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The Dutch Tax-Benefit System and Life-Cycle Employment: Outcomes and Reform Options

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THE DUTCH TAX-BENEFIT SYSTEM AND LIFE-CYCLE EMPLOYMENT: OUTCOMES AND REFORMS

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ABSTRACT/RESUME

The Dutch tax-benefit system and life-cycle employment: Outcomes and reform options

An overlapping-generations model with search unemployment is calibrated for the Netherlands to assess the impact of tax-benefit reforms on labour supply. Several reforms are analysed, in particular the introduction of a flat tax and pension reforms. The model demonstrates the potential of these reforms to raise labour supply. In particular, pension reforms, such as lowering replacement rates for pensioners, help to boost participation rates of older workers. On the other hand, a flat tax would promote longer working hours across the board, thereby rising labour supply. However, the introduction of a flat tax is a costly measure and would increase the primary general government deficit by close to 2% of GDP. Simultaneous measures to lower the structural unemployment rate would not only help to avoid adverse effects of such a tax reform on the fiscal balance but would strengthen further the positive effects of a flat tax on working hours.

This Working Paper relates to the 2008 Economic Survey of the Netherlands (www.oecd.org/eco/surveys/netherlands).

JEL classification: D91 ; E24 ; J64 ; J26
Keywords: Netherlands; overlapping-generations model; dynamic tax-benefit policies; equilibrium unemployment; labour market search frictions; pension reforms, tax reforms

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**Le système des impôts et des transferts sociaux néerlandais et l'emploi pendant le cycle de vie :
Résultats et options de réformes**

Un modèle à générations imbriquées avec chômage d'équilibre est calibré pour les Pays-Bas afin d'évaluer l'impact des réformes du système d'imposition et de transferts sociaux sur l'offre du travail. Plusieurs réformes sont analysées, en particulier l'introduction d'un impôt à taux unique et des réformes du système des retraites. Le modèle montre le potentiel de ces réformes pour augmenter l'offre du travail. En particulier, les réformes du système des retraites visant à diminuer le taux de remplacement des retraites permettent d'augmenter l'offre du travail des seniors. De l'autre côté, un impôt à taux unique permettrait d'augmenter le nombre d'heures travaillées par personne, ce qui augmenterait l'offre du travail. Néanmoins, introduire un tel impôt est une mesure couteuse et augmenterait le déficit primaire de près de 2% du PIB. Des mesures simultanées de réduire le taux de chômage structurel permettraient de contrebalancer des effets adverses d'une telle réforme des impôts sur le solde budgétaire et augmenterait en même temps son effet positif sur le nombre d'heures travaillées.

Ce Document de travail se rapport à l'Étude économique des Pays-Bas 2008 (www.oecd.org/eco/etudes/paysbas).

Classification JEL: D91 ; E24 ; J64 ; J26
Mots clés : Pays-Bas ; modèle à générations imbriquées ; politiques fiscales dynamiques ; chômage d'équilibre ; frictions d'appariement du marché du travail ; réformes du système des retraites ; réformes du système des impôts.

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By Ekkehard Ernst and Timo Teuber[*]

1.   Like other OECD countries, the Dutch economy has started to feel the effects of population ageing, as the growth of labour supply slows, weakening long-run growth prospects. In the past, income replacement schemes, targeted to people staying outside the labour market, were initially put in place as an attempt to address the adverse effects of large economic shocks and industrial restructuring, notably in the 1970s and 1980s. Even though these schemes were subsequently reformed and inactivity fell rapidly over the 1990s, there continue to be around 1½ million recipients (around 18% of the labour force) that still access some form of replacement income due to their health characteristics (long-term sick leave, disability benefits), labour market situation (unemployment benefits, social assistance) or age (early retirement). On the other hand, the ageing effect on aggregate labour supply is mitigated by cohort effects of female participation, whereby younger generations of women tend to participate more than older ones. When measured in the number of hours worked, however, the high incidence of part-time employment among female workers is limiting the positive contribution of higher female participation on labour supply.

2.   As a consequence of these contrasting trends, there is a need to raise simultaneously participation rates of underrepresented groups and hours worked to cope with the challenges of population ageing for labour supply and fiscal sustainability. A particular promising area of reform in this respect is the tax code and the benefit system, including public pensions. Several reforms have been enacted in recent years to strengthen labour supply, in particular by removing tax breaks for early retirement and introducing childcare benefits to help mothers to combine work and care responsibilities. The following paper assesses the effects of the current tax-benefit system on labour supply from a life-cycle point of view, taking into account shifting participation and working hours decision over the course of life of a household. Moreover, the paper discusses some reform options that would allow a further increase in labour supply. The paper also presents the consequences of these reforms for fiscal sustainability and income inequality.

3.   Using the life-cycle point of view is motivated by the fact that households make their labour supply decisions on the basis of the net present value of their tax liabilities net of benefits. As a consequence, the optimal labour input by households in equilibrium will also depend on incentives to save and build up wealth over their life-time. Hence, taxes on capital and consumption directly impact upon savings incentives and labour supply. Moreover, pension rights and the interaction between private and public pension assets will impact on incentives for participating, especially at older ages. In addition, exit routes provided by the benefit system – for instance through social assistance or unemployment benefits –

may allow a temporary or permanent exit from the labour market, several years before the official retirement age.

4.   The analysis of the tax burden over the life-cycle has been a long-standing issue in the literature on optimal taxation and fiscal policy, starting with the seminal contribution by Auerbach and Kotlikoff (1987) and more recently Kotlikoff and Rapson (2006) with an in-depth study of the US tax-benefit system. A main thrust of this literature has been that measures that try to shift the tax burden away from labour and towards capital income or consumption are unlikely to raise labour input permanently to the extent that the (discounted) life-cycle tax burden remains unchanged. Moreover, inactivity traps can open up when households move through different income brackets over their life time. Finally, this literature has pointed to the importance of pension reforms for any changes in the tax-benefit package. Existing state pension systems are likely to raise the implicit tax rate on continuing work for older workers and constitute a substantial drag on public finances that could be used to lower the (marginal) tax burden. In particular in a country with large, privately owned pension wealth in form of capitalised occupational pension schemes as in the Netherlands, the decision to quit the labour market may be strongly influenced by savings incentives and the rate at which sufficient pension wealth can be built up (Bloemen, 2006).

