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How Productivity Can Affect Pension Plan Systems: The Case of Japan and Malaysia

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About Social Security Research Centre

The Social Security Research Centre (SSRC) was established in March 2011 at the Faculty of Economics and Administration (FEA), University of Malaya to initiate and carry out research, teaching and dissemination of evidence-based knowledge in the area of social security, including old age financial protection in order to enhance the understanding of this critical topic to promote economic development and social cohesion in Malaysia.

To support the research in social security in general and old-age financial protection in particular the Employees Provident Fund (EPF) of Malaysia has graciously provided an endowment fund to create the nation's first endowed Chair in Old Age Financial Protection (OAFPC) at University of Malaya. OAFPC has the over-riding objectives to help formulate policies to promote better social security and improve old age financial protection, and to help formulate policies to promote economic growth in an ageing society for consideration by the Government of Malaysia.

The interest in social security and old-age financial protection is ever growing in view of an ageing population. Malaysia is also subjected to rising life expectancy and falling fertility rates, the perceived inadequacy of current social security provisions, coupled with the added fear that simply more expenditure may not be conducive to the development and growth objectives of the society. This calls for innovative policy solutions that may be inspired by international experience based on an empirical grounding in national data and analysis.

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Abstract

This study proposes a new group of indicators in the analysis of pension plan systems performance. Section one presents a new model to evaluate the pension plan systems respond in the case of Japan and Malaysia. This new model, “The Pension Plan Systems Performance Evaluation Model (PPSPE-Model)” is intended to offer policy makers and researchers an additional analytical tool to study the impact of dynamic changes such as change in pension plan systems trends in Japan and Malaysia from a new perspective. The PPSPE-Model can be applied to the study of any pension plan system scheme and not constrained by geographical area or development stage of the entities on study. The PPSPE-Model is simple and flexible. Section two, summarizes the results on the performance of Japan and Malaysia pension plan system vulnerability and strangeness.

Keywords: Malaysia, Japan, pension system programs, economic modeling, policy modeling

JEL Classifications: Y20

1. Introduction

Studies on pension system have largely focused on derivation of key performance indicators and efficiency indicators. However, these are often received with caution simply because no two pension plan systems have similar operating environment, management competency and innovation, efficiency and institutional set up and, government support. As such comparing two pension plan systems performance of Japan and Malaysia would not be meaningful without transparency of data. Further, pension plan system form part of the dynamic global social welfare. The dynamic nature and mobility of pension plan systems models (from procurement of primary and intermediate necessities to national economic welfare issues) are constantly changing as government adjust cost conditions competition between pension plan systems. Pension plan systems exist within a grid. Thus performance standards and common measurements of performance should incorporate this grid. From beginning, this research supports a basic premise that if a country without a large and sustainable economic growth (a large production output based on exports) based on a high national productivity output, then the same country cannot have a strong pension plan system.

A pension plan system may be efficient but not effective. Being effective is to service the right social groups at the right time. It is not just about efficiency alone. For example, hard access to a basic pension plan system when is encroaches into scarce of a clear and sustainable institutional national plan of pensions may not be an issue in different social groups in the same country. Therefore, scoring very important to least important must be cautioned. Reference points must be established. This is allowing pension plan system an insight into what old age population are looking for and in response what to pension plan system to improve and pensions systems to invest. We are assuming that pension plan system is a small part of social

protection general framework. At the same time, the pension plan system is a part of the social security in our model. Government and pensioners focus on costs associated with pension's costs, reliability and safety. This study offers an alternative approach in the study of pension plan systems performance measurement in a dynamic environment. The following section summarizes the literature followed by the introduction of the pension plan system performance evaluation model (PPSPE-Model) using pension plan systems from Japan and Malaysia.

2. Literature Review

The analysis of pension plan systems performance has taken several approaches, namely quantitative and qualitative. From a quantitative perspective, the uses of sophisticated mathematical and econometrics models on the study of pension plan systems make it possible to measure with accuracy the different levels and behavior of pension plan systems performances respectively. The rapid development of pension plan system performance models has been facilitated through the use of "*basic pension plan systems evaluation*" (between the 1980s and 1990s) and through "*advance pension plan systems evaluation*" (Middle of the 1990s up to the present). This enabled the use of sophisticated software which enabled large information management, application of difficult simulations and creation of applications. This ultimately led to the formulation of large pension plan system performance models. The PPSPE-Model comprises of *the private pension plan system performance models* and *the public pension plan system performance models*. Both of which can be categorized according to functions and database sizes coverage. In terms of function, the two pension plan system programs performance modeling approaches can either be descriptive or empirical. The *private pension plan system performance models* on the one hand show arbitrary information that is used to observe

more sophisticated analytical tools such as advance mathematical and econometrical models together with more detail long historical data behavior domestically and internationally from a profitable perspective. While *the public pension plan system performance models* on the other hand is used basic analytical tools such as time-series and cross-section data analysis to show its trends and performance from a less profitable perspective. The research leading to this study shows a strong link between the introduction of a new pension plan system performance model for any country, in our case, we are going to evaluate the pension system programs of Japan and Malaysia.

