Coordination of pension systems when technologies are different

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Abstract

This paper presents a simple condition for optimal coordination of social security policies in the union of two open economies employing different production functions and within which capital and labour are fully mobile. We find that if both countries run fully-funded pension schemes, the allocation of mobile production factors may not be optimal when the countries have different technologies. In order to remove this distortion, at least one country must run a pay-as-you-go (PAYG) pension scheme. Policy coordination which takes technological differences into account allows for the removal of static inefficiencies, maximizing the welfare of the agents in the steady state.

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1 Introduction

The increasing mobility of labour and capital raises questions about the optimal allocation of production factors between countries. One possible reason for non-optimal distribution of mobile resources is uncoordinated pension systems. From the analyses of Homburg and Richter (1993) and Breyer and Kolmar (2002) it follows that, in the absence of population growth, optimal allocation is achieved when countries have the same pension systems. However, in both papers, capital flows are not endogenous and optimality conditions are found assuming an exogenously given amount of capital in the countries. At the same time, if labour moves from one country to another, interest rates change, creating incentives for capital relocation. This paper shows that if both migration and capital mobility are endogenous, and countries employ different production functions, then at least one country should run a PAYG pension scheme in order to avoid static distortions.

An impact of migration on capital flows was studied by Gerking and Mutti (1983). They showed that an immigration of unskilled labour to a more developed country leads to an outflow of capital from the less developed country, and differences in production functions may lead to an increased gap in wage rates. Relevant literature also includes the paper by Fedotenkov and Meijdam who derived an optimality condition similar to Breyer and Kolmar (2002); however, gains in efficiency were determined by an optimal use of land as a production factor. Geide-Stevenson (1998) analyzed incentives for factor mobility caused by differences in pension systems in a model with endogenous capital and labour flows. The model developed in our paper avoids the corner solutions possible in the Geide-Stevenson model by assuming dissimilar production technologies in the countries and land as an immobile production factor, and provides a condition for optimal coordination of the pension systems. Moreover, we expand on Fedotenkov and Meijdam's paper by allowing for different technological functions in the countries - with interesting results. The optimality in the model developed in the current paper derives from the differences in production functions. Different output elasticities of capital in the countries have an empirical confirmation. For example, Maddison (1987) estimates the share of capital income in GDP at 25.5% in the UK, and 30.5% in France. The model proposed in this paper takes such differences into account.

Breyer (1989) and Verbon (1989) show that if a PAYG pension scheme does not produce static distortions, it is impossible to make a welfare improving switch from PAYG to a more fully-funded pension scheme. Many other observers argue that PAYG pension schemes do produce static distortions. They distort the labour supply (Browning 1975 and Homburg 1990) and reduce investments in human capital (Köthenbürger and Poutvaara 2006). However, as this paper shows, assuming a union of two small open economies, abolishing social security systems in both countries creates diverse static distortions if production functions in the two countries are different. Namely, agents choosing a country in which to live do not take into account the likely increase in the marginal productivity of capital in the chosen country which would arise from a

certain degree of complementarity of labour and capital in production. Therefore, the capital stock increases in this country to keep marginal productivity constant. However, if the same agents had decided to settle in the neighboring country - with a larger output elasticity of capital - they could very well attract more capital there. On the other hand, in the union of two small open economies, returns to capital are fixed, while returns to labour are not - unless there are constant returns to scale in labour and capital. Therefore, more agents concentrated in the country with a higher output elasticity of labour facilitate the allocation of more output produced in the union to the agents living there, increasing their welfare. Thus, differences in production functions can lead to an inefficient allocation of mobile production factors within the union, giving rise to the need for a PAYG pension scheme in one of the countries so as to remove these distortions.

A link between pensions, investments in human capital and migration was studied by Poutvaara (2007). He showed that a potential for migration increases investments in human capital in the country with flat-rate benefits, and has the opposite effect in the country with earnings-related benefits.

This paper focuses on the effects produced by different production functions, and mobile production factors. It does not discuss an endogenous labour supply, investment in human capital or other possible extensions discussed in detail in the previous literature.

In the next section the model is developed, and an optimality condition is found, section 3 describes dynamics of the model and welfare of transitional generations, section 4 concludes.

2 The model

A union of two small open economies is presented in the model - referred to as "Home" and "Foreign" countries. The countries may differ regarding land endowments and production technologies. Labour is mobile within the union, and capital is mobile both within the union, and also toward the outside world, so that interest rates are fixed. There are two overlapping generations. Young agents invest their savings in capital and land. Old agents sell the land to the young and consume savings and pension benefits.