5.   In order to analyse the impact of the Dutch tax-benefit system for life-cycle participation and working hours decisions, an overlapping-generations model with search unemployment has been calibrated, with households taking simultaneously decisions regarding their consumption, participation and hours worked. The model considers the impact of three different types of taxes on incentives to participate and to expand working hours: taxes on consumption, on labour earnings and on capital income. In addition, the model includes social benefits and tax breaks available to households, such as the general tax credit and tax exemptions for pensioners. The equilibrium distribution of the aggregate capital stock across different households then allows to calculate the net present value of tax liabilities that a household in a certain income bracket faces and to determine the household's labour supply over the life cycle. In addition, the model considers different tax-benefit and pension reforms to stimulate increases in participation and hours worked. The main results of this paper can be summarised as follows:

- Dutch households face high effective marginal tax rates already for very low earnings. In addition, when calculated over the life-time, their statutory marginal tax rates are also high even for life-time income well below average earnings;

- Pension reforms can lower this life-time tax burden; the most efficient pension reform is a reduction in the level of the state pension (AOW). Labour supply would increase mainly due to higher participation rates of older workers;

- Introducing a flat tax would increase labour supply by 6-8%, mainly through an increase in average hours worked. This is more than suggested by a static analysis of such a tax reform. However, introducing a flat tax would come at a substantial fiscal cost of close to 2% of GDP that has to be financed through higher indirect taxes or through additional reforms to lower structural unemployment.

6.   The paper is structured in the following way: The next section discusses the life of a cohort, deriving the optimal consumption, working hours and participation decision of the household sector. Thereafter, labour market demand is derived on the basis of a matching model with equilibrium unemployment. Before turning to the calibration of the model, a short overview of the Dutch system of taxes and benefits is provided. Finally, in the calibration section, first are presented the results from the current system; then, the section considers the impact of a pension reform and the introduction of a flat tax. A final section concludes.

An overlapping-generations model

A life of a cohort

7.   The analysis of life-cycle labour supply decisions has been based on an overlapping-generations model, similar to the one introduced by Auerbach and Kotlikoff (1987) and more recently applied by Kotlikoff and Rapson (2006). The model embodies 83 cohorts, each of which is characterised by its age at year *t*, its cohort size *N(t)* and - during working life - by its average productivity level *y(t)*. Within each cohort, 10 different productivity levels, *ef(i)*, are distinguished, reflecting individual differences in education and skills. The average individual's economic life starts at age 18 and ends with certain death at age 100. The life span is separated into working life (age 18-65) and retirement (age 65-100). For each generation, the cohort size shrinks over time as only the share *s(t)* of each cohort survives during the year.[1]

8.   During working age, each cohort comprises three groups: inactives, unemployed and employed people. Inactives have access to social assistance, unemployed will receive earnings-related unemployment benefits, while employees receive a wage that is proportional to their individual productivity *ef(i)* and their average cohort productivity *y(t)*, i.e. $w_{it} \sim ef_i \cdot y_t$. Once a cohort reaches retirement age, all individuals of the cohort will become inactive and receive their base pension. This assumption is in line with observed household behaviour whereby only very few individuals continue to participate after their 65th birthday.

9.   Besides earnings-related income, retired individuals also receive income from accumulated wealth. Individuals are supposed to leave no bequests at the time of their certain death. The accumulated wealth of those who have died earlier is supposed to be distributed across the cohort. The model does not make a distinction between different asset types (such as housing, financial and pension assets), which are all assumed to yield the same rate of return.[2] However, capital income taxes are levied only on part of the accumulated wealth, assuming that the relative share of different asset types does not change over the life-time.

The optimal work and leisure choice of a representative household

10.   The household maximises its intertemporal utility by making an optimal arbitrage between work and leisure over its life cycle. The optimal labour supply comprises two elements: a decision to participate and the number of hours worked as participation is costly (to reflect opportunity costs arising from commuting time, for instance), measured by θ_P. The household's utility function is supposed to be time-separable with a constant relative-risk aversion (CRRA). With the daily working time normalised to one, the objective function over the lifetime of the average working individual of cohort *i* therefore writes as:

$$U^i\big(c_t^i, h_t^i, P_t^i\big) = E_{t_0}\left[\sum_{t=1}^{100-17} \beta^t \left(\prod_{j=1}^{t} s_j\right)\left(\left(\frac{c_t^i(1-h_t^i)^{\eta}}{\gamma}\right)^{\gamma} - \theta_P P_t^i\right)\right]$$

where c_t^i: consumption of cohort *i*, P_t^i: its participation rate and h_t^i: its optimal working hours. The household's intertemporal time preference rate is measured by *β*, its relative risk aversion by *γ* and the labour supply elasticity by *γ·η*.

11.   Each household of cohort *i* maximises its utility against the following dynamic budget constraint:

$$a_{t+1}^i = (1 + r_t)a_t^i - \tau_W\big(a_t^i\big) - (1 + \tau_c)c_t^i + Yd\big(w_t, P_t^i, h_t^i, \tau_L\big) + tr_t^i$$

where r_t : the real rate of return on wealth, a_t^i: the total wealth of cohort i, $Yd(w_t, P_t^i, h_t^i, \tau^L)$: its disposable income depending on the ongoing wage w_t, its labour participation P_t^i and working hours h_t^i and the labour income taxes τ^L, and tr_t^i: social transfers depending on the age and the labour market status of the household. Unemployed workers (for whom $P_t^i = 1$ but $h_t^i = 0$) will receive unemployment benefits, while non-participation individuals that have not yet reached retirement age will receive social assistance. Households have to pay wealth and consumption taxes, τ^W and τ^C respectively, and receive transfers (in form of a base pension from 65 years on).

