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Population Decline, Labor Force Stability, and the Future of the Japanese Economy

*by Robert L. Clark, Naohiro Ogawa,
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**POPULATION DECLINE, LABOR FORCE STABILITY, AND THE FUTURE
OF THE JAPANESE ECONOMY**

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ABSTRACT

Demographic trends in Japan are producing a declining population that is rapidly growing older. With a total fertility rate around 1.3, the population has already begun to decline. This paper examines the impact of these demographic trends on the level of employment and economic growth that Japan is projected to experience over the next 20 years. We explore the effect of changes in labor market policies on age specific employment rates and assess whether innovative policies can moderate the decline in employment. Public policies encouraging increased employment of women and persons aged 60 and older could partially offset the anticipated decline in employment. The importance of the Japanese experience for European policy makers is discussed.

Keywords: low fertility, Japan, population decline, population aging

INTRODUCTION

Unless demographic trends are reversed, the Japanese population will decline in absolute size throughout the twenty-first century. Over the next 10 years, the decline will be relatively small but then the population will begin to shrink more rapidly. The decline is the direct result of extremely low fertility and a national policy that severely restricts immigration. At the same time, there will also be a super aging of the Japanese population which follows from the projected low fertility rates and one of the highest life expectancies in the world. No country has ever experienced such a decline in its population and the rapid aging of the population.

Since Japan is at the forefront of this latest stage of the demographic transition, a careful assessment of the impact of population decline and rapid aging in Japan can provide insights and important lessons for the future of Europe and other developed countries if current demographic trends are sustained in these countries. Eurostat (2005) reported that in 2003 the average total fertility rate (TFR) for the 25 member countries of the European Union was 1.48 children per woman. While there is substantial variation in the TFR across member countries, European fertility has been below the replacement level for almost three decades which suggests that low fertility is neither temporary nor transitory among these countries (Lesthaeghe and Willems 1999). The analysis in this paper focuses on Japan which is on the leading edge of the latest demographic transition. However, the economic and labor market responses to population decline and further aging in Japan can provide a useful baseline for important policy discussions on the economic implications of demographic trends in Europe.

A central question confronting national policy makers is “How will the changing demographic environment affect the economic well-being of Japan and its citizens?” An important component of the economic future of Japan will be the impact of population decline and aging on the size and productivity of the labor force (Genda, et al, 2007; Kurokawa, et al, 2004). Obviously, if age specific labor force participation rates remain constant, the labor force will reflect the smaller, older population, and the rate of decline in the labor force will tend to exceed the rate of decline of the population and alter the rate of economic growth (Sakuragawa and Makino, 2007).

A number of scholars have expressed concern about population decline and population aging and the impact of these demographic changes on the Japanese economy (Takayama, 1998; MacKellar, et al, 2000). Recently, the Japanese government also has become very concerned about the potential adverse economic effects of low fertility and issues an annual white paper on low fertility. The 2008 white paper projects that the labor force will decline by one third during the first half of the twenty-first century, falling from its current level of 67 million to only 42 million by 2050, unless specific policy changes are made by the government and employers. The report then makes a series of recommendations to increase labor force participation rates of specific groups to moderate the decline in employment (The Japan Times 2008; Nikkeinet Interactive 2008).

In this paper, we explore whether economic and labor market policies can be adopted to stimulate increases in labor force participation among certain demographic groups to forestall or at least partially offset the decline in the absolute size of the labor force and the degree to which such an augmented labor force might help Japan maintain its current level of Gross Domestic Product (GDP) and GDP per capita. Given the high

level of labor force participation of men aged 25 to 59, increases in age specific employment rates must come among older men, women, and youths.¹

Are such increases in employment possible and if so, what policies are needed to achieve them? By examining past trends in the Japanese labor market, we present an analysis of future employment possibilities and discuss the impact of alternative government policies and regulations, employment contracts and company human resource policies, and changes in general labor market conditions on the future size of the Japanese labor force. An interesting question is whether similar policies could be adopted in Europe or in other developed countries and whether they would be effective in moderating any adverse effects of population decline in these countries.

Our analysis begins by describing the changes in the population and labor force over the past half century. These data will provide the context for assessing the potential to stabilize the labor force even as the population declines. Next, we present baseline projections from the NUPRI Macro Simulation model of the Japanese economy. The model is described along with its key assumptions that reflect current economic policies and demographic trends and then 20 year projections from the NUPRI model are presented. The final sections of the paper focus on the employment rates of older persons, women, and youth and explore how these rates might be increased to augment future employment. Using these potentially higher employment rates, new projections are made using the NUPRI model and we examine the impact of these changes on employment, GDP, and GDP per capita.

POPULATION AND LABOR FORCE TRENDS

Following World War II, Japan experienced a baby boom that was much shorter in duration than that experienced by most developed countries, lasting only three years from 1947 to 1949. Even this short boom set the stage for a relatively rapid growth in the working age population and the labor force in the ensuing decades. Following the baby boom, fertility rates began a long term decline and the fertility rate in the early years of the twenty-first century has remained around 1.3. Coinciding with the fall in the fertility rate, the total number of births has fallen from approximately 2.75 million in 1947 to slightly more than one million in 2007 (Ministry of Internal Affairs and Communications, 2007).

Fertility declines have been accompanied by sharp declines in mortality and a resulting increase in life expectancy at age 65. Female life expectancy at age 65 is now approaching 24 years. This represents a doubling of remaining years of life for women age 65 since 1947. During the same time period, the life expectancy of men at age 65 has risen from 10 to 18 years. These demographic trends, together with immigration policies that essentially closed Japan to net in migration, caused population growth to slow during the 1980s and 1990s and more recently, to decline and have also produced a dramatic aging of the population (Ministry of Health, Labour Welfare, 2007). In this section, we describe the changes in the working age population and the labor force from 1960 to 2006.

Reflecting the higher post-war birth rates, the Japanese population 15 and over (referred to as the adult population) increased by 21 percent between 1960 and 1970 and then grew by 13 percent in each of the next two decades.² The Japanese population grew

from 65.2 million in 1960 to 100.9 million in 1990 (see Table 1). However, the population growth rate has been significantly lower since 1990 as the adult population increased by only 7.4 percent between 1990 and 2000 so that at the end of the twentieth century, the Japanese adult population was 108.4 million. In the last 6 years, the population age 15 and over grew by only 1.7 percent to reach a total of 110.2 million (Statistics Bureau, 2007).

[Table 1]

Declines in age specific labor force participation rates and changes in the age composition of the population meant that the labor force grew more slowly than the population (Sakai and Asaoka, 2007). This difference was most apparent in the 1960s when the proportion of youths enrolled in colleges and universities increased. The proportion of youths aged 15 to 24 enrolled high school and universities rose from 26.9 percent in 1960 to 36.0 percent in 1970 and further to 50.9 percent in 1980. As the enrollments increased, the labor force participation rates for men and women of these ages declined sharply (Statistics Bureau, 2007).

Between 1960 and 1970, the labor force grew by only 14.2 percent compared to the 21 percent increase in the population which resulted in a decline in the labor force participation rate for persons aged 15 and over from 69 percent in 1960 to 65 percent in 1970. More recently, the aging of the population has resulted in an absolute decline in the labor force. The Japanese labor force peaked at 67.9 million in 1998 and declined each year until 2004 when the labor force totaled 66.4 million. Between 2004 and 2006, the labor force increased slightly to 66.6 million. The 2006 Japanese labor force was smaller than the 1995 labor force.

