niskanen, 1968), which asserts that to get more power the bureaucrats increase the public expenditures beyond the efficient level (Cont and al., 2017), we consider the public employment share to capture the effect of the power of bureaucracy on public expenditures. Fourth, a measure of transfers is included to test the hypothesis which argues that more transfers lead to more expenditures than more income (Cont and al., 2017)[9].

The sample of the analysis covers the period from 1989 to 2015. And as Muinelo-Gallo and Roca-Sagales (2013), we use three years averages of all the variables. We apply this method because first of all, year to year changes in fiscal policy variables will not significantly affect year to year changes in economic growth and inequality. Secondly, the three years averages of all the variables aim to diminish any short-run fluctuations and the economic cycle's impacts, and it will also put emphasis on the structural relationship between these three variables. Finally, this method enables us to lessen the problem of the unavailability of data. Overall, each prefecture will have nine observations which yield to 376 observations. Furthermore, time and prefecture effects will be incorporated in the growth and inequality equations, while time effects will only be included in the fiscal policy equation.

The estimations methods used are the seemingly unrelated regression techniques for the SUR model and the three-stage least squares method for the SEM model. However, before presenting the results, we will proceed to a preliminary analysis of the data.

3.2 Data: Descriptive statistics

First, when we look through the evolution of the GDP per capita and income inequality, we note that from 1989 to 1999, these variables evolve in two different directions (figure 1). In fact, while the GDP per capita income increases, the Gini coefficient decreases from 1989 to 1994. Then, from 1999 to 2009, we observe a decrease in GDP per capita. In contrast, the Gini coefficient increases and then decreases during this period. Finally, from 2009 to 2014, while the GDP per capita and the Gini coefficient after-tax increase, the Gini coefficient before tax decreases. Overall, figure 1 seems to indicate that there is a correlation between the GDP per capita and the Gini coefficient.

Figure 2 shows the evolution of direct and indirect taxes and income inequality over the period. First, we note that direct taxes are greater than indirect taxes. This means that the government relies more on revenues collected from direct taxes. From 1989 to 2004, the share of direct taxes in GDP decreases while that of the indirect taxes increases slightly. As for the Gini coefficient, it

9）See in appendix

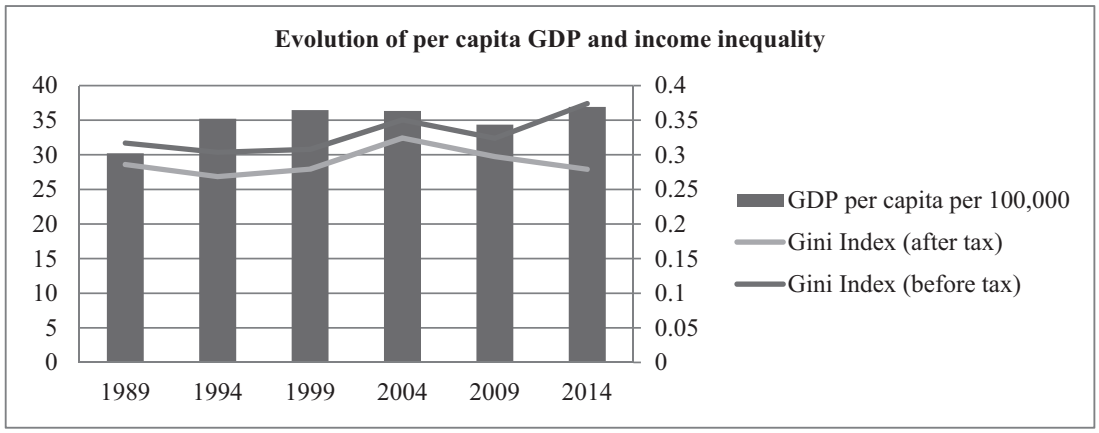

Figure 1: Evolution of GDP per capita and income inequality (prefecture average measures)
Source: The national survey of family income and expenditures and Cabinet Office statistics (author's elaboration).

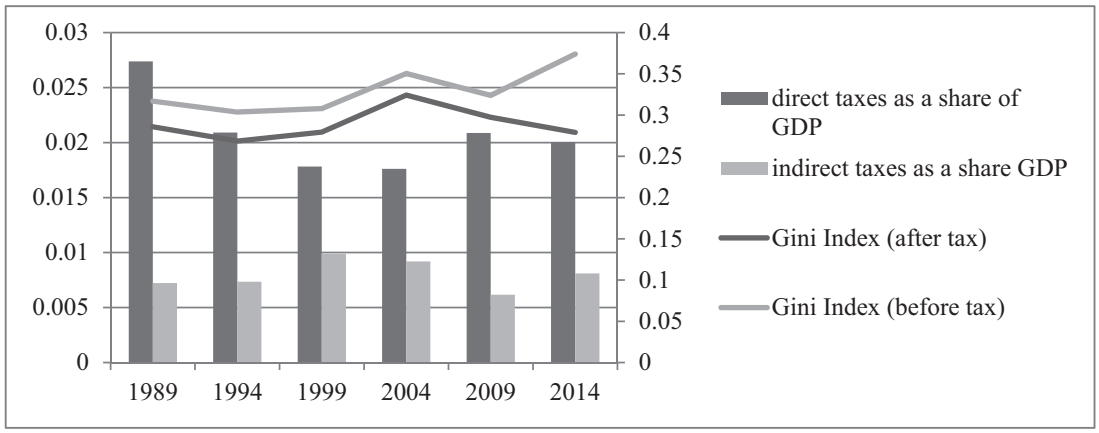

Figure 2: Evolution of direct, indirect taxes and income inequality (prefecture average measures)
Source: The national survey of family income and expenditures, Cabinet Office statistics, and Ministry of internal affairs and communications (author's elaboration).