2.1 Firms

Production Y is determined by a Cobb-Douglas technology:

$$Y_t = A^{1-\alpha-\beta} K_t^{\alpha} L_t^{\beta}, \tag{1}$$

$$\tilde{Y}_t = \tilde{A}^{1-\tilde{\alpha}-\tilde{\beta}} \tilde{K}_t^{\tilde{\alpha}} \tilde{L}_t^{\tilde{\beta}}. \tag{2}$$

A, K and L denote land endowment, capital stock and labour employed in the Home country. It is supposed that $\alpha + \beta < 1$. The corresponding variables and

constants with tildes refer to the Foreign country. Interest rates and wages are equal to the marginal returns of capital and labour respectively.

$$1 + \bar{r} = \alpha A^{1-\alpha-\beta} K_t^{\alpha-1} L_t^{\beta}, \tag{3}$$

$$1 + \bar{r} = \tilde{\alpha} \tilde{A}^{1-\tilde{\alpha}-\tilde{\beta}} \tilde{K}_t^{\tilde{\alpha}-1} \tilde{L}_t^{\tilde{\beta}}, \tag{4}$$

$$w_t = \beta A^{1-\alpha-\beta} K_t^{\alpha} L_t^{\beta-1}, \tag{5}$$

$$\tilde{w}_t = \tilde{\beta} \tilde{A}^{1-\tilde{\alpha}-\tilde{\beta}} \tilde{K}_t^{\tilde{\alpha}} \tilde{L}_t^{\tilde{\beta}-1}. \tag{6}$$

There are also nonzero returns to land:

$$a_t = (1 - \alpha - \beta) A^{-\alpha-\beta} K_t^{\alpha} L_t^{\beta}. \tag{7}$$

Denote the price of land at time t as P_t. Following Köthenbürger and Poutvaara (2006) arbitrage does not exist, implying:

$$(1 + \bar{r}) P_t = a_{t+1} + P_{t+1}, \tag{8}$$

likewise for the Foreign country.

2.2 Households

Denote consumption of the young at time t as C_t^y, and consumption of the old at the period $t + 1$ as C_{t+1}^o. The agents in both countries maximize the same utility function, which satisfies Inada conditions:

$$\max_{C_t^y, C_{t+1}^o} U(C_t^y, C_{t+1}^o), \tag{9}$$

with the budget constraints:

$$C_t^y = (1 - \tau) w_t - s_t \tag{10}$$

$$C_{t+1}^o = \eta_{t+1} + (1 + \bar{r}) s_t, \tag{11}$$

where s_t denotes savings made at time t. As agents may freely choose where to invest their savings, returns on investments in land and capital are equal. There is no need, therefore, to distinguish between them. η_{t+1} denotes pension benefits with defined contributions:

$$\eta_{t+1} = \tau w_{t+1} \frac{L_{t+1}}{L_t}. \tag{12}$$

2.3 Steady state

In this subsection we omit time indexes in reference to steady state values.

As utility function satisfies Inada conditions, a larger present value of life-time income allows for a larger utility. Thus, equilibrium in the labour market is determined by equalities of present values of life-time incomes in the countries:

$$w(1 + \bar{r} - \tau \bar{r}) = \tilde{w}(1 + \bar{r} - \tilde{\tau} \bar{r}). \tag{13}$$

This equation is received using the fact that there is no migration in the steady state. Substituting wages from equations (5) and (6) and using capital derived from equations (3) and (4) an expression for the actual allocation of labour in the steady state is received:

$$\beta\left(\frac{L}{A}\right)^{-\frac{1-\alpha-\beta}{1-\alpha}}\left(\frac{\alpha}{1+\bar{r}}\right)^{\frac{\alpha}{1-\alpha}}(1+\bar{r}-\tau\bar{r})=\tilde{\beta}\left(\frac{\tilde{L}}{\tilde{A}}\right)^{-\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}\left(\frac{\tilde{\alpha}}{1+\bar{r}}\right)^{\frac{\tilde{\alpha}}{1-\tilde{\alpha}}}(1+\bar{r}-\tilde{\tau}\bar{r}) \tag{14}$$

The allocation of labour is expressed in terms of population densities L/A and $\tilde{L}/\tilde{A}$. This depends on the PAYG contribution rates τ and $\tilde{\tau}$.