The slower growth in the labor force is due to the rapid aging of the population which has increased the share of the 15 and older population that was age 60 and older. For example, in 1960 only 12.7 percent of the adult population was over age 60; however, this proportion had increased to 21.5 percent by 1990. With continued population aging, the proportion of the population aged 15 and older composed of those 60 and older had reached 31.2 percent in 2005. The aging of the adult population implies that holding age specific participation rates constant, the national labor force participation rate of the population 15 and older will decline. However, the age specific rates have not been constant over the last 50 years. Tables 2 and 3 show the labor force participation rates by age and gender between 1960 and 2006.

Several important observations can be made from examining these tables. First, virtually all men aged 25 to 54 are in the labor force and there has been little or no change in these rates. Second, there were sharp declines in the participation rates of younger men and women between 1960 and 1980 as the incidence of schooling rose. Interestingly, the participation rates for persons under age 25 declined between 2000 and 2006, a phenomenon related to the change in lifestyles often referred to as Neets and freeters.³

[Tables 2/3]

A third observation is the increase in the participation rate of men 55 to 59 from 1985 to 1995 that has been linked to the raising of the age of mandatory retirement in most companies and changes in the national social security system and company pension plans.⁴ Fourth, we observe increases in the labor force participation rate of women; however, the increase is found mostly among women aged 25 to 29. This increase in the

labor force participation rate of young women that began in 1975 is often attributed to the increase in age of marriage. For example, the mean age of marriage of Japanese women increased from 24.5 years in 1975 to 29.4 years in 2005.

During the past two decades, the Japanese labor market has undergone considerable changes during a period often called the lost decade (Hayashi and Prescott, 2004). With slow or no economic growth, unemployment increased and layoffs became more common. New college and high school graduates found it more difficult to find career jobs. The incidence of part-time employment increased as did the number of workers on contract or temporary jobs. This restructuring of the historical employment relationship and career expectations influenced employment opportunities and labor supply choices and thus the labor force participation rates of men and women of all ages.

As the population declines, can additional persons be enticed to enter the labor force to reduce the anticipated decline in the labor force? Table 4 illustrates the 2006 population by age and gender along with the labor force participation rates. At a glance, one can see that increases in the labor force participation rates can only come from older men and women, working age women, and youths. Can the Japanese government develop new labor market policies that will increase the labor force participation rates of these groups and help stimulate a higher level of economic growth? Do individuals in these demographic groups who are currently not in the labor force want to work? The following sections provide an assessment of the possibility of increasing labor force participation rates, the impact of these increases on GDP and GDP per capita, and a discussion of policies that might offset the projected decline in the size of the labor force in the next 20 years.

[Table 4]

DEMOGRAPHIC REALITIES AND POSSIBLE ECONOMIC FUTURES

Using the NUPRI Macro Simulation Model, we examine how the Japanese economy might evolve given the demographic realities of low fertility and high life expectancy. We present three possible scenarios using alternative assumptions concerning age specific employment rates. First, we present baseline projections of the model assuming that the age specific employment rates remain constant over the next 20 years. Next, we determine the percentage point increase in the employment rates of the elderly, youths, and women needed to maintain the 2005 employment ratio, i.e. the number of employed persons divided by the total population. Are increases of this level possible? Third, we use data from 2002 Employment Status Survey indicating work preferences for individuals currently outside the labor force.⁵ We then show the impact of developing labor market policies that gradually allow these potential workers to enter the labor force.

The NUPRI Macro Simulation Model

The Nihon University Population Research Institute (NUPRI) has been continuously developing a series of population projections as a part of a modeling project supported by the Japan Medical Association since 1984. The 2008 NUPRI model consists of three modules: demographic, economic, and social security. The interrelationships among these modules are depicted in Figure 1 (a more detailed description of the model along with the main equations is presented in the appendix). The model includes stochastic elements in the demographic and economic modules. The arrows in the figure indicate the direction of causation throughout the modules

[Figure 1]

The demographic module was developed following the Lee-Carter method (Lee and Carter 1992). Age-specific death rates at age x in time t , $m(x, t)$, are computed on the basis of the age group from 0 to 100 plus and the time period 1950-2000. In matrix notation, the Lee-Carter model takes the following simple form:

$$\log m(x,t) = \vec{a}(x) + \vec{b}(x)\vec{k}(t)$$

In the above equation, the three parameters (a , b , k) need to be estimated, and we have used time-series data over the period 1950-2000 to estimate the parameters, using the method of singular value decomposition (SVD). Furthermore, we have assumed that the estimated key temporal parameter (k) is linearly linked to the time trend.

Fertility is modeled using the framework laid out by Lee and Tuljapurkar (1994). We have estimated three key parameters (k , a , b) used in the Lee-Tuljapurkar study, using SVD applied to fertility data derived from vital statistics over the period 1950-2000. We have found that an ARIMA (1,0,1) model fit the time series of k as well as any other, so we forecast the parameter as an ARIMA (1,0,1).

The economic module is basically a compact aggregate supply framework. All the coefficients have been estimated on the basis of time-series annual data from 1969 to 1998.⁶ The Social Security module calculates retirement benefits based on the benefit formula in effect prior to the 2004 reforms. This module incorporates data for the other sectors of the NUPRI model to determine retirement benefits. The equations listed in the Appendix, many have been widely utilized in other modeling work previously undertaken (Ogawa et al. 2003), so a detailed description for each equation is not presented in the text except for the real GDP equation and the private saving rate equation, both of which

have been newly incorporated into the 2008 version for the purpose of undertaking the present study.

Insofar as the real GDP equation is concerned, stochastic income forecasts are generated based on the characteristics of the standard error in the following production function:

$$\Delta \log \left(\frac{GDPR_t}{LD_t \cdot HP_t} \right) = 0.0155 + 0.2630 \cdot \Delta \log \left(\frac{KP_{t-1}}{LD_t \cdot HP_t} \right) - 0.0094 \cdot Dum \quad \dots (1)$$

(2.16) (3.06)
(-1.57)

$\bar{R}^2 = 0.311, SE = 0.0144, DW = 1.570$

where *GDPR* = gross domestic product in real terms (billions of 1990 yen), *KP* = gross fixed capital of plants and equipment in the private sector, *LD* = labor demand, and *HP* = annual hours worked. The dummy variable (*Dum*) is intended to capture the effect of the economic structural change leading to “Japan’s lost decade,” taking a value of 1 over the period 1990-98 and otherwise 0.

By using the mean value of each variable (excluding *Dum*) in Equation (1), we have calculated a “potential” level of TFP. Growth in our potential index is approximately 1.56 percent per year, which is considerably higher than Japanese TFP growth reported in other recent studies. For instance, Kimura (2002) has recently shown that the average value of TFP without adjusting for the level of capital stock utilization was -0.7 percent for the period 1981-1985, 1.9 percent during 1986-1990, -1.5 percent for the period 1991-1995, and -0.6 percent for 1996-1998. According to Jorgenson and Motohashi (2003), TFP without adjusting for utilization was 0.96 percent over the period

1975-1990, 0.61 percent during 1990-1995, and 1.04 percent for 1996-2000. Once we take into account the dummy variable, as we do in our forecasts, our effective TFP growth rate averages 0.62 percent, more in line with other estimates.

In the economic module, the private saving rate equation is another key equation. The estimated equation that we have adopted for forecasting is:

$$\log(SRATE) = 4.4440 - 0.6431 \cdot \log\left(\frac{POP65OV}{TPOP}\right) \dots\dots (2)$$

(20.45) (-6.84)

$$\bar{R}^2 = 0.968, SE = 0.052, D.W = 1.903$$

where *SRATE* = private saving rate, *POP65OV* = population aged 65 and over, and *TPOP* = total population. Including the proportion of those aged 65 and over in the total population as a regressor is motivated by the life cycle hypothesis. The computed result implies that when the proportion of those aged 65 and over rises by 10 percent, the private saving rate falls by 6.4 percent.