decreases from 1989 to 1994 and then increases until 2004. During this first period, we note that both the Gini coefficient and indirect taxes evolve in the same direction while direct taxes evolve in the opposite one. From 2004 to 2014, the share of direct taxes in GDP has increased until 2009, but it slightly diminishes at the end of the period. On the contrary, the share of indirect taxes in GDP has the opposite trend. As concerns the Gini coefficients before and after-tax, they decrease at the beginning of the second period. Nevertheless, after 2009, the Gini coefficient after-tax continues to fail while the Gini coefficient before tax increases. During the second period, we observe that both the Gini coefficient before tax and the share of indirect taxes in GDP have the same trend while the share of direct taxes has the opposite trend. To sum up, figure 2 highlights the existence of a link

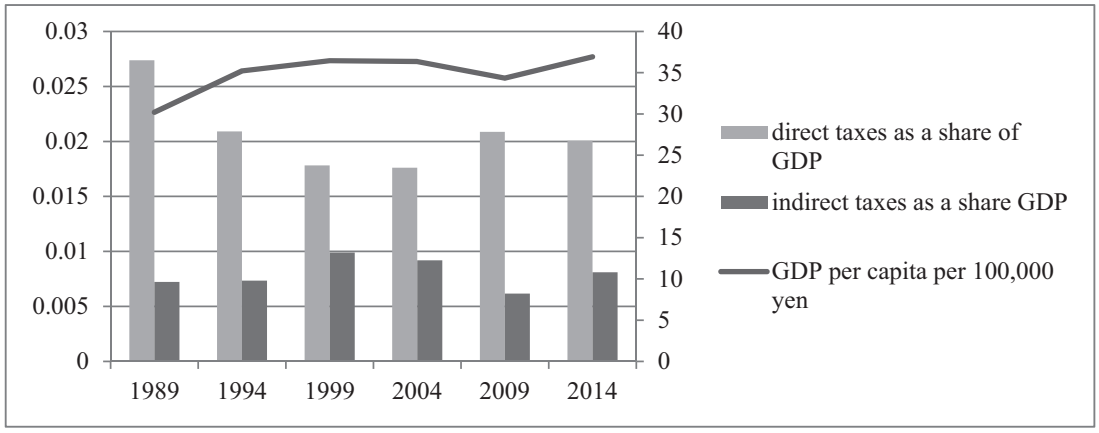

Figure 3: Evolution of direct, indirect taxes and GDP per capita (prefecture average measures)
Source: Cabinet Office statistics and Ministry of internal affairs and communications (author's elaboration).

between the evolution of these variables.

Figure 3 depicts the evolution of direct and indirect taxes and per capita GPD over the period. Concerning the GDP per capita, we observe that it rises from the beginning of the period until 2004 and then slightly diminishes from 2004 to 2009. Afterward, it starts increasing from 2009 to 2014. We can infer that, as abovementioned, there is a correlation between direct and indirect taxes and GDP per capita.

Figure 4 shows the evolution of distributive and non-distributive expenditures and income inequality. First of all, we observe that distributive expenditures are smaller than non-distributive expenditures. Despite a decrease from 1989 to 1994, the non-distributive expenditures experience an increase until 2009. Then, they decrease at the end of the period. As for the distributive expenditures, they slightly decrease from 1989 to 1999, and afterward, they increase from 2004 to 2009. At the end of the period, they diminish. This figure also points out the fact that from 1989 to 1994, the Gini coefficients and both expenditures diminish altogether. However, from 1994 to 2004, it underlines the fact that while distributive expenditures decrease, Gini coefficients increase. On the contrary, while non-distributive expenditures increase, Gini coefficients still increase. From 2004 to 2009, the increases in distributive and non-distributive expenditures go with a decrease in Gini coefficients. Finally, the decrease in distributive and non-distributive expenditures is coupled with a reduction of the Gini coefficient after-tax but a rise in the Gini coefficient before tax. In summary, figure 4 highlights the link between distributive and non-distributive expenditures and income inequality.