We reviewed 250 papers from five different journals on pension system models from 1980 to 2016. Studies adopted either benefit/cost, probabilistic or forecasting analysis approaches through the application of basic econometric methods and use of microeconomic and macroeconomic approaches under the level of secondary data. We observe an increasing dependency of pension system models on econometrics modeling, methods and techniques. 85% of these studies were based on economic approach. Most focused on efficiency aspects. Technical pension system performance models make up 95% and empirical pension system performance models, 95%. Empirically (quantitative) studies outweigh qualitative studies by 95% to 5%. Further, 99% of the studies are based on the use of secondary data from various bibliographical documents (Coto-Millán and Pesquera, 2010). Around 75% of studies dealt with long run models while 10% short run models comprising of times series analysis (65%), cross-sectional data modeling (45%) and panel data modeling (50%). Only 15% of the studies adopted the institutional approach or multidisciplinary approach (entailing several disciplines such as management, administrative, sociology, politics, actuary, and social sciences) in evaluating pension system performance modeling.

This study is of the view that the absence of non-quantitative variables can considerably increase the vulnerability in the analysis of a pension plan systems performance. Therefore, it suggests that any pension plan system model performance should take into consideration a wide range of factors, including unforeseen ones. These include factors such as natural disaster trends, underground economy, foreign labor, climate changes, crime expansion, education system, social events (crime, war, terrorism), social norms and behavior (culture, race, and religion) (Ruiz Estrada, 2013). These are important in the pension plan system performance modeling in order to formulate strong policies to improve the pension plan system performance in the long run. However, it must be assumed that all these factors maintain steady transformation(s) through different historical periods of the pension plan system development stage.

The PPSPE-Model will be employed here to analyze how the pension plan system can affect directly on the marginal productivity growth rate performance, regardless of pension system size through, (i) incorporating pension plan system coverage under private and public level, the national productivity level and (ii) to quantify and analyze the marginal optimum national pension plan system coverage critical point based on the application of national productivity level growth rate. We employ a new mathematical and multidimensional graphical modeling approach to calculate the marginal optimum national pension plan system coverage critical point of Japan and Malaysia. Its advantage is flexible adaptation in analyzing without any restriction the weaknesses and strengths of any pension plan system efficiently. The PPSPE-Model will test one single following hypotheses: The marginal optimum national pension plan system coverage critical point calculation based on the national productivity growth performance is directly connected to the efficient coordination of the private and public pension plan system programs coverage and the national productivity level simultaneously;

3. An Introduction to the PPSPE-Model Theoretical Framework

Initially, the national pension plan system coverage per year (α) is equal to total number of pensioners registered per year (Λ) divided by the total population (P) in the same country. If we build the national pension plan system coverage per year (α) then we can proceed to find the total national pension plan system coverage per year growth rate (Δα). The Δα can show how many people has the possibility to get a pension plan in the future is increasing or decreasing across different periods of time in our case is year by year.

$$\alpha = \Lambda/P \quad \alpha \neq 0 \text{ or} \tag{1}$$

Therefore, the calculation of the total national pension plan system coverage per year growth rate (Δα) is follow by equation 2.

$$\Delta\alpha = \frac{(\sum\alpha')_{\text{final year}} - (\sum\alpha_o)_{\text{last year}}}{(\sum\alpha_o)_{\text{last year}}} * 100\% \tag{2}$$

Analysis of Δα Results

The results of Δα reflect two possible scenarios:

i. If Δα rate is high, then the pension plan system coverage is effective
ii. If Δα rate is low, then the pension plan system coverage is ineffective

Step-2: Derivation of the private and public pensioner's volume coverage under the national level (β) and the private and public pensioner's volume coverage under the national level growth rate (∆β)

The second indicator in our model is called "the private and public pensioner's volume coverage under the national level (β) (see Expression 5). This indicator is responsible to evaluate how much under the national

pension system level (total population = P) is distributed between the private pension system ratio (R_1) and public pension system ratio (R_2) are crossing across every year (see Expression 3 and 4). The calculation of is equal to:

R_1 **=** ∑ Total of Pensioners cover by Private Pension Plan System (ε) / Total Population (P) (3)