The functioning of the economic module given these components is straightforward. First, based upon the production function, real GDP is determined by the initial capital stock owned in the private sector, the country's total labor supply, and total factor productivity. Then, real GDP interacted with the private saving rate determines private saving, which is injected back into the economy in the form of private investment. The amount of private investment for the current year, combined with the current year's private capital stock adjusted for depreciation, determines next year's capital stock.

Government production is assumed to be a negligible share of the overall economy. This sequence is repeated for each year of the forecasting period.

Baseline Projections of NUPRI Model

The baseline projections from the NUPRI model indicate a steady decline in employment from 63.7 million in 2005 to 55.6 million in 2025. At first, the decline in the size of the labor force is due to the aging of the population aged 15 and over and the lower employment rates of those 60 and older. The proportion of the adult population aged 60 and older is projected to increase from 30.8 percent in 2005 to 37.8 percent in 2015 and further to 40.7 percent in 2025. Ultimately the shrinking size of the population 15 and older begins to exacerbate the decline in the labor force. Productivity increases generated by a growth in capital per worker are sufficient to increase GDP until 2019.

During this period, real GDP in 1990 constant prices rises from 555 trillion yen in 2005 to 634 trillion in 2019; however, after that date, the impact of a smaller workforce outstrips the productivity gains and GDP begins to decline falling to 618 trillion yen in 2025. The growth rate in real GDP fluctuates between 0.0 and 1.5 percent until it turns negative in 2020. GDP per capita continues to increase until 2024 and then begins to decline. Thus, the future of the Japanese economy as projected by the NUPRI model is for continued but slow growth over the next 15 years and then declines in GDP and GDP per capita thereafter.

As previously mentioned, these projections assume no major changes in labor market policies and they do not include the impact of the 2004 Social Security changes. As we consider the future of the Japanese economy, key questions are:

1. Will changes in retirement policies that lower future Social Security and pension benefits encourage a higher percentage of older workers to remain in the labor force?
2. Would the increase in the age of mandatory retirement also increase the employment rate of persons aged 60 to 64?
3. Would more active government anti-discrimination policies increase the proportion of women in the labor force?
4. Will the decline in the number of men aged 25 to 59 stimulate a greater demand for employees outside this demographic group and thus increase the labor force participation rate of these groups?

We address these questions in two ways. First, we explore the size of the increase in the age specific employment rates of certain demographic groups needed to offset the projected decline in the labor force and secondly, we examine policies that might generate increases in the participation rates.

Maintaining the Employment Ratio

Using the NUPRI model, the future population of Japan is projected for the next 20 years. Table 5 shows that the total population remains relatively stable on the next ten years as the population declines from 127.5 million in 2005 to 126.2 million in 2015. However, the population experiences a decline of 4 percent over the next 10 years resulting in a population of only 121.2 million in 2025. Since our interest focuses primarily on changes in employment, the second row of the table shows the trends in the adult population, those aged 15 and over. As expected, the decline in the adult population is slower than that of the general population as the immediate impact of low

fertility is revealed in smaller cohorts aged 0-14. The population aged 15 and over remains approximately 110 million until 2015 before beginning to decline. By 2025, the adult population will have fallen to 107.6 million or a decline of 2 percent over 20 years.

[Table 5]

Despite the relative stability in the size of the adult population, there is substantial population aging and this rapid aging has significant implications for the size of the Japanese labor force. Tables 2 and 3 illustrate the lower participation rates of Japanese aged 60 to 64, 65 to 69, and 70 and over compared to those 25 to 59. The rapid increase in the proportion of the population 15 and over that is aged 60 and older combined with their lower labor force participation rates has a negative impact on the size of the labor force.

To illustrate the impact of changing demography on employment, the baseline projections assume that age specific employment rates for men and women remain constant at their 2005 levels over the next 20 years. The combined impact of low fertility and population aging results in a decline in the number of people employed that is considerably larger than the decline in the working age population. Row three of Table 5 shows that over the next 10 years, employment is projected to decline from 63.7 million to 58.7 million, a decline of 7.8 percent during a decade when the working age population remained relatively constant. The decline in employment continues between 2015 and 2025 producing a level of employment of only 55.6 million in 2025. This represents a decline of another 5.3 percent in the number of employed Japanese during this 10 year period. It is important to recognize that this decline in the number of people working is

almost completely due to the aging of the working age population and not due to a decline in its size.

The total decline in employment between 2005 and 2025 is 8.1 million workers or 12.7 percent. This compares with a decline of 1.9 percent in the adult population and a decline of 5 percent in the total population. Thus, low fertility and rapid population aging exerts its largest negative impact on employment. As a result, the employment ratio is projected to decline from 50 percent in 2005 to 46 percent by 2025. Can the demographic impact on the labor force be eliminated or at least moderated? To explore this question, we conducted the following simulation on how the expected decline in employment can be offset.

The ratio of employed persons to the total population was 50.0 percent in 2005. We now find the increase in age specific employment rates necessary to maintain this ratio in each year between 2005 and 2025. Since virtually all men 25 to 59 are employed, we assume that employment rates for these men will remain constant in the coming years. Since men of these ages represented 43 percent of the 2005 labor force, this implies that all increases in employment must come from those demographic groups representing only 57 percent of the current labor force. We then determine a uniform percentage point increase in employment rates of men aged 15 to 24, women aged 15 to 24, women aged 25 to 59, and women aged 60 and over that would be needed to maintain the 2005 ratio of employment to total population at 50.0 percent over the next 20 years.

These percentage point increases in age specific employment rates are reported in row five of Table 5. For example, over the next 5 years, the employment rates of the previously noted demographic groups would need to increase by 4.7 percentage points

for the employment ratio to remain at its 2005 level. By 2015, the employment rates would have to increase by another 4.4 percentage points for a total increase of 9.1 percentage points to stabilize the employment ratio. In the subsequent 5 year periods, the needed increase in employment rates continues to grow. In 2025, the employment rates for youths, women, and the elderly would need to be 13.3 percentage points higher than the 2005 employment rates for these groups.

The magnitude of these changes can be seen by comparing the percentage point increase in employment rates required to maintain the employment ratio to the actual labor force participation rates shown in Tables 2 and 3 for these groups. Are such large increases in the employment rates for these demographic groups likely? If not, the employment ratio will decline and the adverse economic impact of low fertility and population decline will be greater.

Can innovative employment and retirement policies be adopted to increase the proportion of youths, women, and the elderly who are employed? The previously mentioned 2008 white paper on low fertility outlines the government's desire to sharply limit the decline in the labor force by proposing specific policies to encourage the employment of these groups. In particular, the targets are to increase the employment rate of women aged 25 to 44 from the current 64.9 percent to between 69 and 72 percent by 2017 and the employment rate of people aged 60 to 64 from 52.6 percent to between 60 and 61 percent (The Japanese Times 2008). These targeted increases in the employment rates presented in the white paper are about half of those shown in Table 5 that are needed to maintain the employment ratio over the next 20 years.

Preferences for Work and Increases in Participation Rates

The possibility of increasing the employment rates over the next 20 years depends on the preferences for work of those individuals who currently remain outside the labor force, the demand for their services, and the working conditions that they are offered. Every 5 years as part of Employment Status Survey, the Japanese government asks individuals whether they are working and if not, do they want to work. Together these groups comprise the potential labor force. The proportion of the population who are currently not employed but who would like to work is comprised primarily of women and older men.