Finally, figure 5 presents the evolution of distributive and non-distributive expenditures and GDP per capita. We observe that on average the GDP per capita increases from 1989 to 2004. It slightly decreases from 2004 to 2009, and finally goes up at the end of the period. To summarize, figure 5

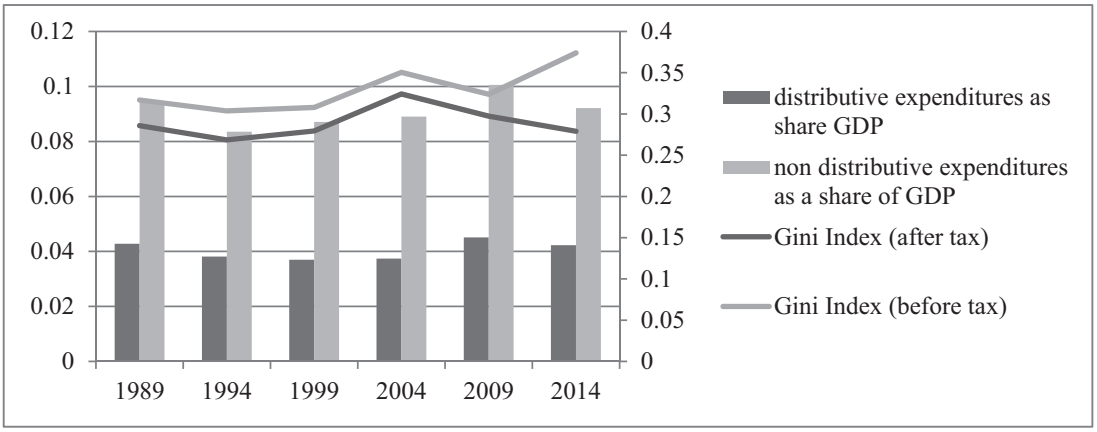

Figure 4: The evolution of distributive, non-distributive expenditures and income inequality (prefecture average measures)

Source: The national survey of family income and expenditures, Cabinet Office statistics, and Ministry of internal affairs and communications (author's elaboration).

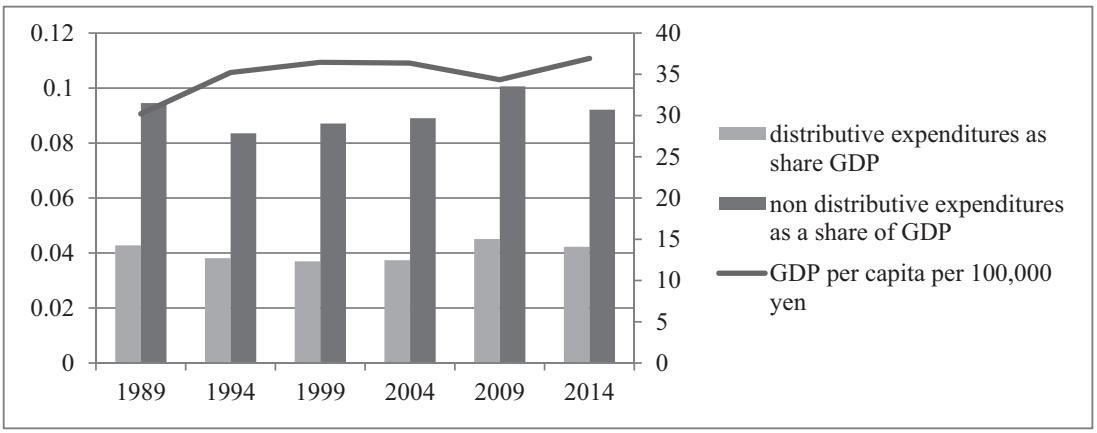

Figure 5: The evolution of distributive, non-distributive expenditures and GDP per capita (prefecture average measures)

Source: The national survey of family income and expenditures, Cabinet Office statistics, and Ministry of internal affairs and communications (author's elaboration).

underlines the existence of a correlation between the evolutions of the distributive and non-distributive expenditures and GDP per capita.

In conclusion, the preliminary analysis of the data underlines the fact that economic growth, inequality, and fiscal policy are interconnected and correlated with each other.

4. RESULTS

This section presents and analyzes the results of the estimations obtained from the SUR and SEM

models (Table 1).

4.1 SUR model Estimations results

4.1.1 The growth equation

Firstly, regarding the control variables, only the international trade variable appears significant with a positive sign. This result confirms the hypothesis stating that more openness contributes to boosting economic growth. As for the initial GDP per capita, population growth, education, and the inflation rate, although they are not significant, they display the expected signs (Table 1-SUR model-column 3 for the initial GDP per capita, column 1 to 3 for the population growth and education, and column 1 to 4 for the inflation). Secondly, concerning the fiscal policy variables, the results highlight the positive effects of distributive and non-distributive expenditures and indirect taxes on economic growth. On the contrary, they underline the negative effect of direct taxes on economic growth. However, it is worth noting that even though the distributive expenditures variable is not significant in columns 3 and 4 (Table 1-SUR model), the negative sign indicates that it might impact negatively the economic growth when they are financed by direct and indirect taxes.

4.1.2 The inequality equation

In the first place, regarding the control variables, the investment ratio, and the fertility rate exhibit a negative sign meaning that they contribute to reducing inequality. As for the population density, the results show that it has a positive sign, which means that a higher population density fosters inequality. In contrast, education and population ratio (15-64 years old) variables are not significant. In the second place, concerning the fiscal policy variables, the non-distributive expenditures and direct taxes have positive signs implying that they increase inequality. So, higher direct taxes and non-distributive expenditures lead to more inequality. As for the distributive expenditures, the results show that they have a negative sign. This suggests that distributive expenditures reduce inequality. Therefore, higher distributive expenditures drive to less inequality.