12.   The household's problem is solved in two steps. First, the household makes a decision whether or not to participate given the capital stock in the last living year and on the basis of its disposable income resulting from its labour market status. In a second step, for participating workers the optimal labour input conditional on being employed is determined, yielding the following optimality condition for consumption and hours worked (see annex):

$$\frac{\eta \cdot c_t^i}{1 - h_t^i} = \frac{1}{1 + \tau_c} \frac{\partial Yd(w_t, 1, h_t^i, \tau_L)}{\partial h_t^i}$$

where due to the progressive nature of the tax-benefit system the term on the right-hand side usually does not have a closed form expression.

The macroeconomic assumptions

13.   Wealth accumulated by the household sector is used by firms for productive investment. Moreover, firms will decide upon total hours worked by opening vacancies to fill available jobs, taking the decision on average hours as given. Jobs are filled through a search and matching process on the labour market, leaving some matches unrealised and thereby generating unemployment even in steady state. In order to maximise the net present value of their profits, firms select their flows of investment $\{i_t\}_{t=0}^{\infty}$ and vacancies $\{V_t\}_{t=0}^{\infty}$. The optimal program for firms therefore writes as:

$$\max_{i_t, V_t, n_{t+1}} \pi_t = \sum_{t=1}^{\infty} \left(\frac{1}{1 + r_t}\right)^t \{Y(A_t, k_t, n_t, h_t) - w_t h_t n_t - i_t - \zeta \cdot w_t V_t\}$$

subject to

$$k_{t+1} = (1 - \delta)k_t + i_t$$
$$n_{t+1} = m(U_t, V_t) + (1 - \sigma)n_t$$

with π_t: net present value of a firm's profits, k_t: the firm's capital stock, n_t: its employment level, h_t: average working hours, i_t: the firm's investment, w_t: the hourly wage rate, V_t: the firms open vacancies and where the production function is supposed to be Cobb-Douglas: $Y(A_t, k_t, h_t, n_t) = k_t^{\alpha}(A_t h_t n_t)^{1-\alpha}$.

14.   Equilibrium unemployment arises on the labour market following search frictions. In the process of labour market matching, households enter employment after having searched for suitable vacancies. We assume that the rate of successful matches, m_t, is proportional to the number of vacancies and unemployed workers (no job hopping). The matching process is described by the following standard constant-returns-to-scale matching function (see Pissarides, 2000), with gross job creation, q, negatively influenced by the vacancy ratio $\theta = V/U$:

$$m(U_t, V_t) = q_0 U_t^{q_1} V_t^{1-q_1} \Leftrightarrow \frac{m(U_t, V_t)}{U_t} = \theta \cdot q(\theta), q(\theta) = q_0 \theta_t^{-q_1}, \frac{\partial q(\theta)}{\partial \theta} < 0.$$

15.   Wages are negotiated at the firm level. As a first approximation to a Nash-bargaining distribution of profits, wages are determined as a weighted average between the marginal contribution of an additional worker to the firms' profits and the worker's fall-back option, *i.e.* social assistance. The bargaining power, ρ, is set to 0.48, in line with the average wage share in the Dutch economy. Moreover, the negotiated wages depend on the state of the labour market, measured by the vacancy ratio θ.

$$w_t h_t = \rho\big(Y_{n,t} + \zeta \cdot \theta_t w_t h_t\big) + (1-\rho)SA \Leftrightarrow w_t h_t = \frac{\rho}{1 - \zeta \cdot \theta_t \rho - (1-\rho)SA} Y_{n,t}$$

where *SA* measures the replacement ratio of social assistance benefits[3] and $Y_{n,t}$ the (aggregate) marginal labour productivity.

16.   In equilibrium, all firms behave symmetrically, hence the first-order conditions allow to determine the steady state as follows (see annex):

$$\bar{r} + \delta = \alpha \bar{k}^{\alpha-1}\big(\bar{A} \cdot \bar{h} \cdot \bar{n} \cdot LFPR \cdot POPT\big)^{1-\alpha}$$
$$\frac{\bar{r} + \sigma}{q(\bar{\theta})} = \frac{1 - \zeta \cdot \rho \cdot \bar{\theta} - (1-\rho)SA}{\rho} - \bar{h}$$
$$\bar{n} = \frac{\bar{\theta}q(\bar{\theta})}{\bar{\theta}q(\bar{\theta}) + \sigma} \cdot LFPR \cdot POPT$$
$$\bar{\imath} = \delta \bar{k}$$

where $\bar{r}$: equilibrium real interest rate, $\bar{n}$: equilibrium employment rate, LFPR: labour force participation rate (determined by households), POPT: working age population (exogenously given), $\bar{k}$: the economy's equilibrium capital stock, $\bar{\imath}$: equilibrium investment and $\bar{\theta}$: steady state vacancy ratio.

The tax-benefit system

Taxes

17.   The schedule for marginal effective tax rates on labour income is taken from OECD (2006). This includes not only the statutory tax rates for different income brackets but also various social benefits, such as housing and child benefits. In addition, different tax credits – such as the general tax credit and the work-related tax credit – are also included. Given that some of these tax credits and benefits depend on the household situation, the tax burden has been assessed separately for an economy only consisting of single earners and another one only consisting of married persons with two children. While this is clearly an abstraction, it allows to better identify how the burden of different tax-benefit reforms will affect different groups depending on their family situation.

18.   In addition, households face a consumption tax in form of a VAT of 19% and a capital income tax ("box 3 income") that is levied as a wealth tax at a rate of 1.2% on financial wealth. Given that the model does not differentiate between housing, pension and other wealth, the wealth tax is only applied on 1/3 of total wealth accumulated by the household, which corresponds to the current distribution of wealth between different asset types. Finally, the calculation of the wealth tax takes a 22.5% tax credit into account.