If Japan were to adopt policies that would remove barriers to their employment, it is reasonable to assume that some or all of these individuals would enter or reenter the labor force. In the case of women, the proportion of women who are not working but would like to find employment ranges between 15 and 25 percentage points in most age groups. The gap for men aged 60 to 69 is 15 percentage points. Thus, it would appear that with the appropriate labor market policies, the future Japanese labor force could be substantially increased. The desire of Japanese elderly to remain in the labor force will be influenced by the expected decline in Social Security benefits and potential reductions in employer provided pensions that will reduce retirement income. In addition, continued improvements in health and increasing longevity may also increase the desire to remain in the labor force until older ages.

To measure the impact of this potential labor force on the Japanese economy, we calculated the difference between the potential level of employment and the actual proportion of persons working for each age and gender group. We then increased the employment rate of each demographic group by 5 percent of this gap each year between

2005 and 2025. This process provides for a gradual movement of all individuals wishing to work into the labor force. Thus, we are simulating the adoption of new employment policies that gradual move toward the full employment of all persons indicating that they desire to be employed.

By 2015, these additional persons increase employment by 1.8 million; however, total employment still declines from 63.7 million in 2005 to 60.4 million in 2015 and further to 56.5 million in 2025. With the inclusion of the additional members of the labor force, real GDP is 2.1 percent higher in 2015 and 2.4 percent higher in 2025 than the baseline projections. Given the stated desire by individuals for employment and the likely increase in demand for additional employees, the adoption of national policies encouraging delayed retirement and greater utilization of women in the formal sector of the economy could significantly slow the decline in the labor force. We now briefly consider some of the policies necessary to achieve a higher labor force ratio in the presence of the shrinking population.

EMPLOYMENT AND RETIREMENT POLICIES

In this section, we consider the likelihood that employment rates of certain demographic groups can be increased over the next 20 years. The projected decrease in the size of the labor force associated with population decline and population aging could increase the demand for youths, women, and the elderly. Changes in public policy and corporate human resource policies may make it easier for these individuals to find and retain employment. Survey evidence indicates that many individuals in these groups who are currently outside the labor force would like to find employment.

Older workers and retirement decisions

Older persons in Japan have much higher employment rates than the elderly in other developed countries. As health has improved and life expectancy increased, employment constraints and national economic conditions have become more important in influencing the age of retirement. Earlier research has shown two important changes in the employment patterns of older persons (Matsukura, et al, 2007). First, in the adverse economic environment of the past decade, employment of persons 60 and over declined. Second, as mandatory retirement ages were increased from 55 to 60 between 1985 and 1995 and the age of eligibility for Social Security benefits was increased, employment rates of persons aged 55 to 60 rose.⁷ Today, men aged 55 to 59 tend to remain on their career jobs and now their employment pattern are similar to men 50 to 54 and look less like the employment patterns of persons 60 to 64.

More changes in national retirement policies are likely. The Japanese government is attempting to encourage firms to increase the mandatory retirement age to 65. The passage of the *Law Concerning Stabilization of Employment of Older Persons* in 2004 required firms to increase the age of mandatory retirement to 65 or adopt a reemployment policy for older employees; however, there are no penalties specified for noncompliance. Few companies have increased the age of mandatory retirement in response to this law. In the future as the number of new entrants into the labor force steadily declines, it is likely that firms will conclude that it is in their own self interest to increase the retirement age. Already enacted changes in Social Security are raising the normal retirement age for full benefits from 60 to 65 and lowering the replacement ratio for future retirees (Sakamoto, 2005). Employers have also been restructuring their company pension plans in ways that will reduce future retirement benefits.

Given the desire to remain on the job by most Japanese men, these changes should result in higher employment rates for men 60 to 64. Potentially, employment rates for men aged 60 to 64 could approach those of men aged 55 to 59. Since the current participation rate for men 60 to 64 is 71 percent and that of men aged 55 to 59 is 93 percent, this could imply an increase of 15 to 20 percentage points in the proportion of men aged 60 to 64 that remain employed.⁸ Such an increase in the employment of men of this age would probably also give rise to an increase in the employment of men aged 65 to 69. Matsukura, et al (2007) present evidence in support of the likely increase in the participation rates of older men in response to changes in retirement policies.

Employment of women and discrimination in the labor market

In marked contrast to many other industrialized societies, the overall level of female labor force participation in Japan has shown no sharp or consistent rise in recent decades. In 1965, the female labor force participation rate stood at 55 percent, and in 2006, it was virtually lower at 49 percent (Statistics Bureau 2007). In the interim, it followed a U-shaped pattern, falling through the mid-1970s before rising again. The absence of any substantial trend in the level of female labor force participation in Japan during the past several decades is the product of contradictory trends in alternative subgroups of the population, as well as the sensitivity of female employment to short-run economic fluctuations. The response of female labor supply in Japan to such factors underscores what is often claimed about female workers in Japan, viz., that they are marginal workers.

It is also important to note that the age-specific labor force participation rates of Japanese women still show an M-shaped pattern, although participation among middle-aged women has been rising in recent years primarily due to their higher education,

shortening of the reproductive span, and a more modern life-style (Ogawa and Ermisch 1996; Mason and Ogawa 2001; Retherford and Ogawa 2006). It should be stressed that slightly more than half of married women working as paid employees are part-time workers, and that this proportion has been growing at a rate faster than that of full-time workers in the 1990s during Japan's lost decade which occurred immediately after the bursting of the bubble economy (1985-1990).

Obviously, one of the labor-related policy options to counteract the declining male labor force is to raise female employment. It should be borne in mind, however, that the total fertility rate (TFR) in Japan has fallen to 1.32 births per woman. In 1989 the TFR was 1.57 births per woman. The media picked up the story, and "1.57 shock" hit the headlines throughout Japan. As a result, in 1990 the government established an inter-ministry committee on "creating a sound environment for bearing and rearing children." Since then, a variety of pro-natalist policies have been implemented, as shown in Table 6. A brief glance at this table reveals that the government of Japan has been implanting a fairly wide range of pronatalist policies and programs over the past 15 years.

Among various pro-natalist policies listed in Table 6, it is worth paying attention to the "Next Generation" law in 2003, which addressed the problem that many parents (mainly women) were not taking childcare leave due to social disapproval from co-workers and employers. It included measures aimed at creating an atmosphere within firms that would encourage parents to take the childcare leave to which they were entitled. To accomplish this, the law required employers with more than 300 employees to come up with a plan to raise fertility among their employees and to submit the plan to the government. Approval of the plan allows the firm to display a logo on its products

and advertisements, which says, “We support childrearing among our employees.” At the bottom, the logo says, “Government-certified child-friendly employer.”

Despite all these measures connected with women’s participation in the labor market, fertility in Japan has continued to decline. Without these measures, however, the TFR probably would have declined even more than it has. It is tempting for the government to place the burden of raising fertility on employers because of the government’s huge budget deficits and public debt. Yet there are dangers in this approach. The first danger is that employers will avoid hiring women, especially as full-time workers. Indeed, survey data show that, since 2000, the proportion of currently married women below age 50 who are working full-time has declined and the proportion who work part-time has gone up (Retherford and Ogawa 2006). The second danger is that firms may become less efficient and less competitive in the global economy.