4.1.3 The fiscal policy equation

First, concerning the distributive expenditures equation, the initial GDP per capita and international trade have a negative impact on distributive expenditures. Consequently, this implies that more openness and a better level of income reduce distributive expenditures. On the contrary, the population aged 65 or more, gross Gini coefficient, transfers, public employment, and the House of Councilors and Representatives' variables have a positive impact on distributive expenditures. These results suggest that an increase in these variables, and particularly an increase in inequality (measured by the gross Gini coefficient), induces an increase in distributive expenditures. Second, regarding non-distributive expenditures, international trade has a negative impact on non-

distributive expenditures. So, this result indicates that more openness diminishes non-distributive expenditures. On the other hand, the remained variables have a positive and significant impact on non-distributive expenditures. Consequently, these results indicate that an increase in these variables, and especially an increase in inequality, stimulates the raise of non-distributive expenditures. Third, concerning the direct taxes, the initial level of income, international trade, the share of elderly people, gross Gini coefficient, and transfers' variables have a negative impact on direct taxes. Therefore, the results imply that an increase in these variables (and mainly an increase in inequality) lessens the direct taxes to be levied. However, the Houses of Councilors and Representatives' variables seem to promote the collection of direct taxes. Four, as for the indirect taxes, the results show that the share of elderly people, population, transfers, and the Houses of Representatives' variables have a positive and significant influence on indirect taxes. Thus, an increase in these variables seems to encourage the collection of indirect taxes.

To summarize, the results point out the negative impact of direct taxes on economic growth on the one hand; and on the other hand, the positive effect of indirect taxes, distributive and non-distributive expenditures on economic growth. Secondly, they highlight the negative and significant correlation between distributive expenditures and inequality. And these results are in line with the literature. The results also underline the positive and significant link between direct taxes and non-distributive expenditures. Finally, they indicate that higher inequality calls for more distributive and non-distributive expenditures. Moreover, they suggest that higher inequality demands less direct and indirect taxes which are in line with the literature.

4.2 SEM model Estimations results

4.2.1 The growth equation

The results show that net inequality has a negative and significant impact on economic growth (Table 1-SEM model column 2). This suggests that inequality has a detrimental effect on economic growth. And this confirms the hypothesis stating that inequality might be harmful to growth. Regarding the fiscal variables, the results indicate that indirect taxes, distributive and non-distributive expenditures have a positive effect on economic growth, while direct taxes have a negative impact on growth no matter how it is financed.

4.2.2 The inequality equation

The results point out that economic growth has a positive and significant impact on inequality. This result implies that economic growth might favor the increase in inequality which is in line with the strand of the literature supporting the idea that economic growth could be conducive to more inequality. As for the fiscal variables, the non-distributive expenditures and direct taxes seem to increase inequality, while the distributive expenditures seem to reduce inequality whether it is

financed by direct or indirect taxes. And these results are in line with the literature.

4.2.3 The fiscal policy equation

The results indicate that a higher initial level of income leads to less distributive expenditures and less direct taxes on the one hand; and on the other hand, a higher level of income leads to more non-distributive expenditures and more indirect taxes. As regards to the inequality, the results point out the fact that inequality demands distributive and non-distributive expenditures. As a result, more inequality drives to an increase in distributive and non-distributive expenditures. On the contrary, the results highlight the fact that more inequality calls for fewer taxes (direct and indirect taxes). Thereby, these results confirm those obtained with the SUR model and are in line with the literature. Concerning the control variables, the results show that the transfers and share of elderly people variables have a positive and significant impact on indirect taxes, distributive and non-distributive expenditures, while they have a negative and significant impact on direct taxes. This implies that first, more elderly people foster the increase in distributive and non-distributive expenditures (via the public pension system for instance) and indirect taxes; and they also foster the decrease of direct taxes. Second, more transfers enable prefectures with more distributive and non-distributive expenditures. Additionally, they enable them to collect indirect taxes, while they lessen the collection of direct taxes. The results also highlight the fact that the House of Representatives variable contributes to the promotion of distributive and non-distributive expenditures and direct taxes. Finally, the population and the public employment variables seem to foster the distributive and non-distributive expenditures. As for indirect taxes, the population variable appears to promote the collection of indirect taxes.

To sum up, the results obtained with the SEM model confirm those obtained with the SUR model and are in line with the literature.