R_2 **=** ∑ Total of Pensioners cover by Public Pension Plan System (ζ) / Total Population (P) (4)

$$\beta = 1/(\text{Ln}[1 - \sqrt{1} - R_1/R_2]^{t+1} : \text{Ln}[1 - \sqrt{1} - R_2/R_1]^{t+1}) \times 100\% \quad (5)$$

Hence, the calculation of the private and public pensioner's volume coverage under the national level growth rate (∆β) is based on Expression 6.

$$\Delta\beta = \frac{(\sum\beta)_{\text{final year}} - (\sum\beta_o)_{\text{last year}}}{(\sum\beta_o)_{\text{last year}}} * 100\% \quad (6)$$

Step-3: Derivation of the National Total Factor Productivity Annual Determinant (∆-NTFP) and the National Total Factor Productivity Annual Growth Rate (∆NTFP)

In the case of the national total factor productivity annual determinant (∆-NTFP) is based on a matrix 3x3. Hence, we have nine variables in our matrix 3x3 such as (V_1) education and training level ratio; (V_2) diet, calories, and basic medical checkup annually ratio; (V_3) average national life expectation ratio; (V_4) average years of working experiences ratio; (V_5) labor security ratio; (V_6) allowance, commissions, and minimum salary ratio; (V_7) centralized or des-centralized management systems (promotions) ratio; (V_8) Holidays and annual leave ratio; (V_9) maternity and medical care leave.

$$\Delta\text{-NTFP} = \begin{pmatrix} V_1 & V_2 & V_3 \\ V_4 & V_5 & V_6 \\ V_7 & V_8 & V_9 \end{pmatrix} \quad (7)$$

Hence, the NTFP growth rate (∆NTFP) is equal to the ∆-NTFP given period (∆NTFP$^{'}$) minus the ∆-NTFP previous period (∆NTFP$_{o}$) is divided by the ∆-NTFP of the previous period (∆NTFP$_{o}$).

$$\Delta NTFP = \frac{\Delta\text{-}NTFP^{'} - \Delta\text{-}NTFP_{o}}{\Delta\text{-}NTFP_{o}} \times 100\% \quad (8)$$

Step-4: Calculation of the Marginal Optimum National Pension System Rate (Ω$^{'}$)

The calculation of the marginal optimum national pension system rate (Ω$^{'}$) is using to measure the Ω$^{'}$ is based on the ∆-NTFP, Δα, ∆β, and externalities coefficient of variation between the present year and past year (θ). The construction of the marginal optimum national pension system rate (Ω$^{'}$) is to evaluate the fast changes and adaptability of any pension system expansion based on the fast expansion of the national productivity in the short run.

$$\Omega^{'} = \left(\sum \frac{\partial \left(\sum \left(\frac{\Delta NTFP_{1} [\Delta\alpha_{1} \times \Delta\beta_{1}]^{\theta-1}}{1 - \Delta NTFP_{1}} \right) \right)}{\partial \left(\sum \left(\frac{\Delta NTFP_{\infty} [\Delta\alpha_{\infty} \times \Delta\beta_{\infty}]^{\theta+1}}{1 - \Delta NTFP_{\infty}} \right) \right)} \right) \quad (9)$$

Source: Authors

To prove the marginal optimum national pension plan system (Ω') depends directly on the degree of pension system growth the total national pension plan system coverage per year growth rate (Δα), the private and public pensioner's volume coverage under the national level growth rate (∆β), and the informal labor effective rate (θ), we will propose a multidimensional graphical analysis to the marginal optimum national pension plan system (Ω'). However, we are going to apply statistical data to calculate the marginal optimum national pension plan system (Ω') on different pension plan systems such as the Japanese and Malaysian pension plan system programs. Hence, the main idea is to analyze the behavior of the marginal optimum national pension plan system (Ω') by parts under the application of a large number of partial derivatives as shown below.

Step-5: Measurement of the marginal optimum national pension plan system coverage critical point (**Ω***) In the calculation of the **Ω*** follow by Expression 10.

$$\Omega^{*}= \left\{ \left[\frac{\partial^{2} \Omega^{'\theta+1}}{\partial^{2} NTFP^{\theta}} \right] / \left[\frac{\partial^{2}\Omega^{'}(\Delta\alpha)}{\partial^{2}\Omega^{'}(\Delta\beta)} \right] \right\} \qquad (10)$$

$$\alpha = \{ x|x \ \varepsilon \ R_{+} \veebar \ \Omega^{*}\}$$
$$\beta = \{ x|x \ \varepsilon \ R_{+} \veebar \ \Omega^{*}\}$$

Finally, we can prove that the effectiveness and ineffectiveness of any pension plan system is strongly related to the marginal optimum national pension plan system coverage critical point (Ω*). It is possible to be observed in the initial state of any pension plan system the effectiveness is directly connected to the ∆NTFP at the short run, but in the long run the effectiveness is going to be directly connected to the marginal optimum national pension plan system (Ω').

