The Nexus between Population Structure, Debt Ratio, Unemployment, and Leadership Election in Aging Countries

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Abstract. For the past decades, aging of population has been a growing concern for many countries, imposing downward pressure on consumption, production, and population growth. Meanwhile, voters in aging countries, influenced by socioeconomic conditions like higher age dependency ratio, rising unemployment rate, constant inflow of immigration and lower fertility rate, might have specific preferences for the corresponding policy targets purposed by the leadership election candidates and might further affect the economic and immigration policies implemented by the new governments after elections. With the investigation of how the preferences of the voters for economic and immigration policies, sharped by the socioeconomic conditions, affect the implementation of the corresponding policies after leadership elections, candidates of these elections might be capable of gaining more support from voters by modifying their election platform, accordingly. In this study, three multinomial logistic models are conducted with government expenditure, taxation, and immigration policies set as dummy dependent variables, separately. And the results imply that, in aging countries, a high level of unemployment tends to induce the new governments to impose more stringent immigration policy and reduce taxation, while the possibility of a decrease of government expenditure would be higher. However, for countries with higher population growth, the new governments would be more likely to implement a tax increase.

Keywords: Aging; election; population structure; debt ratio; unemployment rate; multinomial logistic model

1. Introduction

For the past decades, the concern for aging of population have been growing, and it is predicted that by 2050, on a global basis, the number of old would be the same as the number of young, and people under age 15 and over age 60 would account for 42% of the global population in total [1]. In terms of size and reach with respect to global economy, according to World Atlas, 21 countries of the top 25 countries with the largest aging population proportion, defined as percentage of population over 65 years old, are members of Organization for Economic Co-operation and Development (OECD), and OECD accounted for 60.27 percent of the global GDP in 2021 according to World Development Indicator from the World Bank [2]. Clearly, the influence of aging is widespread and might be inestimable. As for the specific effects of an aging population structure to a society, studies showed that a fall in productivity and consumption should be a major one in economic prospect, while pension pressures should not be neglected, either [3-5]. Moreover, Yoshino and Taghizadeh-Hesary claimed that aging of population could be a structural problem causing recession [6]. More fundamentally, in many aging countries, the aging of population is caused by the combination of growing life expectancy and declining fertility rate [7]. Thus, for one thing, if the fertility rate is below replacement level, in long run, the competitiveness of the overall economy might be weakened with a shrinking population. For another, if the retirement age stays the same, the age dependency ratio, calculated by dividing population of non-working group by the working age population, would gradually rise with the aging of population, which increase the burden of the working age population, especially for working class. Besides,

Although there are arguments that the economy of the countries aging fast have grown more in the past decades, which is possibly caused by the adoption of automation technology, it is more widely accepted that adverse demographic developments have exerted downward pressure on economic growth [8-9]. Therefore, aging of population would be a major challenge for many governments

trying to boost the economy. And since the aging population has not been improved by most aging countries for the past decades, in despite of tremendous effort in solving it, it is reasonable to predict this problem would exist for the next few decades.

Generally, there are three major ways of stimulating the economy, confronting with aging population, with respect to government expenditure, taxation, and immigration policy, respectively.

For government expenditure, some countries would choose to increase government expenditure to create jobs and encourage investments while the other countries might try to avoid deficit and relieve the pressure in paying the increasing pension through cutting down the government budget. For taxation, although rising taxation to increase government revenue and stimulate consumption by income redistribution seems reasonable for some countries, a tax relief to encourage investment and consumption for maximizing the total tax revenue in the end would be impose by the other countries. For immigration policy, despite promoting immigration to fill the vacancies in working age population sounds perfectly reasonable, in many aging countries, on the contrary, the criteria and restriction toward immigration have been risen caused by the waves of opposition from those who believed their jobs and welfare have been comprised by immigration. Besides, it is worthwhile to notice that, in this context, refugee problem is in line with immigration to a great extent for the similar reasons. In general, governments should try to keep policies stable and continued since in most cases it takes time to take effect. However, through election of the leader, the policies about government expenditure, taxation, and immigration change frequently. And since research showed a relationship between economic condition and election result, especially economic condition in the year primary to the election year, it is reasonable to assume that the candidates would adjust and emphasize their statements in election platform accordingly [10-11]. Thus, it would be meaningful to investigate the nexus of the policies stated and implemented by those who won the election and the corresponding economic conditions before election.