Benefits

19.   In the Beveridge-type social security system of the Netherlands, benefits are exclusively financed out of tax revenues. Given that only one household type is considered, the selection of the benefits in the

model is limited to the three major ones: unemployment insurance, social assistance and first-pillar pensions.

Social assistance

20.   Social assistance is available for non-participating households subject to a capital income test (all capital income above 15% of the average wage is deducted from social assistance). In principle, households on social assistance face strict reintegration requirements and cannot simply withdraw from the labour market while receiving replacement income. These reintegration requirements, however, decrease with the age of the person. In order to integrate the idea that younger people face a higher risk of inactivity without any replacement income, we use the relative wage profile to adjust the replacement income accordingly.

Unemployment insurance

21.   Unemployment insurance is granted for periods during which the individual is participating but without a job. The replacement income covers 70% of the last salary but limited to 130% of the average salary.

First pillar pensions

22.   A Beveridge-style state pensions system (AOW) provides an old-age pension income to people who are aged 65 and over and have lived in the Netherlands for most of their lifetime,[4] irrespective of past contributions, similarly to the scheme in place in New Zealand. Eligible single pensioners receive a first pillar monthly pension of €956.18 (which amounts to 30% of the average wage) and retired couples receive €1609.91. This AOW pension constitutes a social safety net and represents 34% of pensioners' average earnings (OECD, 2006). In principle, the full amount goes only to people having lived a full 45 years in the Netherlands, which is assumed to be the case for all generations in our sample.

The government

23.   When simulating the reforms to the tax-benefit and the pension system, a balanced-budget rule has been imposed: The government pays out state pensions and social benefit exclusively by levying taxes. In addition, the government finances (unproductive) government spending at a rate of C^g% of GDP, where C^g has been set at the current share of total non-social public expenditure to GDP (*i.e.* total government disbursements minus social expenditure). The model abstracts from budget deficits and public debt. Should a budget surplus occur, these additional budgetary resources made available by lowering replacement rates or raising the marginal tax rates of pensioners are redistributed to households *via* lower consumption taxes. Alternatively, this higher primary surplus could have been given back to households in the form of lower marginal income tax rates, thereby possibly even increasing the beneficial effects presented above.

Calibration of the model

24.   In order to obtain reliable estimates of the life-cycle tax burden and household's labour supply decisions, the model has been calibrated using the DNB Household Survey. In particular, in order to properly reflect distributional consequences of different tax-benefit systems, a Markov transition matrix between 10 different income deciles and in and out of unemployment has been estimated from the DNB Survey. This transition matrix indicates the probabilities with which individuals in different income strata persist at their current (relative) income level or move up or down one level during one year. As the transition probability changes over time, the matrix has been estimated in 5-years intervals over the entire working life span. Moreover, age-productivity profiles have been estimated (see Figure 1 below) for an average worker at a given educational level and have been used to modulate the wage over each cohort's

working age. Finally, the survival probabilities for each age group have been taken directly from Statistics Netherlands; for the last year (at age 100 years) it has been set to zero.

Figure 1. Figure 1: Productivity over the working life

(Productivity at age 20=100)
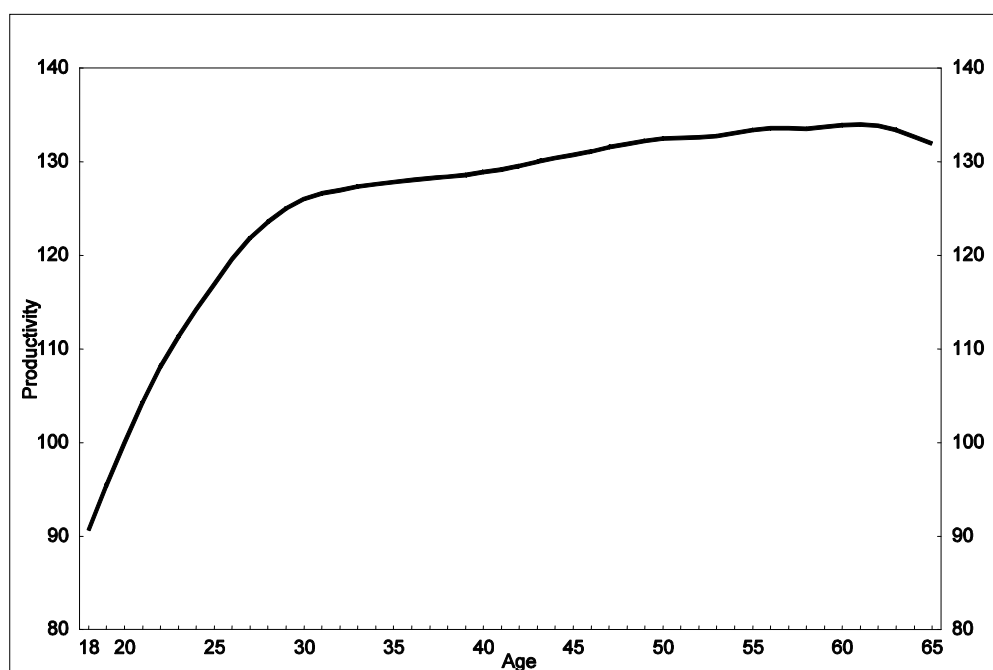
Note: The productivity profile has been established controlling for the highest level of educational attendance.

Source: Secretariat's calculations.

25.   The parameters of the utility function, comprising the time preference rate β, the constant relative risk aversion, γ, and the labour supply elasticity, η, have been selected in such a way as to obtain an equilibrium real interest rate of around 4%, a labour force participation rate of 75.8% and an average working time per week of close to 32 hours, which corresponds to the outcome of the current tax-benefit system.