Step-6: Calculation of The Informal Labor Effective Rate (θ)

In the calculation of the informal labor effective rate (θ) is based on the total amount of people is working on the informal economy between 12 and 65 years old (Pi) divided by the total productive age population between 12 and 65 years old (P_T) in the same country (see expression 11).

$$\theta = Pi / P_T \quad \theta = 0 \tag{11}$$

Step-7: Calculation of the Pension Plan System Coverage Deficit (-D)

The measure of the pension plan system coverage deficit (-D) is equal to the national pension plan system coverage per year (α) minus one (see Expression 12).

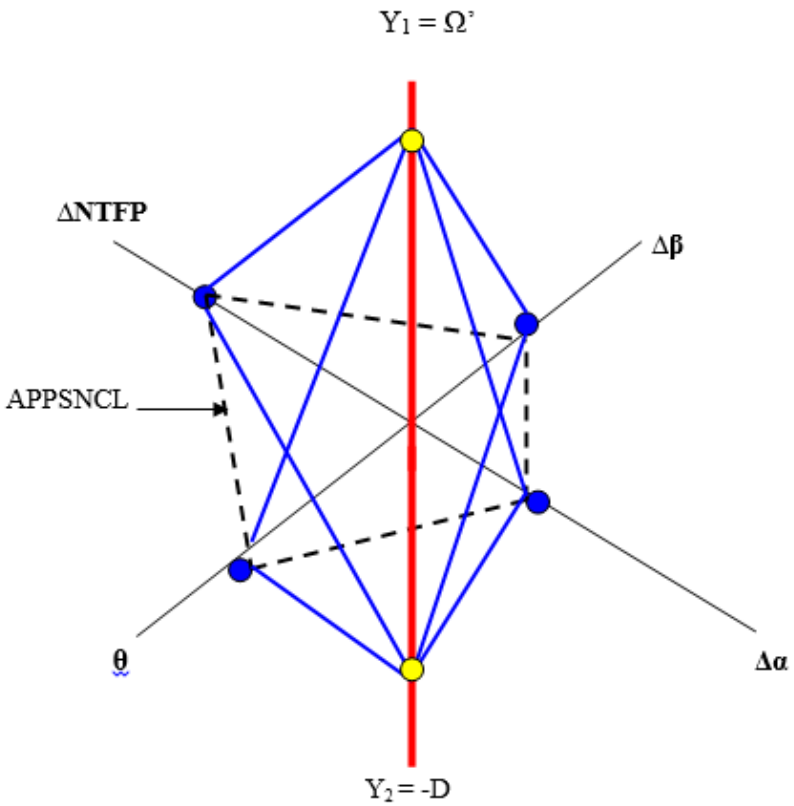
$$-D = \alpha - 1 \tag{12}$$

Step-8: Plotting of Pension Plan System Expansion Diamond Graph

The pension system expansion diamond graph (Ruiz Estrada, 2017) presents a general idea about the current pension System development based on a new concept of graphic representation (see Figure 1). This new concept of graphic representation consists of six axes located in different spaces in the multidimensional coordinate space, each of which has only positive values. In the case of this research, the value in four of the axes is represented by the degree of pension system growth the total national pension plan system coverage per year growth rate (Δα), the private and public pensioner's volume coverage under the national level growth rate (∆β), and the informal labor effective rate (θ). These indexes are independent variables. They can be joined together to create a general area in the same graphical space at the same time respectively. This general area is called "Area of Pension Plan System National Coverage Level (APPSNCL)". This

area shows the dimension of pension system performance from a general point of view. For comparison purposes, the APPSNCL can be applied to different years for the same or different pension system program. The analysis of the APPSNCL is based on the comparison of two periods in analysis. In the case of this research paper, two periods (i.e. first period and second period) are compared. The total APPSNCL may present three possible scenarios, namely: (a) Expansion ($APPSNCL_0$ initial period < APPSNCL' next period); (b) Stagnation ($APPSNCL_0$ initial period = APPSNCL' next period); (c) Contraction ($APPSNCL_0$ initial period > APPSNCL' next period). The fifth and sixth axes are represented by the dependent variables Y_1 (Ω') and Y_2 (-D). They are positioned in the center of the graph which is the meeting point of the other four axes.

Figure 1: The Pension Plan System Expansion Diamond Graph



Source: the marginal optimum national pension plan system rate ($\Omega^{'}$); the pension plan system coverage deficit (-D); the total national pension plan system coverage per year growth rate ($\Delta\alpha$); the private and public pensioner's volume coverage under the national level growth rate ($\Delta\beta$); the national total factor productivity annual rate (ΔNTFP); and the informal labor effective rate **(**θ).