This paper is organized as follows. Section 2 would include literature reviews about government expenditure, taxation, and immigration policy against the backdrop of aging population, while in section 3 would introduce methodology. Then empirical analysis would be in section 4. Lastly, section 5 would discuss about conclusion and implication.

2. Literature Review

Overall, the effect of population aging could be included in four aspects. The first one would be the potential downward pressure on current consumption and production. The second one would be the extra burden on pension and welfare system. And the third one would be the increasing stress on the working age with an increasing age dependency ratio and the prospective rise of tax from government while the last one is about the sustainability of the society with fertility rate lower than the replacement level and the latent national debt crisis due to expansionary government spending. Correspondingly, candidates of the leadership election would set and modify their policy objectives to get more support from voters under given socioeconomic conditions.

2.1 Government Expenditure and Taxation Policy

For many governments, the tax increase and expansionary government expenditure are usually conducted in the same period to stimulate economy, acting as the opposite of the combination of tax relief and government expenditure decrease conducted by the other governments. For instance, it is typical for the United States government to swing back and forth from increasing tax and government expenditure when Democratic is in charge to tax relief and cutting down government expenditure when Republican in charge, which could be regarded as the continuing fight between the ideas of the “freshwater” economists and the “saltwater” economists [12].

Generally, governments seeking for sustainable economic growth would try to avoid a large amount of fiscal surplus or deficit since the former one leaves too many funds out of production and the latter one might cause massive debt problems, despite with a proper amount of deficit used for

investing in productive capacity would benefit economy [13]. And in practice, rising national debts or taxation is the frequently used method to make up for the deficit caused by the expansionary expenditure while tax relief usually force government to limit their expenditure to avoid massive deficit. Therefore, although for some other countries, taxation policy is not necessarily related to government expenditure, it would be more practical to discuss government expenditure and taxation policy in the same section, instead of analyzing them separately.

For the successors of the Neo-Keynesian, they prefer stimulating economic by increasing government expenditure and deficit financing, as they believe with more job opportunities and demand created, employment and general equilibrium would rise to meet the effective demand. This is how the supporters of expansionary government expenditures convince the voters of the effectiveness of the economic policies in their election platform. As more job opportunities would be created by increasing government expenditure, it is reasonable to assume that countries with high er unemployment rates in year primary to the election year would be more likely to support candidates with plans for expansionary government expenditure. Nonetheless, an increase of government expenditure would cause great burden on national finance and might even cause massive deficit. Thus, as discussed above, many candidates might propose increasing to make up for the deficit through the direct increase of the tax revenue.

Whereas some other leaders believe in the theory of Laffer curve, which shows that existence of the optimal level of average tax rate and indicates that a proper tax relief would increase the tax revenue in the end [14]. Thus, for stimulating economic growth, instead of rising government expenditure and deficit financing, they are more likely to conduct a tax cut and reduce government expenditure. Besides, the typical shape of Laffer curve is only available under the assumption of complete market and a closed economy, which is almost unrealistic in the background of globalization and the prosperity of neo liberalism [14]. However, most private companies and capitalists would still embrace the tax relief as the direct beneficiaries, which keeps the competitiveness of tax relief and reduction of government expenditure in election platforms.

Nevertheless, there are arguments that against the background of aging population, the effect of government expenditure policy might not be expected [15]. Similarly, the effect of monetary policy on consumption would also be less [16]. In addition, although in some countries, tax relief was assumed to positively affect employment, Ferraro and Fiori stated that the effect of tax relief on employment would be weakened due to population aging [17-18]. Plus, considering that the effects of population on marginal propensities to consume are unclear and vary for different income levels, whether, in practice, changing fiscal and monetary policies would bring back the consumption under an older population structure is not clear [3].

However, in this study, the discussion about monetary policy would not be involved, because in some countries monetary policy is independent from the governments, which makes it less likely to be affected through elections.

2.2 Immigration Policy

Apart from the economic policies, many countries attend to solve the aging population problem via a more direct way, which is improving the population structure by promoting immigration, despite a study shows that the impact of the post-1990 immigration on the share of the working-age population of the United States is minimal, as it added those outside of the working-age population in a similar proportion [19].