Table 1: SUR and SEM models regressions results

	SUR MODEL				SEM MODEL			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Growth Equation	Real GDP per capita growth				Real GDP per capita growth			
Net Inequality$_{t-1}$					0.0110	−0.0301**	0.0065	0.0178
					(0.0153)	(0.0153)	(0.0152)	(0.0156)
Initial GDP per capita	0.0073	0.0271	−0.0069	0.0320	0.0040	0.0347	0.0092	0.0180
	(0.0334)	(0.0379)	(0.0355)	(0.0363)	(0.0353)	(0.0360)	(0.0335)	(0.0378)
Population growth	−0.0064	−0.0047	−0.0060	0.0006	−0.0059	−0.0003	−0.0068	−0.0049
	(0.0042)	(0.0043)	(0.0042)	(0.0036)	(0.0042)	(0.0035)	(0.0042)	(0.0043)
Education	0.0190	0.0209	0.0129	−0.0113	0.0216	−0.0059	0.0168	0.0195
	(0.0195)	(0.0200)	(0.0197)	(0.0174)	(0.0197)	(0.0174)	(0.0196)	(0.0200)
Trade	0.0295*	0.0194	0.0247	0.0297*	0.0210	0.0287*	0.0184	0.0085
	(0.0155)	(0.0157)	(0.0156)	(0.0157)	(0.0157)	(0.0157)	(0.0158)	(0.0159)
Inflation	−0.0001	−0.0004	−0.0008	−0.0002	−0.0014	−0.0002	−0.0003	−0.0006
	(0.0023)	(0.0024)	(0.0023)	(0.0024)	(0.0023)	(0.0023)	(0.0024)	(0.0024)
Non distributive expenditures$_{t-1}$	0.0826***		0.0782***	0.0830***	0.0704***	0.0906***	0.0788***	
	(0.0129)		(0.0187)	(0.0187)	(0.0188)	(0.0187)	(0.0129)	
Distributive expenditures$_{t-1}$		0.0522***	−0.0059	−0.0043	0.0032	−0.0097		0.0491***
		(0.0113)	(0.0151)	(0.0161)	(0.0152)	(0.0161)		(0.0114)
Indirect taxes$_{t-1}$	0.0204***	0.0251***	0.0196**		0.0200**		0.0206***	0.0302***
	(0.0079)	(0.0080)	(0.0079)		(0.0079)		(0.0079)	(0.0080)
Direct taxes$_{t-1}$	−0.0189*	−0.0207*		−0.0196		−0.0162	−0.0192*	−0.0242*
	(0.0115)	(0.0125)		(0.0124)		(0.0123)	(0.0115)	(0.0126)
Constant	−0.4407	−0.5768	−0.1922	−0.7462	−0.3396	−0.8357	−0.3979	−0.3633
	(0.5078)	(0.5689)	(0.5326)	(0.5459)	(0.5298)	(0.5423)	(0.5090)	(0.5685)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.6543	0.6375	0.6526	0.6489	0.6500	0.6443	0.6553	0.6362

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Table 1 (continued)

	SUR MODEL				SEM MODEL			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Inequality equation	Gini Coefficient				Gini Coefficient			
Growth					1.1103***	-0.4725	0.5505*	0.6329
					(0.3393)	(0.4777)	(0.3196)	(0.4471)
Education	0.0229	0.0263	-0.0056	-0.0158	-0.0386	0.0511	-0.0225	-0.0284
	(0.0755)	(0.0761)	(0.0748)	(0.0692)	(0.0775)	(0.0759)	(0.0780)	(0.0861)
Non distributive expenditures	0.1043**		0.2015***	0.2104***	0.3984***	0.5947***	0.0663	
	(0.0442)		(0.0629)	(0.0633)	(0.0942)	(0.1220)	(0.0522)	
Distributive expenditures		-0.0051	-0.1457***	-0.1505***	-0.3401***	-0.3633***		-0.0326
		(0.0392)	(0.0545)	(0.0561)	(0.0918)	(0.0874)		(0.0397)
Indirect taxes	0.0107	0.0189	0.0069		-0.0029		0.0069	0.0026
	(0.0223)	(0.0223)	(0.0223)		(0.0231)		(0.0226)	(0.0303)
Direct taxes	0.0557	0.0933**		0.0591		0.0241	0.0071	0.0884*
	(0.0454)	(0.0463)		(0.0468)		(0.0513)	(0.0716)	(0.0471)
Investment ratio	-0.0539***	-0.0620***	-0.0440**	-0.0446**	-0.0247	-0.0187	-0.0564***	-0.0602***
	(0.0188)	(0.0189)	(0.0193)	(0.0191)	(0.0211)	(0.0215)	(0.0191)	(0.0194)
Fertility ratio	-0.0902*	-0.1084**	-0.0910*	-0.0919*	-0.0818	-0.0787	-0.0811	-0.0965
	(0.0539)	(0.0541)	(0.0539)	(0.0504)	(0.0558)	(0.0542)	(0.0551)	(0.0600)
Population ratio (15-64)	0.3440	0.2386	0.2703	0.2707	0.3421	0.2996	0.4402	0.2928
	(0.2603)	(0.2656)	(0.2601)	(0.2642)	(0.2823)	(0.3027)	(0.2831)	(0.2954)
Population density	0.3130***	0.2925***	0.3093***	0.3055***	0.3093***	0.3392***	0.2916***	0.2800***
	(0.0919)	(0.0924)	(0.0914)	(0.0921)	(0.0944)	(0.0994)	(0.0944)	(0.0952)
Constant	-3.9288***	-3.1048**	-3.5382***	-3.5523***	-4.0510***	-4.5951***	-4.0745***	-3.1785**
	(1.3279)	(1.3327)	(1.3158)	(1.3381)	(1.4038)	(1.4816)	(1.4196)	(1.4193)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.8889	0.8886	0.8916	0.8928	0.8815	0.8717	0.8892	0.8878

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Table 1 (continued)