4. PPSPE-Model and the Performance of selected Asian Pension System

The PPSPE-Model was applied initially to two pension plan system programs namely the pension system of Japan and Malaysia respectively (see Table 1). The period of study is between 1981 and 2016. In this period of time was chosen because we are interested to evaluate if exist a strong linkage between the marginal optimum national pension plan system rate ($\Omega^{'}$) and the pension plan system coverage deficit (-D) with its four main sub-variables of analysis (ΔNTFP), the total national pension plan system coverage per year growth rate ($\Delta\alpha$), the private and public pensioner's volume coverage under the national level growth rate ($\Delta\beta$), and the informal labor effective rate **(**θ). The results show that the the total national pension plan system coverage per year growth rate ($\Delta\alpha$) of Japan is equal to 0.93 and Malaysia only keeps 0.20 (see Figure 4 and 5). It means Japan keeps a more higher, fast, and homogeneous coverage under the national level than Malaysia in the last 35 years. Japan shows more progressive and coordination among different economic players such as private sector, public sector, and civil society. In the case of the private and public pensioner's volume coverage under the national level growth rate ($\Delta\beta$) is posible to observe that Japan public sector cover 98% of whole Japanese population and 2% by the private sector. For the private and public pensioner's volume coverage under the national level growth rate ($\Delta\beta$) of Malaysia situation is different because according to this research 30% is under private pension plan system programs offered by different financial institutions and 70% is cover by the public pension system (EPF). The main reason of this imbalance is

originated by a large number of underground and informal economy is happening in Malaysia.

However, the national total factor productivity annual determinant (∆-NTFP) for Japan and Malaysia is equal to 0.01 and 0.0057 according to our Matrix-NTFP (see Figure 4 and 5) that shows nine variables follow by V_1) education and training level ratio (Japan = 1 and Malaysia = 0.87); (V_2) diet, calories, and basic medical checkup annually ratio (Japan = 1 and Malaysia = 0.67); (V_3) average national life expectation ratio (Japan = 1 and Malaysia = 0.63); (V_4) average years of working experiences ratio (Japan = 1 and Malaysia = 0.52); (V_5) labor security ratio (Japan = 1 and Malaysia = 0.45); (V_6) allowance, commissions, and minimum salary ratio (Japan = 0.90 and Malaysia = 0.35); (V_7) centralized or des-centralized management systems (promotions) ratio (Japan = 1 and Malaysia = 0.60); (V_8) Holidays and annual leave ratio (Japan = 1 and Malaysia = 0.40); (V_9) maternity and medical care leave (Japan = 0.90 and Malaysia = 0.60) respectively. We can observe a better condition in the Japanese pension plan system in all variables in analysis. Therefore, the national total factor productivity annual growth rate (∆NTFP) for Japan (0.05) is lower than Malaysia (0.30) between 2000-2016 (see Figure 4 and 5). The low rate of the national total factor productivity annual growth rate (∆NTFP) is related to the low Japanese young population growth rate (0-15 years old) compare to the actual large Japanese older age population (60-100 years old). In opposite case, Malaysia has a large young population growth rate (0-15 years old) compared to its actual relatively small older age population (60-100 years old).

The marginal optimum national pension plan system rate **(**$\Omega^{'}$) for Japan and Malaysia in 1980s (0.80 : 0.25), in 1990 (0.75 : 0.30), and between 2000-2016 (0.75 : 0.35) (see Figure 4 and 5). The marginal optimum national pension plan system rate **(**$\Omega^{'}$) is showing the fast changes and adaptability of any pension plan system expansion based on the fast expansion of the