In practice, the attitude toward immigration would be different from countries to countries, for countries with serious problem of aging population, to attract new immigrants, theoretically, the criteria of immigration should be relatively low, and the corresponding welfare should be relatively high. However, some of the nativists attribute their unemployment to the immigrants since the unemployment rate of natives kept declining with a constant inflow of immigrants [20]. Thus, even though there are arguments that the effect of the immigrants on the employments and wages of the natives is positive as the relationship of immigrants and natives in the job markets is complementary

rather than competitive, the immigration policies in these countries might even be tightened, corresponding to the public opinion [21]. In contrast, for countries with less concern about the aging population problem and higher attractiveness to immigrants, the criteria would be set relatively high, to improve economic competitiveness at the same time by introducing immigrant investors or skilled workers. Besides, in this sense, an expansionary government expenditure might be welcomed since more job opportunities would be created to solve the unemployment problem.

Nonetheless, although some advocates of immigrant believe that immigrant could fix aging population fundamentally with higher fertility rate, for some aging countries, the fertility rates of immigrants are so close to the fertility rates of natives that the influence of the immigrants on the overall fertility rate is minimal, not to mention that in the United States, the fertility rates of immigrants have even declined faster than the fertility rates of natives since 2008 [22]. Then again, the fertility rate in the Global North, which includes most developed countries, is much lower than the Global South, where most countries are developing [23]. With stringent immigrant criteria, immigrants would be more likely from the North, which further lowers the overall fertility of immigrants.

3. Methodology and Data

3.1 Ecometric Model

Three Multinomial logistic regression would be conducted with immigration policy, government expenditure policy, and taxation policy as dependent variables, respectively. Immigration policy, government expenditure policy, and taxation policy conducted by the winners are set as dummy variables, with 0 for not mentioning at all, 1 for promoting immigration, increasing government expenditure, and increasing tax, respectively, and -1 for restricting immigration, reducing government expenditure, and decreasing tax, respectively.

The model formula is as follows,

$$Y^* = Constant + X\beta + \varepsilon \quad (1)$$

where Y* is the policy dummy variable, X is the set of independent variables and control variables, β is the corresponding coefficients and ε is the error term subject to the logistic distribution.

And the independent variables include population growth, fertility rate, debt to GDP ratio, age dependency, and unemployment rate, denoted as Population_G, Fertility, Debt, Dependency, and Unemployment, respectively. Besides, net migration rate, GDP per capita, or GDP per capita growth are considered as control variables (see Table 1).

Table 1. Details of variables

Variable	Symbol	Meaning	Measurement
Dependent variable	GE	Government expenditure policy	Dummy variable 0 for not changing 1 for positive -1 for negative
	T	Taxation policy	
	IM	Immigration policy	
Independent variables	Population_G	Population growth	percentage
	Fertility	Fertility rate	percentage
	Debt	Debt to GDP ratio	percentage of GDP
	Dependency	Age dependency ratio	Non-working age population divided by working age population
	Unemployment	Unemployment rate	Unemployed population divided by the sum of unemployed population and employed population
Control variables	Migration	Net migration rate	Net migration population divided by total population
	PGDP	GDP per capita	In USD
	PGDP_G	GDP per capita growth	percentage

Note: data are drawn from World Development Indicators of World Bank Database (WDI), United Nation Department of Economic and Social Affairs, tradingeconomics, and macrotrend.

3.2 Data Description

The data are drawn across 13 aging countries, including Finland, France, Germany, Greece, Italy, Japan, South Korea, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States, for the past 3 elections, excluding transitional governments.

Table 2 shows the descriptive statistics of variables across the chosen countries. For debt to GDP ratio, the minimum value is 32.2 while the maximum value is 270, and the corresponding standard deviation is 57.477, which is extremely high, illustrating that debt issues might be highly different from countries to countries. For population growth and fertility rate, they are generally low, and their standard deviations are small too, matching the intuition for aging countries. The standard deviations for age dependency ratio, unemployment rate, GDP per capita growth, and population growth are medium, while net migration rate is negative for some countries, demonstrating an outflow of population. Besides, the minimum GDP per capita growth is -24.7, suggesting that some countries might have experienced severe recession. And the average age dependency ratio is 53.027, which means, for aging countries in past decades, approximately two people in working age need to support the living of one person out of working age, which might seem to be acceptable. But the maximum value is 69.483. In other words, ten people in working age might need to support the living of seven people out working age, not to mention that people in working age does not necessarily have jobs.