It is also worth remarking that despite the slow developments in greater equality between the sexes in the labor market, acceptance of sexual equality is rapidly increasing throughout the Japanese society, and is reflected by the attention given to it by the mass media. One indication of changing attitudes is the trend in the proportion of men and women reacting positively to the question: “The external world for the husband, the domestic world for the wife. What do you think of this view?” The proportion who responded positively declined from 85 percent to 51 percent among men and from 84 percent to 40 percent among women between 1972 and 2007.⁹

freeters and Neets: Labor Market Choices of Japanese Youths

An increasing proportion of Japanese youths aged 15 to 34 are choosing alternative life styles that do not including finding and keeping full-time, career jobs in

the formal sector of the economy. These nontraditional lifestyles may have been imposed on some individuals due to the lack of career job opportunities over the last two decades. Two terms are frequently used to describe young persons who remain outside the formal labor force are freeter and Neet. Persons classified by the government as being Neets are completely outside the labor force while freeters are youths that are engaged in temporary or part-time employment. The increasing proportion of young people who are choosing not to seek permanent full-time jobs after graduation or who decide to quit their first jobs is causing considerable concern among policy makers in Japan. A country with a declining population must strive to have a very high proportion of its potential labor force actually working. The Japanese government is sufficiently concerned about the rising incidence of freeters and Neets that the government published a series of papers examining these trends and offering some policy recommendations (Japan Institute of Labour Policy and Training 2000; Cabinet Office 2003).

Between 1982 and 2002, the proportion of youths aged 15 to 34 who are classified by the government as freeters rose from 1.9 percent to 7.4 percent. In contrast, the proportion of younger Japanese who are viewed as being Neets remained virtually unchanged at 1.6 percent of the population aged 15 to 34. In 2002, this meant that there were 2.5 million freeters and 0.5 Neets among younger Japanese. Thus, 9.0 percent of Japanese aged 15 to 34 or over 3.0 million individuals were outside of the formal labor force and did not want to join it. The proportion of women that are freeters and Neets has consistently been higher than the incidence for men. In 2002, the incidence of being either a freeter or Neet among men was 7.9 percent compared to 10.3 percent for young women.

A key policy question is whether this recent decline in the proportion of Japanese youth who are engaged in full-time, permanent employment is an on-going lifestyle trend or a by-product of the lost decade and poor employment opportunities. The 2002 Employment Status Survey of worker preferences indicates that about 10 percent of men and women aged 15 to 24 do not have a job but would like to be employed. Another reflection of the changed labor market for youths during the lost decade is the decline in the proportion of university graduates that found employment after graduation. The employment ratio of graduates declined from 80 percent in 1990 to around 60 percent in 2000. The decline in employment of youths reflected the overall drop in demand for workers associated with the adverse economic conditions.

Enhanced employment prospect that may evolve due to a shortage of older workers may result in more aggressive recruiting by employers of young workers and thus, increase the employment ratio of this group. During the next three years, the large cohort of baby boomers will reach age 60 and many will retire from their career jobs and others will leave the labor force entirely. The relatively large number of retirements will increase the employment opportunities of youths.

CONCLUSIONS

The short run demographic future of the Japanese is virtually certain. Little or no immigration, long life expectancy, and a recent history of very low fertility rates will produce a slowly declining population over the next 20 years and a super aging of the population. Within the next two decades, over 40 percent of the working age population will be age 60 or older. The economic impact of these demographic realities depends on employers, individuals, and government reactions to a declining population and the

ultimate decline in the size of the economy. The baseline projections presented in Table 7 reveal a slow decline in the population over the next 20 years but an extremely rapid aging of the adult population. As a result, the labor force is expected to decline which will slow the growth of GDP and GDP per capita.

[Table 7]

As the number of new entrants into the labor force declines below the number of retiring employees, will labor markets adjust to increase the labor force participation rates of youths, women, and older men? A restructuring of the Japanese system of industrial relations and employment contracts may be needed if a larger proportion of individuals aged 60 and older are to remain active employees. Policy changes include increasing the age of mandatory retirement to allow older employees to remain on career jobs, reducing seniority wage gains so that older employees are not much more expensive than younger employees, and eliminating deeply held views concerning the employment of women. Recontracting with retired older workers at lower wages, perhaps in less prominent jobs, is another way of reducing the cost of older employees. If a main determinant of companies desiring to force older employees to retire is that their cost exceeds their productivity, then methods of wage reduction should increase employment opportunities for older persons.

If demand for Japanese products remains high, the demand for workers could well exceed the traditional labor force. Thus, to hire and retain an adequate labor force, firms will need to hire more women and to retain older workers. Will a higher proportion of the adult population be willing to work? Survey evidence indicates that many women aged 20 to 59 who are currently not employed would like to be working. Thus, there may

be a potential but as yet untapped supply of additional workers. With companies seeking additional workers and the government mandating new retirement and antidiscrimination laws, new employment opportunities will become available for these potential workers.

The bottom two sections of Table 7 report projections based on increased employment rates from the two scenarios we developed. Our first simulation illustrates the impact of increasing the age specific employment rates of youths, women, and older men sufficiently to maintain the employment ratio. This example illustrates that the main effect on the Japanese labor force in the next 20 years is not a decline in the population 15 and older but the rapid aging of the working age population. In contrast, our scenario that allows all persons desiring to work to find jobs results in a decline in the employment ratio from 50.0 percent in 2005 to 46.6 percent in 2025.

Despite the prospect of increasing employment rates in the future, the demographic realities of Japan are such that the labor force will ultimately decline. In the short run, productivity growth will be greater than the decline in the labor force and GDP continues to increase. However, around 2020, the rate of decline in the number of workers exceeds productivity growth and the size of the economy will begin to shrink. Continued productivity growth and a rising capital labor ratio will enable GDP per capita to continue to increase for a few additional years.

What lessons will the Japanese experience provide for Europe? The ability to augment the future labor force by increasing employment rates of certain groups will depend, in part, on the current employment levels of these groups. In contrast to Japan, the labor force participation rates in Europe among women are higher but the participation rates of older persons are much lower.¹⁰ Thus, if European populations

begin to decline, the potential to augment employment must primarily be among persons aged 60 and over.

To achieve this objective, countries must raise the ages of eligibility for Social Security, eliminate mandatory retirement or increase the age of compulsory retirement, and develop other labor market policies aimed at providing job opportunities for older workers. Increasing the employment rates of persons 60 and over to half the levels observed in Japan would add a significant number of workers to the future labor forces of European countries. Of course, such changes will be controversial and resistance can be expected. Another option for European countries to maintain a higher employment ratio in the face of population decline is higher levels of immigration. Greater immigration is also a highly political policy alternative and Japan with its lack of immigration will not provide any guidance on its economic impact in a low fertility world (Keese, 2006).

As the demographic future unfolds, European policy makers may wish to closely examine the Japanese experience where population decline and super aging are already occurring. The ability of Japan to adopt labor market and retirement policies to increase employment rates among women and the elderly should be closely monitored by countries facing similar population trends.

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Table 1 Population and the labor force: 1960 TO 2006

Year	Population 15 and older (millions)	Labor Force (millions)	Labor Participation Rate (percent)
1960	65.2	45.1	69.2
1970	78.9	51.5	65.3
1980	89.3	56.5	63.3
1990	100.9	63.8	63.2
2000	108.4	67.7	62.5
2006	110.2	66.6	60.4

Source: Statistics Bureau Japan, Annual Report on the Labour Force Survey, 2007.

Table 2 Male labor force participation rates

Year	15-19	20-24	25-29	30-54	55-59	60-64	65-69	70 and over
1960	52.7	87.8	95.5	96.1	88.9	81.4		
1965	36.3	85.8	96.8	96.7	90.0	82.8		
1970	31.4	80.7	97.1	97.4	91.2	81.5		
1975	20.4	76.0	96.4	97.3	92.2	80.1	63.6	31.4
1980	17.4	69.6	96.3	97.1	91.2	77.8	60.1	28.4
1985	17.3	70.1	95.7	96.9	90.3	72.5	55.6	26.8
1990	18.3	71.7	96.1	97.3	92.1	72.9	54.1	26.3
1995	17.9	74.0	96.4	97.7	94.1	74.9	54.2	26.1
2000	18.4	72.7	95.8	97.4	94.2	72.6	51.1	24.3
2006	16.4	69.1	93.9	96.6	93.2	70.9	47.6	20.7

Source: Statistics Bureau Japan, Annual Report on the Labour Force Survey, 2007.