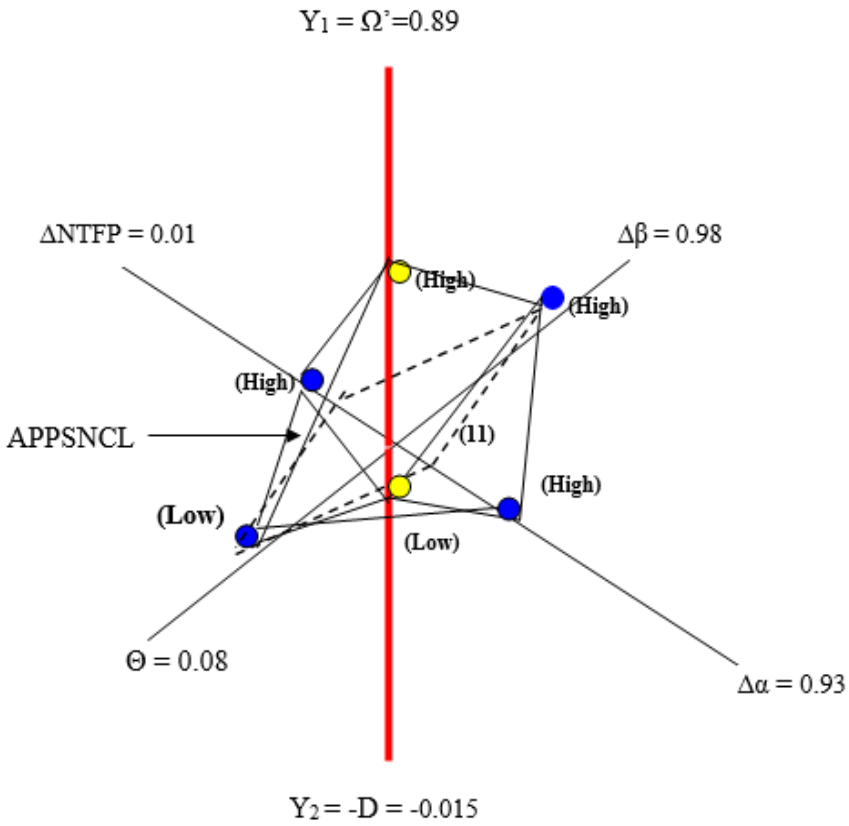
national productivity in the long run. Hence, we can observe that the marginal optimum national pension plan system rate **(**$\Omega^{'}$) of Japan is dropping faster together that impact on the Japanese pension plan system. Malaysia has a moderate gross in its marginal optimum national pension plan system rate ($\Omega^{'}$) but it is not enough to generate a homogeneous national strong pension plan system that can satisfied the national necessities. Therefore, the marginal optimum national pension plan system coverage critical point (Ω^{*}) can give us the perfect amount of coverage in the Japanese and Malaysian according to our results Japan needs a minimum coverage of (0.89 = 89%) and Malaysia request a minimum coverage of (0.68 = 68%) to generate an effective pension plan system. If Japan and Malaysia has less than 89% and 68%, then both countries pension plan system can generate deep socio-economic welfare damages in the short and long term. For the case of the informal labor effective rate (θ) is possible observe that Japan is keeping lower rate of underground or informal economy according to this model shows that 1980s (0.03), 1990s (0.05), and 2000-2016 (0.08) (see Figure 4). For the underground and informal economy Malaysia is keeping in a constant gross until our day. It is possible be observed in these results 1980s (0.22), 1990s (0.25), and 2000-2016 (0.30) (see Figure 4). Finally, the pension plan system coverage deficit (-D) for Japan is equal to -0.015 and the pension plan system coverage deficit (–D) for Japan is equal to -0.35. These results show how much effort or percentage Japan (+1.5%) and Malaysia (+35%) (see Figure 4 and 5) needs to do for cover up the full national pension plan system.

Table 1: PPSPE-Model Final Results (1981-2016)

Japan		**Malaysia**	
α = 0.985		α= 0.65	
∆α = 0.93		∆α = 0.20	
Japan		**Malaysia**	
Private	Public	Private	Public
0.02	0.98	0.30	0.70
∆-NTFP: Japan		**ΔNTFP**	
1.00 1.00 1.00		1980s	0.20
1.00 1.00 0.90		1990s	0.10
0.90 1.00 0.90		2000-2016	0.05
0.01 = 1			
∆-NTFP: Malaysia		**ΔNTFP**	
0.87 0.67 0.63		1980s	0.35
0.52 0.45 0.35		1990s	0.45
0.60 0.40 0.60		2000-2016	0.30
0.0057 = 0.52			
θ-Japan		**θ-Malaysia**	
1980s	0.80		0.25
1990s	0.75		0.30
2000-2016	0.83		0.35
Ω' = Japan		**Ω' = Malaysia**	
1980s	0.91		0.63
1990s	0.87		0.65
2000-2016	0.89		0.68
θ = Japan		**θ = Malaysia**	
1980s	0.03		0.22
1990s	0.05		0.25
2000-2016	0.08		0.30
-D Japan		**-D Malaysia**	
-0.015		-0.35	

Sources: Asian Development Bank (2016); Japan Pension Service (2016); KWSP (2016); Ministry of Health, Labour, and Welfare of Japan (2016); Ministry of Human Resources (2016); World Bank (2016)