Table 2. Descriptive statistics of variables

	Obs	Min	Max	Average	Std Dev	Median
Population_G	39	-0.659	1.851	0.389	0.524	0.397
Fertility	39	1.089	1.979	1.551	0.247	1.457
Debt	39	32.2	270	93.674	57.477	78.4
Dependency	39	36.327	69.483	53.027	6.761	53.426
Unemployment	39	2.8	24.9	8.287	5.591	7.78
PGDP_G	39	-24.7	18.33	1.561	9.331	3.03
Migration	39	-5.966	10.742	2.738	3.371	2.857

3.3 Model Likelihood Ratio Test

To test the effectiveness of multinomial logistic models with immigration, government expenditure, and taxation set as dependent variables, separately, model likelihood ratio tests are done. And the results indicates that, all multinomial logistic models are effective (shown in Table 3).

Table 3. Multinomial logistic model likelihood ratio test

	$\chi 2$	df	p value	AIC value	BIC value
IM model	23.902	14	0.047	93.171	119.788
GE model	31.159	14	0.001	81.379	107.996
T model	35.882	14	0.001	80.039	106.656

4. Empirical Analysis

4.1 Empirical Result

The results of these three multinomial logistic regressions are shown in Table 4.

Table 4. Results of multinomial logit/logistic regression

result of multinomial logit regression for immigration policy			result of multinomial logistic regression for government expenditure policy			result of multinomial logistic regression for taxation policy		
	0	1		0	1		0	1
Population_G	1.285 (0.574)	1.763 (0.872)	Population_G	-2.982 (-1.472)	-8.639* (-1.975)	Population_G	0.716 (0.23)	6.572* (2.09)
Fertility	-4.479 (-1.037)	-1.079 (-0.287)	Fertility	5.659 (1.49)	16.591* (1.993)	Fertility	-3.197 (-0.583)	-1.351 (-0.315)
Debt	-0.02 (-0.985)	-0.011 (-0.627)	Debt	-0.036 (-1.399)	0.09 (1.70)	Debt	-0.051* (-2.035)	0.035 (1.31)
Dependency	0.203 (1.07)	0.159 (0.99)	Dependency	-0.284 (-1.762)	-0.677 (-1.875)	Dependency	0.123 (0.596)	-0.273 (-1.218)
Unemployment	-0.291* (-2.178)	-0.355* (-2.053)	Unemployment	-0.072 (-0.582)	-0.804* (-2.175)	Unemployment	-0.631* (-1.993)	-0.319 (-1.415)
PGDP	0 (-1.481)	0 (-1.269)	PGDP_G	-0.112 (-1.166)	-0.101 (-0.986)	PGDP_G	-0.066 (-0.650)	-0.019 (-0.232)
Migration	-0.411 (-1.094)	-0.324 (-0.887)	Migration	0.328 (1.04)	0.396 (1.16)	Migration	-0.796 (-1.664)	-0.788 (-1.649)
Intercept	5.724 (0.763)	0.314 (0.042)	Intercept	9.859 (1.60)	9.569 (1.19)	Intercept	9.393 (1.09)	14.8 (1.57)
Likelihood test	$\chi 2(14)=23.902$ $p=0.047$		Likelihood test	$\chi 2(14)=36.159$ $p=0.001$		Likelihood test	$\chi 2(14)=35.882$ $p=0.001$	
Dependent variable: IM McFadden R^2: 0.281 Cox & Snell R^2: 0.458 Nagelkerke R^2: 0.517 * $p<0.05$ ** $p<0.01$, z value in parentheses			Dependent variable: GE McFadden R^2: 0.423 Cox & Snell R^2 : 0.604 Nagelkerke R^2 : 0.680 * $p<0.05$ ** $p<0.01$, Z value in parentheses			Dependent variable: T McFadden R^2: 0.428 Cox & Snell R^2 : 0.602 Nagelkerke R^2 : 0.681 * $p<0.05$ ** $p<0.01$, Z value in parentheses		

The result with respect to immigration policy indicates that an increase of unemployment level would rise the possibilities of implementation of more stringent immigration policy. And compared to a tight immigration policy, higher level of unemployment rate would lower the possibilities of not changing immigration policy or applying a looser immigration policy. Apart from these, the effects of other variables are not statistically significant.

Then, for government expenditure policy, population growth, fertility rate, and unemployment rate all have statistically significant effects on expenditure policy. Higher fertility rate would impose a positive and large effect on expansionary expenditure, while population growth and unemployment rate would have negative influence on rising government expenditure.