2.4 Optimality

According to Homburg and Richter (1993) and Breyer and Kolmar (2002), the allocation of labour between countries is optimal when it leads to the maximal amount of production in the union. This is not the case in our model, since under the assumption of a union of two small open economies, interest rates are fixed and returns to capital may go abroad. Agents receive wages - not constant due to the presence of a fixed factor (land) in the production function - and pension benefits which are linked to wages. Therefore, an optimality for the agents living in the union is achieved when the total amount of wages in the union is maximized $Lw+\tilde{L}\tilde{w}=\beta Y+\tilde{\beta}Y$.

Suppose that the total number of agents in the union is constant and denote it with $\Lambda=L+\tilde{L}$. Inserting capital expressed from equations (3) and (4) into (1) and (2) the total wages in the union become equal:

$$\beta Y+\tilde{\beta}Y=\beta A^{\frac{1-\alpha-\beta}{1-\alpha}}L^{\frac{\beta}{1-\alpha}}\left(\frac{\alpha}{1+\bar{r}}\right)^{\frac{\alpha}{1-\alpha}}+\tilde{\beta}\tilde{A}^{\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}(\Lambda-L)^{\frac{\tilde{\beta}}{1-\tilde{\alpha}}}\left(\frac{\tilde{\alpha}}{1+\bar{r}}\right)^{\frac{\tilde{\alpha}}{1-\tilde{\alpha}}}. \tag{15}$$

Derivation of equation (15) ensures that capital flows are modeled endogenously. This is an essential difference from Homburg and Richter (1993) and Breyer and Kolmar (2002). Taking a derivative with respect to L and equalizing it to zero we find that the production in the union is maximal when labour allocation between the countries satisfies

$$\frac{\beta^2}{1-\alpha}\left(\frac{L}{A}\right)^{-\frac{1-\alpha-\beta}{1-\alpha}}\left(\frac{\alpha}{1+\bar{r}}\right)^{\frac{\alpha}{1-\alpha}}=\frac{\tilde{\beta}^2}{1-\tilde{\alpha}}\left(\frac{\tilde{L}}{\tilde{A}}\right)^{-\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}\left(\frac{\tilde{\alpha}}{1+\bar{r}}\right)^{\frac{\tilde{\alpha}}{1-\tilde{\alpha}}}. \tag{16}$$

It is easy to see that the second derivative of equation (15) with respect to L is negative, so equation (16) is indeed a condition for the optimal allocation of labour in the union. It is interesting to note that if the countries employ the same production technologies, this condition simplifies to the equality of population densities, i.e. $L/A=\tilde{L}/\tilde{A}$. This generalizes the result received by Fedotenkov and Meijdam, who show that when the countries are equal in size and employ the same production functions, optimality is achieved when labour is allocated equally between the countries. Condition (16) is a more general result, allowing both for different-sized countries and also for different technologies.

Comparing the optimality condition (16) with the actual allocation of labour described by equation (14), we see that the optimal allocation of labour is achieved when

$$\frac{1+\bar{r}-\tau\bar{r}}{1+\bar{r}-\tilde{\tau}\bar{r}} = \frac{(1-\tilde{\alpha})\beta}{(1-\alpha)\tilde{\beta}}. \tag{17}$$

Thus, if countries have different technologies, one of the countries should run a more generous (for pensioners) PAYG pension scheme unless $\beta/(1-\alpha) = \tilde{\beta}/(1-\tilde{\alpha})$. Suppose $\beta/(1-\alpha) < \tilde{\beta}/(1-\tilde{\alpha})$ and the Foreign country runs a fully-funded pension scheme. i.e. $\tilde{\tau} = 0$. Then the optimal PAYG contribution rate in the Home country is

$$\tau^* = \frac{(1+\bar{r})(\tilde{\beta}(1-\alpha) - \beta(1-\tilde{\alpha}))}{\bar{r}\tilde{\beta}(1-\alpha)} > 0. \tag{18}$$

Therefore, one of the countries needs to impose a positive PAYG tax in order to maximize the welfare in the union.