26.   Regarding the calibration of the macroeconomy, the parameters for the labour market matching function have been set using standard values found in the literature (see Pissarides and Petrongolo, 2001 for a survey), leading to an unemployment rate of 4%. The parameters on the capital-labour elasticity, α, and the capital depreciation rate, δ, have been taken from Ernst *et al*. (2006), while the parameters on vacancy costs, ζ, and employment destruction, σ, are taken from Merz (1995). A summary of the calibration of the parameters and functions can be found in the following Table 1.

Table 1.   Table 1. Calibration of parameter values

	Variable/Function	Parameter values
Utility function	$u(c_t, l_t, P_t) = \begin{cases} \frac{(c_t(l_t - \theta_P)^\eta)^\gamma}{\gamma} & \text{for } P_t = 1 \\ \frac{c_t^\gamma}{\gamma} & \text{for } P_t = 0 \end{cases}$	γ=-1.5; η=4; θ_P=0.0565
Time preference rate	β	β=1.011
Production function	$F = k_t^\alpha (A_t h_t n_t)^{1-\alpha}$	α=0.36
Depreciation	δ	δ=0.08
Job separation	σ	σ=0.1
Vacancy cost	ζ	ζ=0.1
Wage bargaining power	P	ρ=0.48
Unemployment insurance	w^{UI}	$w^{UI} = \begin{cases} 0.65 w_{t-1} & \text{if } w^{UI} < 130\% \cdot AE \\ 130\% \cdot AE & \text{otherwise} \end{cases}$
Social assistance *(Replacement rate)*	R	R=0.19
Government consumption	C^g	C^g=0.15
Corporate profit taxes	τ_π	τ_π=0.315
Labour market matching function	$m(\mathcal{V}_t, U_t) = q_0 \mathcal{V}_t^{q_1} \cdot U_t^{1-q_1}$	q_0=1.0; q_1=0.5

Note: AE = average earnings

Determining the equilibrium distribution of work and leisure

27.   Given that no cohort has individuals that live beyond the age of 100; a method called "finite value approach" has been chosen to calculate the equilibrium distribution of consumption and working hours (Heer and Maussner, 2005). This algorithm calculates the optimal path of consumption and hours worked for each value out of a large, but finite number of average capital stocks. The equilibrium value is then determined by selecting the path with the highest net present value of the individual's utility. Concretely, the following steps have been carried:

1. Set up a grid of possible terminate capital stocks around the expected steady state average capital stock;

2. Make a guess of the initial capital stock k_0 and the initial average working hours h_0;

3. Compute the macroeconomic values of w, r, θ and n;

4. Compute the policy reactions of c, h, and P through backward induction for all values in the capital stock grid;

5. Use the policy reaction functions to determine the distribution of individuals in each cohort and for each year across different capital stock positions;

6. Aggregate across different generations;

7. If the aggregate capital stock and the average hours worked are close to the values in step 2 stop, otherwise use the new values and go back to step 3.

Average life cycle tax burden

28.   The model has been run separately for single earners and working couples with two children. The outcome in terms of hours worked and labour force participation rates are very similar between the two set-ups (see Table 2), suggesting that a more complete model where both types of households are represented according to their relative shares in the population would not yield a substantial improvement of the simulations.

Table 2.   Table 2. Aggregate outcomes for single earners and working couples

	Single Earners	Married first earner
Participation rate	75.4%	75.4%
Hours worked	31.6h	31.2h
Pensions (average replacement rate)	74.1%	73.8%
Income inequality (Gini coefficient)	48.2	47.1

29.   The differences in aggregate participation rates between single and married earners reflect a different evolution of total hours worked over the life cycle. Indeed, married earners benefit from substantially lower marginal effective tax rates for low incomes and therefore have a stronger incentive to participate early in their working life. With income evolving at the same rhythm over the life cycle for both types of earners, married workers will start to face higher marginal effective tax rates at intermediate income levels due to social benefits that taper off quickly with the rise in household income. By consequence, both their participation and their working hours margin will decrease and remain lower than for single earners until retirement. The implicit redistribution from older (richer) to younger (poorer) workers in the case of married employees is also reflected in a lower Gini coefficient.[5]

Reforms of the tax benefit system

30.   Two different types of tax-benefit reforms are considered in this paper. The first reform scenario analyses the impact of different pension reforms on participation and hours worked. The second one discusses the effects of a reduced marginal tax burden on working hours, for instance, by introducing a flat tax system.

Pension reforms

31.   The state-pension system runs the risk of weakening labour participation incentives, in particular for low-income and second earners, as inactivity does not penalise access to the AOW pensions. Participation incentives could therefore be strengthened by reforming the current state pension system. The WWB Act already provides a social safety net ensuring a net minimum income to every resident, including pensioners. A separate social safety net therefore does not appear necessary. For people with life-time careers, the well-functioning second pillar pension funds provide adequate old-age retirement income. A reduction in the AOW pension is likely to increase participation through postponed (early) retirement, without aggravating poverty among pensioners. More generally, a budget-neutral reduction of both the pension entitlement and income tax rates would substantially reduce the net present value of the tax burden over the working life, in particular for lower-income earners (Figure 2). For instance, a reduction in the replacement rate from 30% to 25% would help to increase labour participation, in particular of the 55-65 age group, by 3% and the average working time for this age group by almost 10%. Any changes to

the pensions system, however, should be introduced gradually in order to allow future recipients to make alternative savings.[6]