Whereas for taxation policy, higher level of population growth would lead to increase of taxation, and the effect would be noteworthy. Nonetheless, rather than keeping the taxation constant, higher debt to GDP ratio and unemployment rate would be more likely to conduct a tax cut, though the effect of debt seems to be minimal.

4.2 Robustness Check

Robustness checks are conducted by replacing the fertility rate with the fertility rate growth, as a measurement of the trend of birth, and the results are shown in Table 5 for immigration, government expenditure, and taxation policy.

Table 5. Results of robustness check of multinomial logistic regression

result of robustness check of multinomial logistic regression for immigration policy			result of robustness check of multinomial logistic regression for government expenditure policy			result of robustness check of multinomial logistic regression for taxation policy		
	0	1		0	1		0	1
Population_G	-0.278 (-0.156)	1.315 (0.854)	Population_G	-0.983 (-0.66)	-1.467 (-0.87)	Population_G	-0.883 (-0.41)	6.004* (2.334)
Fertility_G	0.59 (1.042)	0.041 (0.078)	Fertility_G	-0.079 (-0.16)	-1.007 (-1.72)	Fertility_G	-0.345 (-0.67)	-0.248 (-0.43)
Debt	-0.016 (-0.832)	-0.009 (-0.598)	Debt	-0.04 (-1.50)	0.053 (1.656)	Debt	-0.04 (-1.89)	0.042 (1.84)
Dependency	0.111 (0.767)	0.13 (1.121)	Dependency	-0.13 (-1.16)	-0.131 (-0.94)	Dependency	0.025 (0.176)	-0.325 (-1.85)
Unemployment	-0.316* (-2.413)	-0.346* (-2.057)	Unemployment	-0.094 (-0.74)	-0.57* (-1.98)	Unemployment	-0.67* (-2.19)	-0.3 (-1.40)
PGDP	0 (-1.687)	0 (-1.365)	PGDP_G	-0.07 (-0.84)	0.03 (0.352)	PGDP_G	-0.09 (-0.98)	-0.018 (-0.21)
Migration	-0.374 (-1.098)	-0.243 (-0.772)	Migration	0.075 (0.283)	0.027 (0.095)	Migration	-0.579 (-1.41)	-0.637 (-1.72)
Intercept	4.569 (1.092)	-0.068 (1.567)	Intercept	10.931 (1.609)	6.316 (0.852)	Intercept	9.045 (1.113)	14.34 (1.575)
Likelihood test	$\chi 2$ (14)=24.344 p=0.042		Likelihood test	$\chi 2$ (14)=31.426 p=0.005		Likelihood test	$\chi 2$ (14)=35.990 p=0.001	
Dependent variable: IM McFadden R^2: 0.286 Cox & Snell R^2 : 0.464			Dependent variable: GE McFadden R^2: 0.367 Cox & Snell R^2 : 0.553			Dependent variable: T McFadden R^2: 0.429 Cox & Snell R^2 : 0.603		

Obviously, for immigration policy, the result is the same even though the trend of birth measured by fertility rate growth instead of fertility rate, as unemployment rate still have statistically significant effect on immigration policy. However, for government expenditure policy, the effects of population growth and fertility are not statistically significnat anymore, while unemployment rate still shows a statistically sinificant effect on expansionary government expenditure. Similarly for taxation policy, the effect of debt is not statistically significant while the robustness of the results with respect to population growth and unemlpoyment is verified.

5. Conclusion and Implication

In sum, in aging countries, aging dependency, debt to GDP ratio, fertility rate, and net migration do not have statistically significant effect on immigration, government expenditure, and taxation policy, while population growth would be more likely to result in an expansionary government expenditure. And unemployment has statistically significant influence on immigration, government expenditure, and taxation policy. Aging countries with high level of unemployment would prefer to tight the immigration policies and increase their government expenditures while implement a tax relief. The corresponding implication would be for the candidates of the leadership election in aging countries with high level of unemployment, which is about including expansionary expenditure and stringent immigration policies into their election platform. In the meantime, to make up the deficit due to expansionary expenditure and pension burden from aging population, tax reform might be a better idea than increasing national debt. Although, the debt to GDP ratio does not seem to induce a preference expenditure and taxation policy, too much debt might be unsustainable and even cause debt crisis.

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