The intuition of this result comes from two observations: An increase of labour supply in one of the countries tends to increase interest rates. But, as the interest rates are constant, this results in the inflow of capital to the country. Suppose, there is no PAYG pension system. From the equations (3)-(6) it is easy to get

$$\frac{\partial K}{\partial L} = \frac{\alpha w}{(1-\alpha)(1+\bar{r})} \neq \frac{\tilde{\alpha}\tilde{w}}{(1-\tilde{\alpha})(1+\bar{r})} = \frac{\partial \tilde{K}}{\partial \tilde{L}} \tag{19}$$

if $\alpha \neq \tilde{\alpha}$. Note that in this case $w = \tilde{w}$ because of the labour market equilibrium (13). Therefore, a marginal increase of labour in the country with a lower output elasticity of capital is likely to attract less capital to this country than it would attract to the neighbouring country. On the other hand, interest rates are fixed. Therefore, an increase in wages and pensions, which are wage-linked, increases the welfare of agents, while the returns to capital may go to the rest of the world (or agents living in the union may invest their savings abroad). A larger concentration of labour in the country with a larger output elasticity of labour permits the redistribution of more output produced in the union to the agents living there in the form of higher wages and pensions. Therefore, the optimal coordination of PAYG pension systems depends on a combination of country-specific output elasticities of labour and capital.

This finding does not contradict the first welfare theorem, because the amount of capital is infinite in the world, assuming a small open union. We derive an optimality condition for the two countries constituting the union - the rest of the world is not taken into account, which in the case of two small open economies is too large to be a affected by these two countries. It should also be noted that PAYG pension system in the model works as a tool to make incentives for agents to reallocate from one country to another. This can also be achieved by introducing labour taxes, which finance government consumption or external debt, or by other fiscal measures.

3 Transition

In this section transitional dynamics and welfare of transitional generations are analysed.

3.1 Stability

The possibility of establishing an efficient coordination of pension systems is an incentive for a pension reform in one of the countries. Long-run results were discussed in the previous section, and now we will briefly discuss the dynamics of the model that arises if pension reform takes place. The model, in fact, has an unstable saddle-point equilibrium. This can be seen from the following analysis: Agents migrate to the country where they obtain a larger present value of lifetime income; therefore present values of lifetime incomes in both countries are equal:

$$w_t(1-\tau)+\tau w_{t+1}\frac{L_{t+1}}{L_t(1+\bar{r})}=\tilde{w}_t(1-\tilde{\tau})+\tilde{\tau}\tilde{w}_{t+1}\frac{\tilde{L}_{t+1}}{\tilde{L}_t(1+\bar{r})}. \tag{20}$$

Using expressions for wages (5) and (6), and eliminating capital from them with equations (3) and (4) we get

$$\begin{aligned}\beta\left(\frac{\alpha}{1+\bar{r}}\right)^{\frac{\alpha}{1-\alpha}}A^{\frac{1-\alpha-\beta}{1-\alpha}}L_t^{-\frac{1-\alpha-\beta}{1-\alpha}}\left[1-\tau+\frac{\tau}{1+\bar{r}}\left(\frac{L_{t+1}}{L_t}\right)^{\frac{\beta}{1-\alpha}}\right]=\\ \tilde{\beta}\left(\frac{\tilde{\alpha}}{1+\bar{r}}\right)^{\frac{\tilde{\alpha}}{1-\tilde{\alpha}}}\tilde{A}^{\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}\tilde{L}_t^{-\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}\left[1-\tilde{\tau}+\frac{\tilde{\tau}}{1+\bar{r}}\left(\frac{\tilde{L}_{t+1}}{\tilde{L}_t}\right)^{\frac{\tilde{\beta}}{1-\tilde{\alpha}}}\right].\end{aligned} \tag{21}$$

The system is in the steady state when $L_t = L_{t+1}$. Suppose, this is not the case. Write $L_t = L_s + \Delta L_t$, where L_s denotes the steady state value of labour in country H, ΔL_t is a deviation from this steady state. As there is no population growth in the union, $\tilde{L}_t = \tilde{L}_s - \Delta L_t$ where $\tilde{L}_s = \Lambda - L_s$.

$$\begin{aligned}\beta\left(\frac{\alpha}{1+\bar{r}}\right)^{\frac{\alpha}{1-\alpha}}A^{\frac{1-\alpha-\beta}{1-\alpha}}\underbrace{(L_s+\Delta L_t)^{-\frac{1-\alpha-\beta}{1-\alpha}}}_{\Psi_1}\left[1-\tau+\frac{\tau}{1+\bar{r}}\underbrace{\left(\frac{L_s+\Delta L_{t+1}}{L_s+\Delta L_t}\right)^{\frac{\beta}{1-\alpha}}}_{\Psi_2}\right]=\\ \tilde{\beta}\left(\frac{\tilde{\alpha}}{1+\bar{r}}\right)^{\frac{\tilde{\alpha}}{1-\tilde{\alpha}}}\tilde{A}^{\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}\underbrace{(\tilde{L}_s-\Delta L_t)^{-\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}}_{\Psi_3}\left[1-\tilde{\tau}+\frac{\tilde{\tau}}{1+\bar{r}}\underbrace{\left(\frac{\tilde{L}_s-\Delta L_{t+1}}{\tilde{L}_s-\Delta L_t}\right)^{\frac{\tilde{\beta}}{1-\tilde{\alpha}}}}_{\Psi_4}\right].\end{aligned} \tag{22}$$