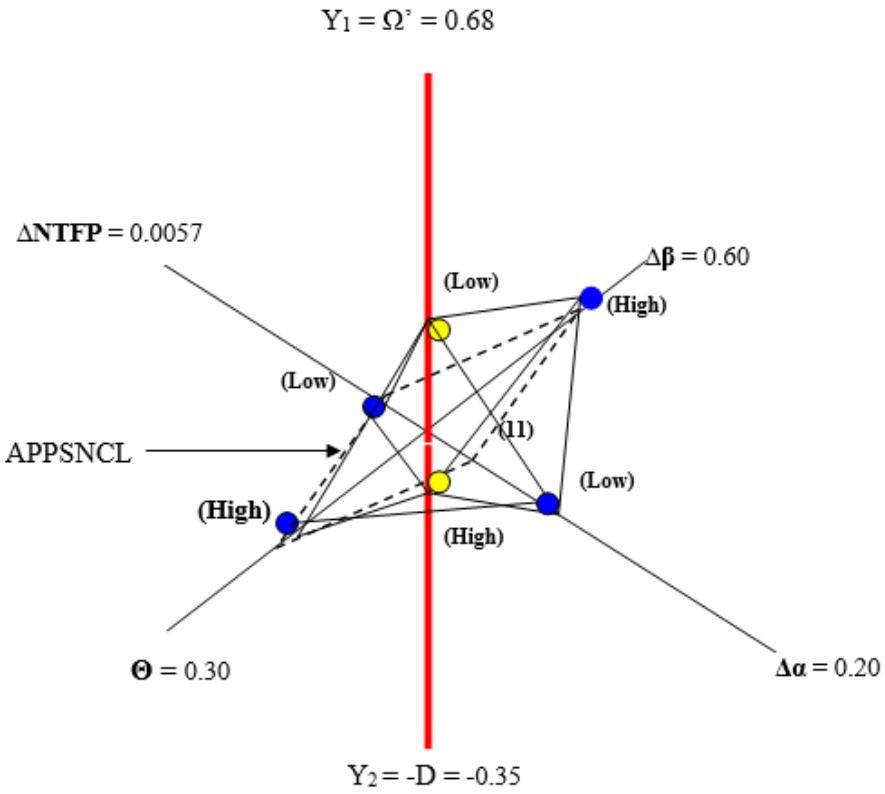
Figure 4: The Pension Plan System Expansion Diamond Graph for Japan (2000-2016)



Sources: Asian Development Bank (2016); Japan Pension Service (2016); KWSP (2016); Ministry of Health, Labour, and Welfare of Japan (2016); Ministry of Human Resources (2016); World Bank (2016)

Note: The marginal optimum national pension plan system rate (Ω'); the pension plan system coverage deficit (-D); the total national pension plan system coverage per year growth rate (Δα); the private and public pensioner's volume coverage under the national level growth rate (Δβ); the national total factor productivity annual rate (ΔNTFP); and the informal labor effective rate **(**θ).

Figure 5: The Pension Plan System Expansion Diamond Graph for Malaysia (2000-2016)



Sources: Asian Development Bank (2016); Japan Pension Service (2016); KWSP (2016); Ministry of Health, Labour, and Welfare of Japan (2016); Ministry of Human Resources (2016); World Bank (2016).

Note: the marginal optimum national pension plan system rate (Ω˙); the pension plan system coverage deficit (-D); the total national pension plan system coverage per year growth rate (Δα); the private and public pensioner's volume coverage under the national level growth rate (Δβ); the national total factor productivity annual rate (ΔNTFP); and the informal labor effective rate **(**θ).

4. Conclusion

This study incorporates factors such as the marginal optimum national pension system rate (Ω'); the pension system coverage deficit (-D); the total national pension system coverage per year growth rate ($\Delta\alpha$); the private and public pensioner's volume coverage under the national level growth rate ($\Delta\beta$); the national total factor productivity annual rate (ΔNTFP); and the informal labor effective rate **(**θ). We conclude that there exists a strong linkage between the marginal optimum national pension system rate (Ω') and the pension system coverage deficit (-D) according to our results from the Japanese and Malaysian pension system programs evaluation. In addition, to keep a strong marginal optimum national pension system rate (Ω') requires a high total national pension system coverage per year growth rate ($\Delta\alpha$), a perfect balance between the private and public pensioner's volume coverage ($\Delta\beta$), and a low informal labor effective rate **(**θ).

The main objective of the PPSPE-Model is to offer policy makers and researchers a different perspective in incorporating dynamic changes such as change in the analysis of pension system programs performance (Ruiz Estrada, 2011). The versatility of the PPSPE-Model is such that it can be applied to any country or a group of economic activity. It is not constrained by geographical area or development stage of the entities. It is thus simple and flexible. In an era of globalization where changes take place in short cycles and the pension system programs are changing very fast, the main advantage of the PPSPE-Model is the ability to capture and measure the change, vulnerability and any pension system performance.