**Figure 2. Figure 2. Net present value of tax liabilities when lowering state pension**
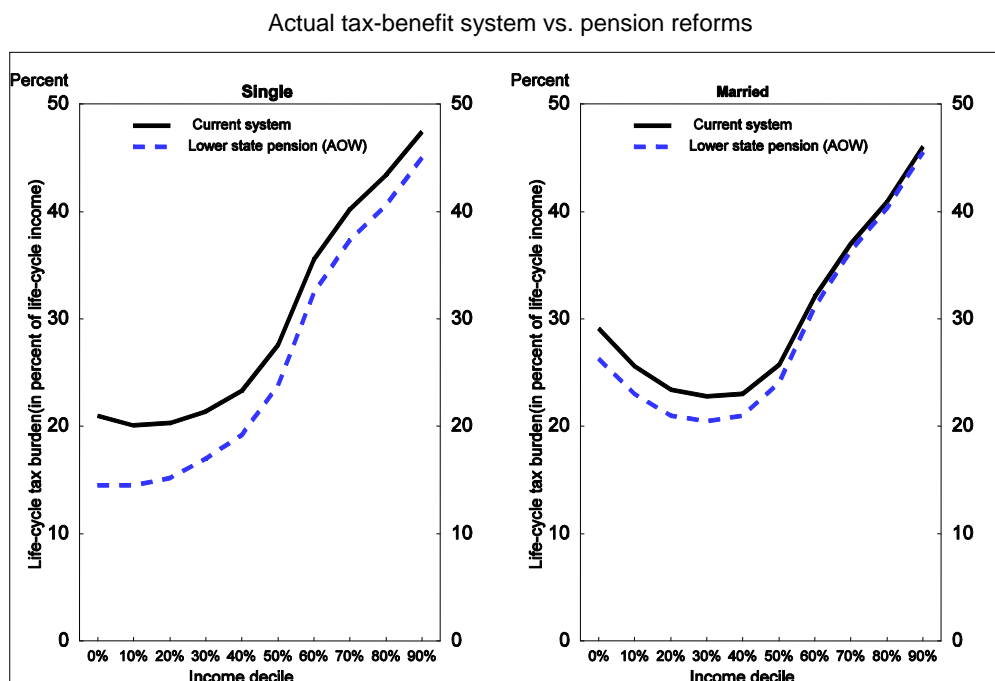
Actual tax-benefit system vs. pension reforms

Note: The figures present the average life-cycle tax burden across income deciles in the current system, compared with the life-cycle tax burden after a reduction of the gross state pension of € 161 per month.

Source: Secretariat's calculations.

32.   Incentives to postpone retirement are also affected by the fact that pensioners do not pay social security contributions for state pensions. This tax exemption allows a reduction in the tax rate of 17.9 percentage points for all income in the first two income tax brackets, implying an increasing implicit tax on continued work before the age of 65. In addition, the exemption constitutes a substantial redistribution towards pensioners of about 0.5% of GDP. As first pillar pensions are linked on a net basis to the social minimum income, a removal of this tax exemption would increase state pensions on a gross basis, yielding the same net disposable income as before. Consequently, the current tax break exclusively benefits pensioners who also have access to second pillar pensions. Hence, removing the tax break would not lower net disposable income for pensioners who only receive the first pillar pension but would raise the tax burden for those who also have access to second pillar pensions. The full impact of removing the tax break depends on how the additional tax revenues will be used to strengthen participation incentives for the working-age population (see Figure 3).

Figure 3. Figure 3. Net present value of tax liabilities when removing pensioners' tax exemptions
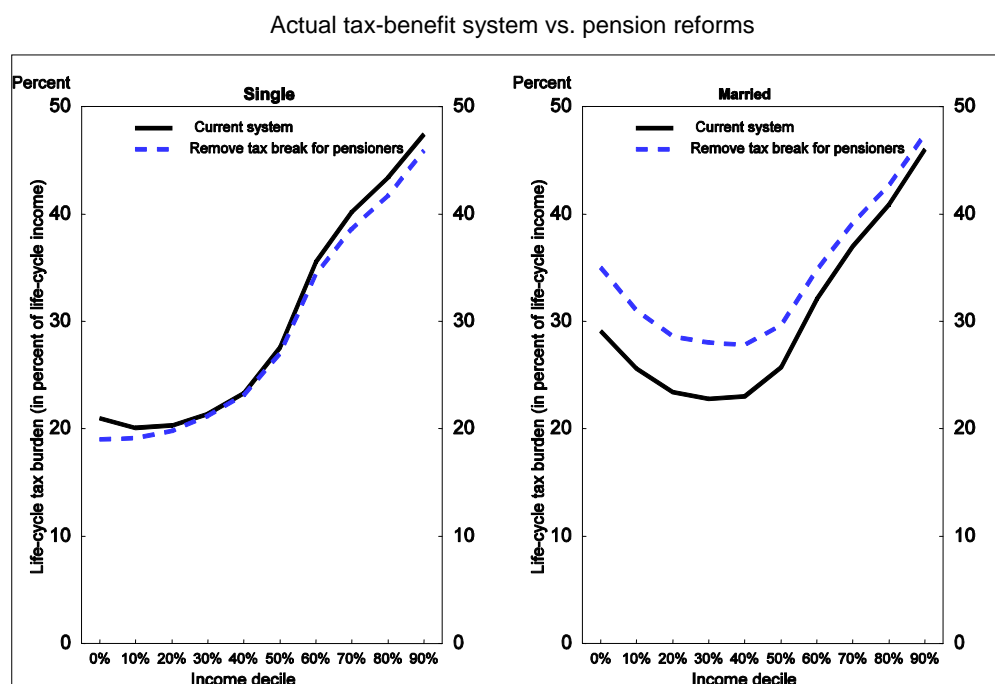
Actual tax-benefit system vs. pension reforms

Note: The figures present the average life-cycle tax burden across income deciles in the current system, compared with the life-cycle tax burden when removing the tax exemption for pensioners on the first and second income bracket.

Source: Secretariat's calculations.