All values in equation (22) are constant, except for ΔL_t and ΔL_{t+1}. If the system is in the steady state, $\Delta L_t = \Delta L_{t+1} = 0$. $\Delta L_t > 0$ (the case $\Delta L_t < 0$ is symmetric) reduces Ψ_1 and increases Ψ_3 relatively to the steady state values. Hence, the equality can only be valid if Ψ_2 increases and/or Ψ_4 decreases. This

is only possible when $\Delta L_{t+1} > \Delta L_t$. Therefore, if L_t is not in its steady state, L_{t+1} will be even further from it. As a result, the system will never converge to its new steady state. This shows that the equilibrium in the model is an unstable saddle-point equilibrium.

Therefore, if the pay-as-you-go tax is changed in one of the countries, the model immediately jumps to its new steady state. There are no transitional dynamics in the model.

3.2 Welfare effects

Suppose that initially both countries have fully-funded pension schemes, and at time $t = 0$ one of the countries introduces a PAYG pension scheme as in equation (18). The model is saddle-point stable and following the introduction of a PAYG pension scheme, the system would immediately jump to its new steady state; therefore, the young generation at the time of the reform, and all future generations would gain from the introduction of a PAYG scheme. However, the welfare of the old generations living at the time of the reform remains problematic. The old generations invest in both land and capital. Capital is fully mobile (in the short run as well) within the union of the two countries, and also within the wider world - so interest rates remain unchanged, and investments to capital bring neither welfare gains nor losses. However, land is immobile, and returns to land vary post-reform, thus affecting the price at which it can be sold. From the assumptions of the model it is not clear who exactly owns the land, since agents from one country may invest in land in another country. Likewise, foreigners from outside the union may invest in land in both countries. In the latter case, old generations in the countries are not affected by pension reform at all. That said, it is more logical to assume that land in a country belongs to the citizens of this country. As labour moves from the country introducing a PAYG pension scheme to the country with a fully-funded pension scheme, returns to land and, likewise, the price of land in the funded country increase, while in the PAYG country they decline. The old generation in the funded country gains from the higher price of land, while the old generation in the PAYG country loses, but some these losses are compensated by the introduced PAYG pension scheme. If the countries coordinate pension reform, old generation benefits in the funded country can be taxed in order to compensate for the losses of the old generation in the PAYG country. An interesting question is whether the introduced PAYG pension scheme and benefits of the old generation in the funded country are sufficient to counterbalance the losses to the old generation in the PAYG country caused by a decline in the price of land. Consider the problem thusly: Similar to Köthenbürger and Poutvaara (2006) the value of land in the Home country can be found using recursion in the equation (8), and it is equal to $V = a/\bar{r}$, where a is defined in equation (7). Furthermore, elderly generation receives returns to land a. Therefore, the total income of the old generations in both countries at the time of pension reform is equal to

$$(L_{-1}\sigma_{-1} + \tilde{L}_{-1}\tilde{\sigma}_{-1})(1+\bar{r}) + \frac{1+\bar{r}}{\bar{r}}(Aa_0 + \tilde{A}\tilde{a}_0) + L_0 w_0 \tau, \qquad (23)$$

where σ and $\tilde{\sigma}$ denote savings invested in the capital market (in equations (10) and (11), s_t refers to total savings including investments in land), index -1 corresponds to the old generation at the time of pension reform, and index 0 corresponds to the period of reform. Let's see what occurs when this income is maximal. Using equations (3)-(5), (7) and performing an analysis similar to that in subsection 2.4, we find that the welfare of the elderly people at the time of reform is maximal, when labour (at $t = 0$) is allocated thusly:

$$\frac{\beta\big(1-\alpha-\beta(1-\tau\bar{r}/(1+\bar{r}))\big)}{1-\alpha}\left(\frac{L}{A}\right)^{-\frac{1-\alpha-\beta}{1-\alpha}}\left(\frac{\alpha}{1+\bar{r}}\right)^{\frac{\alpha}{1-\alpha}} = \frac{\tilde{\beta}(1-\tilde{\alpha}-\tilde{\beta})}{1-\tilde{\alpha}}\left(\frac{\tilde{L}}{\tilde{A}}\right)^{-\frac{1-\tilde{\alpha}-\tilde{\beta}}{1-\tilde{\alpha}}}\left(\frac{\tilde{\alpha}}{1+\bar{r}}\right)^{\frac{\tilde{\alpha}}{1-\tilde{\alpha}}}. \tag{24}$$