	SUR MODEL				SEM MODEL			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Fiscal policy equation	Fiscal policy				Fiscal policy			
	Distributive expenditures	Non distributive expenditures	Direct taxes	Indirect taxes	Distributive expenditures	Non distributive expenditures	Direct taxes	Indirect taxes
Initial GDP per capita	−0.2346***	0.0991*	−0.1484***	0.0772	−0.2382***	0.0898*	−0.1486***	0.0788
	(0.0440)	(0.0516)	(0.0398)	(0.0798)	(0.0441)	(0.0516)	(0.0399)	(0.0798)
Trade	−0.3881***	−0.5350***	−0.0772*	−0.0452	−0.3791***	−0.5266***	−0.0789*	−0.0435
	(0.0516)	(0.0606)	(0.0467)	(0.0937)	(0.0517)	(0.0605)	(0.0468)	(0.0937)
Population>65 years	0.0971**	0.2621***	−0.1150***	0.2239***	0.0849**	0.2687***	−0.1110***	0.2203***
	(0.0425)	(0.0499)	(0.0385)	(0.0772)	(0.0426)	(0.0499)	(0.0386)	(0.0772)
Population	0.0270	0.0411**	0.0228	0.1270***	0.0326*	0.0366*	0.0215	0.1289***
	(0.0172)	(0.0202)	(0.0156)	(0.0312)	(0.0172)	(0.0201)	(0.0156)	(0.0312)
Gross Inequality$_{t-1}$	0.2333***	0.3925***	−0.3015***	−0.1898	0.1773**	0.4101***	−0.2861***	−0.1967
	(0.0691)	(0.0812)	(0.0627)	(0.1259)	(0.0695)	(0.0811)	(0.0629)	(0.1259)
Transfers	0.2265***	0.2657***	−0.1639***	0.0911***	0.2338***	0.2601***	−0.1663***	0.0935***
	(0.0172)	(0.0202)	(0.0156)	(0.0312)	(0.0172)	(0.0202)	(0.0156)	(0.0312)
Public employment	0.3981***	0.4777***	0.0045	−0.0690	0.4035***	0.4766***	0.0035	−0.0683
	(0.0344)	(0.0404)	(0.0312)	(0.0624)	(0.0345)	(0.0404)	(0.0312)	(0.0624)
House of councillors	0.0835***	0.1125***	0.1151***	−0.0628	0.0809***	0.1105***	0.1168***	−0.0666
	(0.0303)	(0.0357)	(0.0276)	(0.0553)	(0.0305)	(0.0356)	(0.0276)	(0.0552)
House of representatives	0.1548***	0.1121**	0.2414***	0.1419*	0.1587***	0.1092**	0.2403***	0.1529*
	(0.0445)	(0.0523)	(0.0404)	(0.0811)	(0.0447)	(0.0522)	(0.0405)	(0.0810)
Constant	4.1950***	−0.0583	2.8002***	−4.0777***	4.0573***	0.1315	2.8462***	−4.1561***
	(0.6219)	(0.7301)	(0.5633)	(1.1286)	(0.6230)	(0.7301)	(0.5638)	(1.1283)
Country effects	No	No	No	No	No	No	No	No
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.9376	0.9189	0.7453	0.4727	0.9378	0.9188	0.7455	0.4726
Observations	376	376	376	376	376	376	376	376

Standard errors in parentheses. *, **, *** measures statistical significance at the 10, 5, and 1% respectively.

5. CONCLUSION

This paper investigates the joint relationship between economic growth, inequality, and fiscal policy. The analysis focuses on a panel made up of 47 Japanese prefectures for the period 1989-2015. The results confirm the detrimental effect of inequality on economic growth and the damaging effect of economic growth on inequality. These results support the hypothesis stating that inequality can be harmful to economic growth and also that economic growth might promote inequality. And these conclusions are in line with the literature.

Regarding the fiscal policy, the results emphasize the fact that distributive expenditures enable to reduce inequality while non-distributive expenditures, direct and indirect taxes contribute to increasing inequality. And these conclusions are in line with the literature. The results also indicate that distributive and non-distributive expenditures are beneficial to economic growth. In contrast, they show that direct taxes have a deleterious effect on economic growth.

Finally, the results confirm the hypothesis stating that more inequality demands more redistribution (through distributive and non-distributive expenditures). In fact, gross inequality is positively correlated with distributive and non-distributive expenditures. The results also confirm the hypothesis stating that more inequality calls for fewer taxes (direct and indirect taxes).

In sum, the results assert the existence of a joint relationship between economic growth, inequality and fiscal policy; and therefore, to design effective economic and fiscal policies, this mutual interconnection needs to be more investigated due to the crucial role that plays fiscal policy as an instrument allowing the promotion of economic growth and the redistribution of income.

REFERENCES

Alesina, A., & Rodrik, D., "Distributive politics and economic growth," The quarterly journal of economics, Vol. 109, No.2, 1994.

Barro, R. J., "Government spending in a simple model of endogenous growth," Journal of political economy, Vol. 98, No.5, Part 2, 1990.

Barro, R. J., "Economic growth in a cross-section of countries," The quarterly journal of economics, Vol. 106, No. 2, 1991.

Barro, R. J., "Inequality, growth, and investment," National bureau of economic research, No. w7038, 1999.

Barro, R. J., & Sala-i-Martin, X., "Public finance in models of economic growth," The Review of Economic Studies, Vol. 59, No. 4, 1992.

Benabou, R., "Unequal societies: Income distribution and the social contract," American Economic Review, Vol. 90, No. 1, 2000.