33.   More specifically, four pension reforms are considered and analysed with respect to their impact on rising labour supply. The first one corresponds to the actual government programme and consists of removing the tax break for pensioners that currently lowers the statutory tax rates for the first two income brackets. The second reform consists of a reduction in the replacement rate of the base pension by 17%. Currently, the base pension is calculated as to represent 30% of the average wage. In the reform proposal in the chapter, the replacement rate is reduced to 25%. A third reform proposal discussed in the survey consists of introducing income tests for the state pension. Finally, a convergence of the state pension and social assistance system is analysed whereby the state pension is replaced by the (means-tested) social assistance benefit system and the available resources being used to lift occupational (second pillar) pensions. The following table replicates the aggregate labour supply effects of these reforms as well as consequences for pension replacement rates and income inequality. Table 3 shows that the strongest impact on labour supply would come from a convergence of the current state-pension system with social assistance benefits. However, such a pension reform would substantially lower public pensions and increase income inequality, which may not be warranted from an equity point of view.

Table 3.   Table 3. Reforms of the state pension system

	Remove tax exemption	Lower state pension	State pensions with income test	Converge state pensions and WWB
Participation rate	75.0%	76.3%	75.4%	76.8%
Hours worked	31.6h	32.0h	31.8h	32.4h
Pensions (average replacement rate)	74.2%	61.5%	74.5%	58.1%
Income inequality (Gini coefficient)	48.9	48.0	52.9	50.7

Note: Participation rates are in percent of the working-age population. Pensions are given relative to the calibrated average earnings.

Source: Own calculations.

Introducing a flat tax

34.   The incentive to work longer hours is weakened by relatively high marginal effective tax rates, with large effects on workers with relatively high labour supply elasticity, such as second earners (Table 4). The impact is even greater when long-run effects are taken into account: households are likely to base their labour supply decision on the expected net tax burden over the life-time, including during retirement. Indeed, a static view of the tax burden indicates that only 4% of the working age population is subject to the highest statutory marginal tax rate; but when evaluated in net present value terms, a substantially larger group is subject to high marginal tax burdens, due to the evolution of income over the lifetime (Figure 3). Past governments have adjusted tax credits and income-dependent benefits so as to mitigate these negative effects. However, the provision of generous social benefits (to address equity concerns) and their rapid tapering-off (to address budgetary concerns) keep the marginal effective tax rates at a high level, thus weakening work incentives.

Table 4.   Table 4. Marginal effective tax rates for different income groups and family types

(In per cent)

	2005	2006
2 adults, 1 income, with child(ren)		
Minimum plus	69.5	60.8
Modal income	70.0	71.0
Twice modal income	59.3	52.8
2 adults, 2 incomes, with child(ren), income of lowest earner rises		
Minimum plus + half minimum plus	35.3	35.8
Modal income + half modal income	38.0	39.8
Twice modal income + modal income	50.0	48.0

Note: The table indicates the evolution of marginal effective tax rates between 2005 and 2006 at various income levels and for two different family types. The "minimum plus" income level corresponds to 60% of the modal income (€ 24 956). The modal income level corresponds to the most frequent income across the income distribution. The figures do not include childcare benefits.

Source: Ministry of Social Affairs and Social Security.

**Figure 4. Figure 4. Life-cycle marginal tax burden**
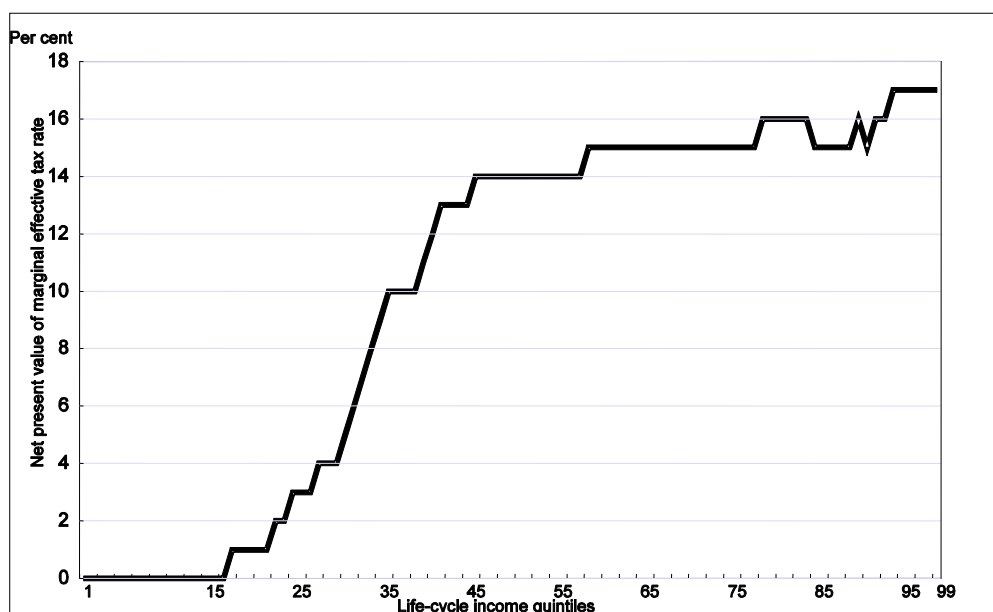
Note: The life-cycle marginal tax burden is calculated as the net present value of statutory marginal tax liabilities over the life-cycle (age 16-91) as a percentage of the net present value of income at a certain quintile. This assumes that an individual does not change the income quintile over the life cycle and that tax liabilities remain at their 2005 level. The net present value assumes a real interest rate of 3% *per annum*.

Source: DNB Household Survey, Secretariat's calculations.