We ignore time indexes, since all the variables in this equation correspond to the period 0, which in turn corresponds to the new equilibrium. Equalizing $\tilde{\tau}$ to zero, and comparing equation (24) with equation (14), we see that benefits of the old generations living at the time of reform are maximal when τ satisfies

$$\tau = \frac{(1+\bar{r})\big((1-\tilde{\alpha})\beta-(1-\alpha)\tilde{\beta}\big)}{\bar{r}\big(\beta(1-\tilde{\alpha})+(1-\alpha)(1-\tilde{\alpha}-\tilde{\beta})\big)}. \tag{25}$$

Comparing optimal taxes in equations (25) and (18), we observe that they are of the opposite sign - i.e. a welfare improving pension reform for the young generation results in losses for the old generation. As a result, if a PAYG pension system is introduced, the old generation in the reforming country becomes worse off, and the benefits accruing to the old generation in the funded country are not sufficient to outbalance these losses. Nevertheless, the result noted in the previous section is still interesting, since many countries do reform their pension systems by switching from PAYG to more funded schemes, and the main message of this paper is that a PAYG pension system may be useful in the long run.

4 Conclusions

This paper develops a simple rule for the coordination of PAYG pension schemes in a union of two countries with mobile capital and labour, and land as an immobile production factor. The general rule is that the optimal coordination of pension systems depends on the output elasticities of labour and capital. Even if pensions in one country are fully funded, the other country should run a PAYG scheme in order to maximize the welfare of agents in the union in the long run. However, the introduction of a PAYG pension scheme may have an adverse effect on the old generation in the reforming country because of a decline in the price of land. The inclusion of an endogenous labour supply and/or investments in human capital within the model would reduce the need for the

PAYG pension scheme, or even entirely eliminate incentives for running a PAYG pension scheme. These factors have been analyzed in detail in the previous literature; the goal of this paper has been to focus on the need for a PAYG pension scheme arising from differences in production functions and endogenous labour and capital mobility in the union of two small open economies, aspects unreported on in the earlier works.

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References

Breyer, F. (1989). On the intergenerational Pareto efficiency of pay-as-you-go financed pension systems. Journal of Institutional and Theoretical Economics 145, 643-658.

Breyer, F. and M. Kolmar (2002). Are national pension systems efficient if labor is (im)perfectly mobile? Journal of Public Economics 83, 347-374.

Browning, K. (1975). Labor supply distortions of social security. Southern Economic Journal 42 (2), 243-252.

Fedotenkov, I. and A. C. Meijdam. Forthcoming. Pension reform with migration and mobile capital: is a Pareto improvement possible? International Economics and Economic Policy. DOI 10.1007/s10368-013-0259-2.

Geide-Stevenson, D. (1998). Social security policy and international labor and capital mobility. Review of International Economics 6 (3), 407-416.

Gerking, S. D., Mutti J. H. (1983). Factor rewards and the international migration of unskilled labor: A model with capital mobility. Journal of International Economics 14, 367-380.

Homburg, S. (1990). The efficiency of unfunded pension schemes. Journal of Institutional and Theoretical Economics 146, 630-647.

Homburg, S. and W. F. Richter (1993). Harmonizing public debt and public pension schemes in the European community. Journal of Economics. Zeltschrift für Nationalökonomie 146, 54-63.

Köthenbürger, M. and P. Poutvaara (2006). Social security reform and investment in education: Is there scope for a Pareto improvement? Economica 73, 299-319.

Maddison, A. (1987). Growth and slowdown in advanced capitalist economies: Techniques of quantitative assessment. Journal of Economic Literature 25(2), 649-698.

Poutvaara, P. (2007). Social security incentives, human capital investment and mobility of labor. Journal of Public Economics 91(7-8), 1299-1325.

Verbon, H. A. (1989). Conversion policies for public pensions plans in a small open economy. B. Gustafsson and N. Klevmarken, eds, The Political Economy of Social Security, Elsevier Science, Amsterdam.