The main conclusion is that to generate a high marginal optimum national pension system rate (Ω') is necessary to have an efficient coordination of the total national pension system coverage per year growth rate ($\Delta\alpha$); the private and public pensioner's volume coverage under the national level growth rate

($\Delta\beta$); the national total factor productivity annual rate (ΔNTFP); and the informal labor effective rate **(**θ). The ability to expand pension system programs quickly, and the ability of the pension system to adapt to the fast labor productivity changes locally and internationally. The second finding is that the marginal optimum national pension system rate (Ω') is based on how the marginal optimum national pension system coverage critical point (Ω^*) can be adapted to any pension system to generate a large impact in all levels in the society without any discrimination or special groups.

References

Asian Development Bank. (2016). General Information and Database Statistics. Retrieved from http://www.adb.org

Employees Provident Fund (EPF). (2016). General Information and EPF Database Statistics. Retrieved from http://www.kwsp.gov.my/portal/en/web/kwsp/home

Japan Pension Service. (2016). General Information and Database Statistics. Retrieved from http://www.nenkin.go.jp/international/english/nationalpension/nationalpension.html

Ministry of Health, Labour, and Welfare in Japan. (2016). General Information and Database Statistics. Retrieved from http://www.mhlw.go.jp/english/

Ministry of Human Resources. (2016). General Information and Database Statistics. Retrieved from http://www.mohr.gov.my/index.php/en/

Ruiz Estrada, M.A. (2011). Policy Modeling: Definition, Classification, and Evaluation. *Journal of Policy Modeling, 33*(4), 523-536.

Ruiz Estrada, M.A. & Yap, S.F. (2013). The Origins and Evolution of Policy Modeling. *Journal of Policy Modeling, 35*(1), 170-182.

Ruiz Estrada, M.A. (2017). An Alternative Graphical Modeling for Economics: Econographicology. *Quality and Quantity*. DOI: 10.1007/s11135-015-0280-3

World Bank. (2016). General Information and Database Statistics. Retrieved from www.worldbank.org

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His research, which has been published extensively in journals such as Journal of Policy Modeling, Disasters, Quality and Quantity, Singapore Economic Review, Panoeconomicus, Contemporary Economics, Defense and Peace Economics, Procedia Computer Sciences, Malaysian Journal of Economic Studies, Malaysian Journal of Science, and books, that revolves around policy-oriented topics relevant for worldwide long-term development, including policy modeling, natural disasters evaluation, war and border conflicts, social security, and food security issues.

DONGHYUN PARK

Dr. Donghyun PARK is currently Principal Economist at the Economics and Research Department (ERD) of the Asian Development Bank (ADB), which he joined in April 2007. Prior to joining ADB, he was a tenured Associate Professor of Economics at Nanyang Technological University in Singapore. Dr. Park has a Ph.D. in economics from UCLA, and his main research fields are international finance, international trade, and development economics. His research, which has been published extensively in journals and books, revolves around policy-oriented topics relevant for Asia's long-term development, including the middle-income trap, service sector development, and financial sector development. Dr. Park plays a leading role in the production of Asian Development Outlook, ADB's flagship annual publication.

EVANGELOS KOUTRONAS

Evangelos Koutronas is a Junior Research Fellow at SSRC. Evangelos Koutronas holds a PhD in Economics with concentration in Social Security from University of Malaya. His research interests span a wide range of topics, including social security, economics of terrorism, natural disasters, war game theory, mathematical economic modelling, and labor economics.

Evangelos Koutronas specializes in business, financial and economic analysis. He has an overall 10-year working experience with significant exposure to a wide variety of business fields. He graduated with Bachelor of Science as well as his first Master in Business Administration with concentration in Finance from University of La Verne, California and his second Master in Economics with concentration in Financial Economics and International Trade & Economics from West Virginia University, both in United States. Throughout his undergraduate studies, he participated in two national-level competitions in Economics where he received two distinctions.

NORMA MANSOR

Norma Mansor is the Director of SSRC, a position she holds since 2013. She is a professor at the Department of Administrative Studies and Politics, Faculty of Economics and Administration, University of Malaya where she served as the Dean from April 2004 to June 2009. She was appointed as Secretary of the National Economic Advisory Council in Prime Minister's Department from July 2009 to May 2011. She was a Ragnar Nurkse Visiting Professor at Talinn University of Technology, Estonia in 2015. Prior to these appointments, she has served as advisor and consultant to various government bodies and private organizations which include The National Institute Of Public Administration (INTAN), Sarawak Economic Development Corporation (SEDC), Federal Agricultural Marketing Authority (FAMA), The United Nations Development Programme (UNDP), World Bank, International Labor Organization (ILO), Organisation for Economic Co-operation and Development (OECD) and the European Union (EU).

Her research interest includes public policy, governance and social protection. She has written extensively in books and scholarly journals. She sits as Editor in Chief of Institutions and Economies Journal, Member of Editorial Advisory Board of Public Management and Money and guest editor to several academic journals.

Recent Publications

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