Bénabou, R., "Tax and education policy in a heterogeneous-agent economy: What levels of redistribution maximize growth and efficiency?," Econometrica, Vol. 70, No. 2, 2002.

Bénabou, R., "Inequality, technology, and the social contract," Handbook of economic growth, Vol. 1, Part B, Elsevier,

2005.
Benhabib, J., "The tradeoff between inequality and growth," Annals of economics and finance, Vol. 4, 2003.
Berg, A., & Ostry, J. D., "Equality and efficiency," Finance & Development, Vol. 48, No. 3, 2011.
Bertola, G., "Factor Shares, Income Distribution and Economic Growth," American Economic Review, Vol. 83, No. 5, 1993.
Blomquist, S., & Micheletto, L., "Nonlinear Income Taxation and Matching Grants in a Federation with Decentralized In-kind Transfers," International Economic Review, Vol. 50, No. 2, 2009.
Bourguignon, F., "Pareto superiority of inegalitarian equilibria in Stiglitz'model of wealth distribution with convex saving function," Econometrica: Journal of the Econometric Society, 1981.
Calderón, C., & Servén, L., "Trends in infrastructure in Latin America, 1980-2001," The World Bank, 2004.
Castelló, A., & Doménech, R., "Human capital inequality and economic growth: some new evidence," The economic journal, Vol. 112, No. 478, 2002.
Chatterjee, S., "The distributional consequences of government spending," 2008.
Cont, W., Porto, A., & Minatta, M., "Interdependence among fiscal policy, inequality and economic growth at a provincial level in Argentina. 1995-2010," 2017.
Davtyan, K., "Interrelation among Economic Growth, Income Inequality, and Fiscal Performance: Evidence from Anglo-Saxon Countries," Hacienda Pública Española , Vol. 217, No. 2, 2016.
Galor, O., & Moav, O., "From physical to human capital accumulation: Inequality and the process of development," The Review of Economic Studies, Vol. 71, No. 4, 2004.
García-Peñalosa, C., & Turnovsky, S. J., "Growth, income inequality, and fiscal policy: What are the relevant trade-offs?," Journal of Money, Credit and Banking, Vol. 39, No. 2-3, 2007.
Kaldor, N., "A model of economic growth," The economic journal, Vol. 67, No. 268, 1957.
Kneller, R., Bleaney, M. F., & Gemmell, N., "Fiscal policy and growth: evidence from OECD countries," Journal of public economics, Vol. 74, No. 2, 1999.
Kuznets, S., "Economic growth and income inequality," The American economic review, Vol. 45, No. 1, 1955.
Li, H., Squire, L., & Zou, H. F., "Explaining international and intertemporal variations in income inequality," The economic journal, Vol. 108, No. 446, 1998.
Li, H., & Zou, H. F., "Income inequality is not harmful to growth: theory and evidence," Review of development economics, Vol. 2, No. 3, 1998.
Liu, Y., & Martinez-Vazquez, J., "Growth-inequality tradeoff in the design of tax structure: Evidence from a large panel of countries," Pacific Economic Review, Vol. 20, No. 2, 2015.
Lundberg, M., & Squire, L., "The simultaneous evolution of growth and inequality," The economic journal, Vol. 113, No. 487, 2003.
Meltzer, A. H., & Richard, S. F., "A rational theory of the size of government," Journal of Political Economy, Vol. 89, No. 5, 1981.
Mendoza, E. G., Milesi-Ferretti, G. M., & Asea, P., "On the ineffectiveness of tax policy in altering long-run growth: Harberger's super neutrality conjecture," Journal of Public Economics, Vol. 66, No. 1, 1997.
Milanovic, B., "Do more unequal countries redistribute more? Does the median voter hypothesis hold?," The World Bank, 1999.
Mechicla, N., "Taxes and Transfers in Japan's Local Public Finances," The World Bank, 2001.
Muinelo-Gallo, L., & Roca-Sagalés, O., "Economic growth, inequality, and fiscal policies: a survey of the macroeconomics literature," Theories and Effects of Economic Growth, 2011.
Muinelo-Gallo, L., & Roca-Sagalés, O., "Economic growth and inequality: the role of fiscal policies," Australian Economic Papers, Vol. 50, No. 2-3, 2011.
Muinelo-Gallo, L., & Roca-Sagalés, O., "Joint determinants of fiscal policy, income inequality, and economic growth," Economic Modelling, Vol. 30, 2013.

Muinelo-Gallo, L., & Roca-Sagalés, O., “Is the Fiscal Policy Increasing Income Inequality in Uruguay?,” Journal of Economics, Vol. 2, No. 3, 2014.

Musgrave, R. A., “Theory of public finance; a study in public economy,” New York, McGraw-Hill, 1959.

Niskanen, W. A., “The peculiar economics of bureaucracy,” The American Economic Review, Vol. 58, No. 2, 1968.

Ohtake, F., “Inequality in Japan,” Asian Economic Policy Review, Vol. 3, No. 1, 2008.

Ohtake, F., Kohara, M., Okuyama, N., & Yamada, K., “GINI Country Report: Growing Inequalities and their Impacts in Japan,” Amsterdam Institute for Advanced Labour Studies, No. Japan, 2013.

Okun, A. M., “Equality and Efficiency: The big tradeoff,” Brookings Institution Press, 2015.