Table 3 Female labor force participation rates

Year	15-19	20-24	25-29	30-54	55-59	60-64	65-69	70 and over
1960	49.0	70.8	54.5	58.4	49.7	43.0		
1965	35.8	70.2	49.0	57.8	49.8	39.8		
1970	33.6	70.6	45.5	57.6	48.7	39.1		
1975	21.7	65.7	42.6	55.0	48.8	38.3	24.5	9.5
1980	18.5	70.0	49.2	58.2	50.5	38.8	25.8	9.6
1985	16.6	71.9	54.1	61.4	51.0	38.5	26.8	10.0
1990	17.8	75.1	61.4	64.8	53.9	39.5	27.6	10.4
1995	16.0	74.1	66.4	65.0	57.0	39.7	27.2	10.3
2000	16.6	72.7	69.9	65.7	58.7	39.5	25.4	9.8
2006	16.6	70.1	75.7	68.1	60.3	40.2	25.1	8.7

Source: Statistics Bureau Japan, Annual Report on the Labour Force Survey, 2007.

Table 4 Population and the labor force: 2006

Group	Population 15 and older (millions)	Labor Force (millions)	Labor Force Participation Rate (percent)
Age 15-24			
Men	7.1	3.2	44.7
Women	6.8	3.1	45.3
Age 25-59			
Men	31.1	29.8	95.6
Women	30.8	20.9	67.7
Age 60-64			
Men	3.9	2.8	70.9
Women	4.2	1.7	40.2
Age 65-69			
Men	3.6	1.7	47.6
Women	3.9	1.0	25.1
Age 70 and over			
Men	7.6	1.6	20.7
Women	11.2	1.0	8.7

Source: Statistics Bureau Japan, Annual Report on the Labour Force Survey, 2007.

Table 5 Population and labor force projection: 2005 TO 2025

	2005	2010	2015	2020	2025
Total population (millions)	127.5	127.4	126.2	124.1	121.2
Working age population (15 and older in millions)	109.7	109.8	109.5	108.7	107.6
Total employment millions ¹	63.7	61.8	58.7	56.7	55.6
Employment ratio (percent) ²	50.0	48.5	46.5	45.7	45.9
Percentage point increase in age-specific employment rates needed to maintain the employment ratio at 50.0		4.7	9.1	12.2	13.3

¹ Assumes age specific employment rates remain constant over time.

² Employment ratio is the number of people employed divided by the total population.

Table 6 Selected major Japanese government programs aimed at raising fertility

TFR	Year	Action
2.14	1972	Establishment of child allowances (no pronatalist intent at first)
1.54	1990	Establishment of inter-ministry committee on “Creating a sound environment for bearing and rearing children”
1.53	1991	Enactment of Childcare Leave Act
1.5	1994	Announcement of Angel Plan for 1995-99
1.42	1995	Enactment of Childcare and Family Care Leave Act
1.34	1999	Announcement of New Angel Plan for 2000-04
1.33	2001	Amendment to the Employment Insurance Law, specifying 40 percent of salary to be paid to regular full-time employees during childcare leave
1.32	2002	Announcement of “plus one” plan
1.29	2003	Enactment of “next generation” law
	2003	Enactment of law on “Basic Measures to Cope with a Declining Fertility Society”
1.29	2004	Announcement of New Angel Plan for 2005-09

Source: Matsukura, Retherford, and Ogawa (2007).

Table 7 Demographic and economic projections

	2005	2010	2015	2020	2025
<u>Baseline Projections</u>					
Total Population (millions)	127.5	127.4	126.2	124.1	121.2
Population 15 and older (millions)	109.7	109.8	109.5	108.7	107.6
Population 60 and older/Population 15 and older (percent)	30.8	35.1	37.8	39.2	40.7
Employed person (millions)	63.7	61.8	58.7	56.7	55.6
Employment ratio* (percent)	50.0	48.5	46.5	45.7	45.9
GDP (trillions of yen)	555.4	594.1	609.4	628.6	618.1
GDP per capita (millions of yen)	4.4	4.7	4.8	5.1	5.1
<u>Maintain Employment Ratio</u>					
Employed person (millions)	63.7	63.7	63.1	62.1	60.6
Employment ratio* (percent)	50.0	50.0	50.0	50.0	50.0
GDP (trillions of yen)	555.5	607.1	643.6	674.8	669.6
GDP per capita (millions of yen)	4.4	4.8	5.1	5.4	5.5
<u>Accommodate Work Preferences:</u>					
Employed person (millions)	63.7	61.9	60.4	58.6	56.5
Employment ratio* (percent)	50.0	48.6	47.9	47.2	46.6
GDP (trillions of yen)	555.4	594.7	622.0	645.3	633.3
GDP per capita (millions of yen)	4.4	4.7	4.9	5.2	5.2

*Employment ratio is the number of people employed divided by the total population.