Ostry, M. J. D., Berg, M. A., & Tsangarides, M. C. G., “Redistribution, inequality, and growth,” International Monetary Fund, 2014.

Persson, T., Roland, G., & Tabellini, G., “Comparative politics and public finance,” Journal of political Economy, Vol. 108, No. 6, 2000.

Persson, T., & Tabellini, G., “ls lnequality Harmful for Growth,” American Economic Review, Vol. 84, No. 3, 1994.

Persson, T., & Tabellini, G. E., “Political economics: explaining economic policy,” MIT press, 2000.

Persson, T., & Tabellini, G., “The economic effects of constitutions,” Munich lectures in economics, 2003.

Ramos, X., & Roca-Sagales, O., “Long-Term Effects of Fiscal Policy on the Size and Distribution of the Pie in the UK,” Fiscal Studies, Vol. 29, No. 3, 2008.

Saint-Paul, G., & Verdier, T., “Education, democracy and growth,” Journal of Development Economics, Vol. 42, No. 2, 1993.

Solow, R. M., “A contribution to the theory of economic growth,” The quarterly journal of economics, Vol. 70, No. 1, 1993.

Stiglitz, J. E., “Distribution of income and wealth among individuals,” Econometrica: Journal of the Econometric Society, Vol. 37, No. 3, 1969.

Tachibanaki, T., “Inequality and poverty in Japan,” The Japanese Economic Review, Vol. 57, No. 1, 2006.

Wagner, R. E., & Weber, W. E., “Wagner’s law, fiscal institutions, and the growth of government,” National Tax Journal, Vol. 30, No. 1, 1977.

Wolff, E. N., & Zacharias, A., “The distributional consequences of government spending and taxation in the US, 1989 and 2000,” Review of income and wealth, Vol. 53, No. 4, 2007.

別所俊一郎, “再分配政策と地方財政.「地方財政の理論的進展と地方消費税」” 日本地方財政学会研究叢書第18号, 2011.

APPENDIX

Table 2: Data: Sources and definitions

Variables	Definition	Source
Net inequality	Gini coefficient after taxes at the prefectural level	The National Survey of Family Income and Expenditures
Gross inequality	Gini coefficient before taxes at the prefectural level	The National Survey of Family Income and Expenditures
Initial GDP per capita	Initial GDP per capita in logs at the prefectural level	Cabinet Office statistics
Population growth	Annual growth of population at the prefectural level	Official Statistics of Japan
Education	The ratio of people having completed up to colleges and universities at the prefectural level	Official Statistics of Japan
International trade	Imports and exports of goods and services as a percentage of GDP at the prefectural level	Official Statistics of Japan
Inflation	Annual growth of consumer price index (CPI) at the prefectural level	Official Statistics of Japan
Non-distributive expenditures	Expenditures on public services, defense, public order and safety, and economic affairs of prefectural government as a percentage of prefecture-GDP	Ministry of Internal affairs and Communications
Distributive expenditures	Social protection, health, education and housing expenditures of the prefectural government as a percentage of prefecture-GDP	Ministry of Internal affairs and Communications
Indirect taxes	Revenues of prefectural government due to indirect taxes as a percentage of prefecture-GDP	Ministry of Internal affairs and Communications
Direct taxes	Revenues of prefectural government due to direct taxes as a percentage of prefecture-GDP	Ministry of Internal affairs and Communications
GDP growth	Annual prefecture-GDP growth (variation of GDP per capita in logs)	Cabinet Office statistics
Investment	The ratio of investment expenses at the prefectural level (prefectural finance)	Official Statistics of Japan
Fertility rate		Official Statistics of Japan
Population ratio (15-64 years old)		Official Statistics of Japan

(Continued on next page)

Table 2 (continued)

Variables	Definition	Source
Population density	Population density per 1km^2 of total area (people) in logs at the prefectural level	Official Statistics of Japan
Population	Total population (prefecture) in logs	Official Statistics of Japan
Transfers	Transfers (local transfers, local allocation tax, and disbursement) as a percentage of total income at the prefectural level	Ministry of Internal affairs and Communications Official Statistics of Japan
Public employment	Public employment as a percentage of total public employment at the prefectural level	Official Statistics of Japan
Councilors	Councilors per million of habitants at the prefectural level	The House of Councilors, the National Diet of Japan (Sangiin)
Representatives	Representatives per million of habitants at the prefectural level	The House of Representatives, Japan (Shuugiin)

Note: all variables are expressed in logs except inflation, fertility rate, Councilors, Representatives, population, and GDP growth.

Table 3: Theoretical aggregation of fiscal policy

Theoretical classification	Government Finance Statistics classification
Revenues	
Direct taxes	Prefectural taxes Business taxes Property taxes Car taxes Mine-lot taxes Hunt taxes (registration, entrance, hunting taxes)
Indirect taxes	Special consumption taxes Real estate acquisition taxes Prefectural tobacco taxes Light oil delivery taxes Golf usage taxes Local consumption taxes
Expenditures	
Distributive expenditures	Household expenditures Sanitation and health expenditures Education expenditures Labor expenditures
Non-distributive expenditures	General public expenditures Public order and safety expenditures Economic affairs

Source: Ministry of Finance, Japan