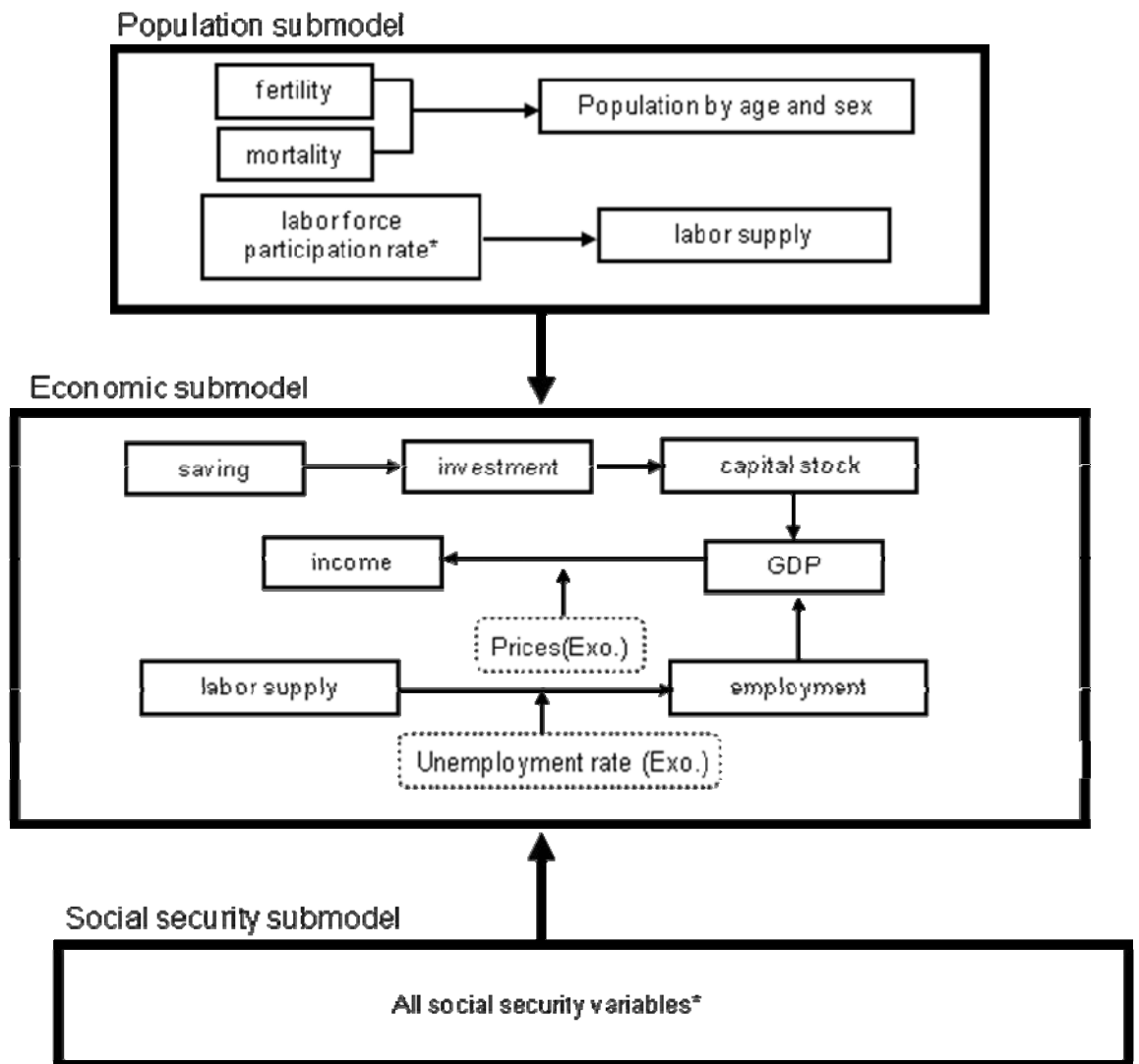


Fig. 1 Interrelations among the three modules in the NUPRI macro simulation model

* Variables exogenously to the model. Arrows indicate direction of causation.

Appendix: NUPRI Model

This appendix provides the basic equations of the NUPRI model and presents a list of variables used in the simulation projections.

Production function (or real GDP)

$$\Delta \log \left(\frac{GDPR_t}{LD_t \cdot HP_t} \right) = 0.0155 + 0.2630 \cdot \Delta \log \left(\frac{KP_{t-1}}{LD_t \cdot HP_t} \right) - 0.0094 \times Dum$$

(2.16) (3.06) (−1.57)

Dum: 1990~1998

$$\bar{R}^2 = 0.312, SE = 0.014, DW = 1.570$$

LD: Employment

$$LD = \left(1.0 - \frac{URATE}{1000} \right) \times LN$$

LN: Labor force

LW: Employees

$$LW = -1416.41 + 0.5737 \times LD + 0.5568 \times LW_{-1}$$

(−11.08) (11.98) (15.77)

$$\bar{R}^2 = 0.999, SE = 17.718, DW = 1.793$$

LSE: Self-employed workers

$$LSE = LD - LW$$

GDPN: Nominal GDP

$$GDPN = GDPR \times \frac{GDPD^*}{100}$$

DEP: Consumption of fixed capital (all)

$$DEP = DEPPR + DEPG$$

DEPPR: Consumption of fixed capital (private sector)

$$DEPR = d1 \times NFAPR_{-1}$$

DEPG: Consumption of fixed capital (government)

$$DEPG = d2 \times NFAG_{-1}$$

YD: National disposable income

$$YD = GDPN - DEP - DISC + YWAB + IRAB + TROTHAB$$

DISC: Statistical discrepancy

YWAB: Consumption of employers from the rest of the world

IRAB: Property income from the rest of the world

TROTHAB: Other current transfers from the rest of the world (net)

YDPR: Disposable income (private sector)

$$YDPR = YD - YDG$$

YDG: Disposable income (general government sector)

YWG: Wages and salaries

$$\ln YWG = -1.1841 + 1.035 \times \log(GDPN)$$

(−6.69)(72.26)

$$\bar{R}^2 = 0.995, SE = 0.044, DW = 0.269$$

WAGE: Wage rate (per man-hour)

$$WAGE = \frac{YWG}{(HP \times LW)}$$

YW: Compensation for employers

$$YW = YWG + SIEA$$

SIE: Employers' contributions to social security schemes in respect of their employees

$$SIEA = SIE + SIOH$$

SIOH: Employers' contributions to private pension, health and other causality insurance, life insurance and similar schemes in respect of their employees

$$SIOH = \mu \times YWG \quad (\mu : \text{constant})$$

SRATE: Saving rate (private sector)

$$\ln(SRATE) = 4.4440 - 0.6431 \times \log\left(\frac{POP65OV}{TPOP}\right)$$

$$(20.45) \quad (-6.84)$$

$$\bar{R}^2 = 0.968, SE = 0.052, D.W = 1.903$$

POP65OV: Population aged 65 and over

POP65OV: Total population

SVPR: Saving rate of private sector

$$SVPR = SRATE \times \frac{YDPR}{100}$$

IPN: Fixed capital formation in plants and equipment

$$IPN = (SVPR + SVG) + DEP - (ISMACRO + IHN + IGN + JNPR + JGN)$$

$$IPR = \frac{IPN}{IPD} \times 100$$

IHR: Residential buildings

$$IHR = 4.2942 + 0.8356 \times \log\left(\frac{YDPR}{GDPD}\right) - 0.4248 \times \log(KH_{-1} - IHR_{-1})$$

$$(4.93) \quad (5.99) \quad (-3.44)$$

$$\bar{R}^2 = 0.641, SE = 0.098, D.W = 0.968$$

KP: Gross fixed capital in plants and equipment (1990 prices)

$$KP = (1 - DEL) \times KP_{-1} + IPR$$

KH: Housing stocks (1990 prices)

$$KH = (1 - DEL) \times KH_{-1} + IHR$$

JNPR: Inventory investment (nominal, private sector)

$$JNPR = \alpha \times GDPN$$

LANDPR: Purchase of land (net) private sector

$$LANDPR = -LANDG \quad (= -(LANDAD + LANDSOC))$$

LANDG: Purchase of land (net) general government sector

LANDAD: Purchase of land (central and local government)

LANDSOC: Purchase of land (social security funds)

ISPR: Net lending (Balance of saving and investment)

$$ISPR = ISMACRO - ISG + CTRAB$$

ISMALRO: Balance of savings and investment (all)

$$ISMALRO = (SVPR + SVG) + DEP - (IPN + IHN + IGN + JNPR + JGN)$$

ISG: Balance of saving and investment (central and local government)

CTRAB: Capital transfers from the rest of the world

IPN: Fixed capital formation in machinery and equipment

IHN: Residential investment

IGN: Fixed capital formation (general government)

JNPR: Inventory investment (private sector)

JGN: Inventory investment (general government)

FAPR: Financial assets (net)

$$FAPR = FAPR_{-1} + ISPR$$

IRAB: Property income from the rest of the world

$$IRAB = RALB \times \frac{FAAB}{2}$$

FAAB: Net worth abroad

$$FAAB = FAAB_{-1} + ISMACRO$$

YC: Operating surplus (non-financial incorporated enterprises + financial institutions)

$$YC = GDPN - YW - DEP - TD + SUB - DISC - YMIX$$

YW: Compensation for employers

TD: Direct taxes

SUB: Subsidies

DISC: Statistical discrepancy

YMIX: Operating surplus (including own house rent)

$$YMIX = YOH + YSE$$

YOH: Operating surplus (including imputed rent from own house)

$$YOH = -3296.29 + 0.1135 \times \frac{KHPR_{-1} \times IHD}{100}$$

(-3.47) (20.86)

$$\bar{R}^2 = 0.942, SE = 2202.03, D.W = 0.126$$

YSE: Operating surplus (self-employed workers)

$$YOH = 5194.04 + 0.3909 \times \frac{YW}{LW} \times LSE$$

(3.55) (14.62)

$$\bar{R}^2 = 0.887, SE = 1982.26, D.W = 0.450$$

NFAPR: Nominal fixed assets (private sector)

$$NFAPR = NFAPR_{-1} + IPN + IHN - DEPPR = (1 - d1) \times NFAPR_{-1} + IPN + IHN$$

NFAG: Nominal fixed assets (general government)

$$NFAG = NFAG_{-1} + IGN - DEPG = (1 - d2) \times NFAG_{-1} + IG$$

KP: Gross fixed capital stock (plants and equipment)

$$KP = (1 - \delta) \times KP_{-1} + IPR$$

FAAD: Financial assets (net; central and local government)

$$FAAD = FAAD_{-1} + ISAD$$

FASOCC: Financial assets (net; social security funds)

$$FASOC = FASOC_{-1} + ISSOC$$

IPD: Deflator for investment

$$\log(IPD) = 1.0651 \times \log(GDPD) - 0.0147 \times TIME$$

(766.38) (-41.18)

$$\bar{R}^2 = 0.996, SE = 0.014, D.W = 0.946$$

IHD: Deflator for housing investment

$$\log(IHD) = 0.9790 \times \log(GDPD) + 0.0046 \cdot TIME$$

(301.55) (5.53)

$$\bar{R}^2 = 0.990, SE = 0.034, D.W = 0.754$$

CGD: Deflator for government final consumption expenditure

$$\log(CGD) = -0.7895 + 1.1558 \times \log(GDPD) + 0.0038 \cdot TIME$$

(-4.05) (23.40) (2.19)

$$\bar{R}^2 = 0.991, SE = 0.035, D.W = 0.459$$

IGD: Deflator for government investment

$$\log(IGD) = -0.4055 + 1.1063 \times \log(GDPD) - 0.0048 \times TIME$$

(-3.30)(35.52) (-4.45)

$$\bar{R}^2 = 0.994, SE = 0.022, D.W = 0.670$$

RAL: Nominal long-run interest rate

$$\left(RAL - \left(\frac{GDPD}{GDPD_{-1}} - 1.0 \right) * 100 \right) = 2.2835 \cdot \frac{GDPR}{Kp_{-1}}$$

(2.329)

$$\bar{R}^2 = 0.304, SE = 4.128, D.W = 0.666$$

CGN: Nominal government final consumption expenditure

$$CGN = CGR \times \frac{CGD}{100}$$

CGR: Real government final consumption expenditure

$$CGR = CGR_{-1} \times (1.0 + GR(GDPR))$$

IGN: Nominal gross domestic capital formation

$$IGN = IGR \times \frac{IGD}{100}$$

IGR: Real gross domestic capital formation

$$IGR = IGR_{-1} \times (1.0 + GR(GDPR))$$

TI: Indirect tax

$$TI = -2856.77 + 0.087441 \times GDPN$$

(-5.43) (57.47)

$$\bar{R}^2 = 0.992, SE = 1108.70, D.W = 0.457$$

TD: Direct tax

$$TD = 0.9986 \times \frac{TDR}{1 - TDR} \times \frac{YDPR_{-1}}{GDPN_{-1}} \times GDPN$$

(367.14)

$$\bar{R}^2 = 0.999, SE = 568.831, D.W = 1.280$$

SI: Social security contribution

SIE: Social security contributions by employers

TR: Social security benefits

TRAID: Social assistance grants

$$\ln TRAID = -1.9812 + 0.8011 \times \log(GDPR) + 0.4970 \times \log(URATE)$$

(-1.77) (8.01) (2.67)

$$\bar{R}^2 = 0.941, SE = 0.151, D.W = 0.129$$

YDG: Disposable income (general government)

$$YDG = YDAD + YDSOC$$

YDAD: Disposable income (central and local government)

$$YDAD = TI + TD + IRFAAD - SUB - TRAID + TROTHAD - TRADSOC + TRABAD$$

IRFAAD: Property income (net)

SUB: Subsidies

TROTHAD: Other current transfers (net)

TRADSOC : Current transfers from central government to social security

TRABAD: Current transfers from the rest of the world to central and local government disposable income (social security funds)

YDSOC: Disposable income (social security funds)

$$YDSOC = IRFASOC + TROTHSOC + TRADSOC$$

CGAD: Final consumption expenditure (central and local government)

$$CGAD = \alpha \times CGN$$

IGAD: Fixed capital formation (central and local government)

$$IGAD = \beta \times CGN$$

JAD: inventory investment

$$JAD = JGN = \gamma \times GDPN$$

LANDAD: Purchase of land (net; central and local government)

$$LANDAD = -386.621 + 0.2002 \times IGAD$$

(-2.36) (23.80)

$$\bar{R}^2 = 0.953, SE = 0.396.97, D.W = 0.447$$

SVAD: Saving (central and local government)

$$SVAD = YDAD - CGAD$$

ISAD: Net lending (central and local government)

$$ISAD = SAVAD - IGAD - JAD - LANDAD + CTRAD$$

CTRAD : Capital transfer

IRFAAD: Property income (central and local government)

$$IRFAAD = 0.01248 \times RAL \times FAAD_{-1}$$

(18.86)

$$\bar{R}^2 = 0.728, SE = 2607.67, D.W = 0.363$$

CGSOC: Final consumption expenditure (social security funds)

$$CGSOC = (1 - \alpha) \times CGN$$

IGSOC: Fixed capital formation (social security funds)

$$IGSOC = (1 - \beta) \times IGN$$

JSOC: Inventory investment (social security funds)

$$JSOC = 0$$

LANDSOC: Purchase of land (net; social security funds)

$$LANDSOC = 0.24559 \times IGSOC$$

SVOC: Saving (social security funds)

$$SVSOC = YDSOC - CGSOC$$

ISSOC: Net lending (social security funds)

$$ISSOC = SVSOC - IGSOC - JSOC - LANDSOC + CTSOC$$

CTRSOC: Capital transfer (social security funds)

IRFASOC: Property income (social security funds)

$$IRFASOC = 0.0117 \cdot RAL \cdot FASOC_{-1}$$

(22.73)

$$\bar{R}^2 = 0.812, SE = 1428.30, DW = 0.481$$

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ENDNOTES

¹ Useful descriptions of the Japanese labor market, population aging, and shifts in employment relations are provided by Hamada and Kato (2007) and Hashimoto (1990) among others.

² The population and labor force data described in this section are the authors’ calculations from information presented in Statistics Bureau Japan (2007) and shown in Tables 1-3.

³ Clark, Ogawa, and Matsukura (2007) describe this trend for Japanese youths to remain outside of the labor force or to engage in only casual work and part-time employment. Also see Cabinet Office (2003) and Japan Institute for Labor and Training (2000).

⁴ Matsukura, Ogawa, and Clark (2007) examine the increase in the proportion of men aged 55 to 59 that remained in the labor force after the increase in the age of mandatory retirement that began in the mid-1980s. Also, Clark, Ogawa, and Matsukura (2008 forthcoming) examine the impact of greater levels of employment by older men on GDP growth. Also see Sakai and Asaoka (2007).

⁵ Every 5 years, the Statistics Bureau conducts an Employment Status Survey. The 2002 is most recent survey currently available.

⁶ The government of Japan discontinued compiling long-term time-series data in the 1990s. Thus, recent time-series data is only available for a relatively short time span. For these reasons, we have decided to use the time-series data over 1969-1998, which covers the longest time span among all the time-series data sets currently available.

⁷ Clark and Ogawa (1992) reported the increase in the mandatory retirement age from 1970 to 1985 and estimated its impact on the career earnings and employment policies. Clark and Ogawa (1996) also examined the desire of older men to continue working even after mandatory retirement.

⁸ In the years following the increase in the mandatory retirement age from 55 to 60, the participation rate of men 55 to 59 increased by about 4 percentage point so that the current participation rate for men 55 to 59 is only about 3 percentage points lower than that for younger men.

⁹ Even as the government adopts additional policies to encourage the employment of women, one must be concerned that greater levels of female employment might result in even lower fertility.

¹⁰ Fukuda and Morozumi (2004) provide some international evidence on the economic impact of the demographic transition.

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