35.   Lowering the high marginal tax burden has been a long-standing government policy objective. However, a main concern with respect to lowering taxes is whether such measures will be self-financing through an increase in labour supply. If not, strengthening labour supply incentives through changes in the tax code may require off-setting measures to ensure a revenue-neutral package. In order to address these issues, the Council of Economic Advisors recommended the introduction of a flat tax system, combined with a phasing-out of certain tax expenditures in order to finance the reduction of the marginal statutory tax rate across the board.[7] Such a general overhaul of the tax system would help to restore labour supply incentives for women who currently face the highest marginal tax rates, but would also lower the marginal tax burden, even for lower income people. Over the life-cycle, the introduction of a flat tax would help to decrease the tax burden substantially both for low and for high income groups, while it would increase it only moderately for medium-income households (Figure 5). Such a shift in the life-cycle tax burden would raise total hours worked by 6-8%, which is more than suggested by a static analysis of changes in marginal income taxes alone. The flat tax proposal would have an even stronger impact if combined with measures to remove or phase-out certain tax expenditures, such as the mortgage interest rate deductibility or reduced tax rates for pensioners, as this would allow introducing a flat tax at a lower rate.

Figure 5. Figure 5. Life cycle burden: actual system vs. flat tax
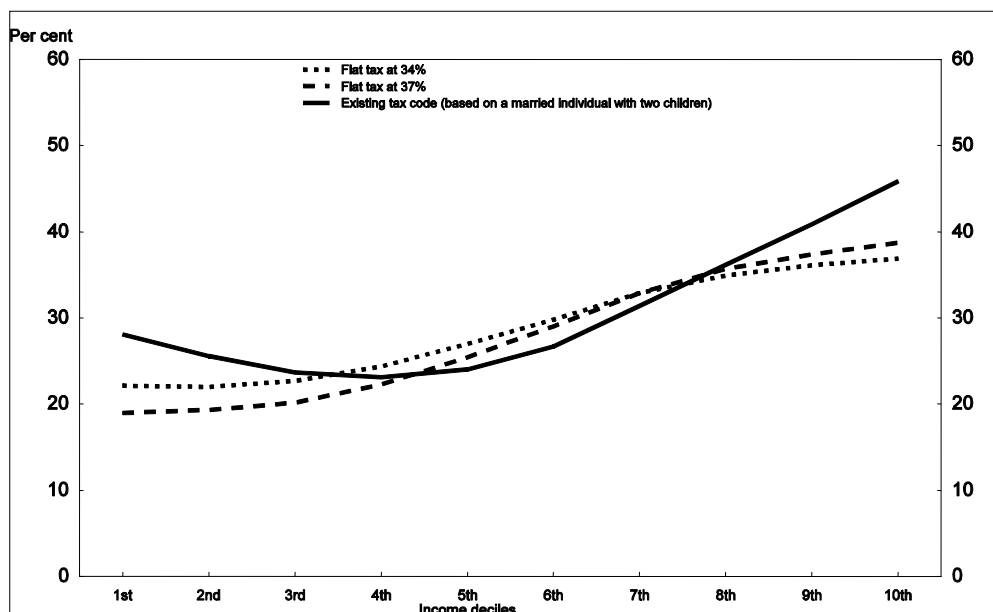
Note: The flat tax proposal is financed by an increase of consumption taxes, compared with the actual situation. A flat rate of 34% requires an increase of the consumption tax by 3 percentage points, a flat rate of 37% would require an increase by 1 percentage point.

Source: DNB Household Survey, Secretariat's calculations.

36.   More specifically, in order to simulate the effect of such a flat tax for labour supply over the life-cycle, two different tax rates have been simulated (at 34% and at 37%), keeping the current general tax credit at 15%. Moreover, it has been assumed that these new rates correspond to the new marginal *effective* tax rates; hence all benefits are subsumed under the new system. The VAT rate is assumed to adjust in order to balance the government's budget (alternatively, changes in the VAT rate indicate the burden that such measures would have for public finances). Table 5 summarises the labour supply effects as well as consequences for income of pensioners and income inequality. The implications of introducing a flat tax on the primary balance are noticeable (represented here by an increase in consumption taxes), reaching up to 1.7% of GDP when the flat tax is lowered to 34%. Such adverse consequences for the fiscal balance can, however, be avoided when simultaneous reforms on the labour market help further reducing the structural unemployment. In the last the column of Table 5, it is assumed that further reforms of active labour market policies help lowering the structural unemployment rate by an additional 1.2pp. In this case, the flat tax reform even lowers the primary deficit, to an extent that depends on the rate of the flat tax. Moreover, even though a slight reduction in the overall participation rate is discernible – a typical income effect in our model – reducing the structural unemployment rate would further boost the positive effect of a flat tax on working hours, by almost 1h per week.

Table 5.   Table 5. The effects of a flat rate on labour supply

	34% Flat	37% Flat	34% Flat Lower structural unemployment	37% Flat Lower structural unemployment
Participation rate	75.4%	75.3%	74.1%	74.4%
Hours worked	34.1h	33.7h	34.8h	34.4h
Pensions (average replacement rate)	73.6%	73.3%	74.5%	73.8%
Income inequality (Gini coefficient)	51.5	51.3	57.9	58.9
Increase in VAT rate	2.9pp	0.5pp	-0.8pp	-4.0pp

Note: Participation rates are in percent of the working-age population. Pensions are given relative to the calibrated average earnings. Structural reforms on the labour market (last two columns) are assumed to lower the structural unemployment rate by 1.2pp.

Source: Own calculations.

Conclusion

37.   Amidst high labour participation and employment rates, the Netherlands faces an increasing problem of labour shortages due to population aging. The paper has evaluated different tax-benefit reforms to address this issue, in particular the introduction of a flat tax and a reform of the pension system in order to strengthen participation incentives of those currently not active in the labour market. As labour supply decisions are evolving over the lifecycle, the paper has used a calibrated overlapping-generations model to assess the quantitative impact of the suggested reforms.

38.   Pension reforms have been shown to be a powerful tool to increase participation rate, in particular of older workers, while at the same time improve fiscal sustainability. On the other hand, the introduction of a flat tax would increase labour supply mainly by rising average hours worked as its costs would weigh on lifecycle participation incentives for those currently in the labour force. The cost of introducing a flat tax could, however, be mitigated when simultaneously introducing reforms that help to lower structural unemployment.

ANNEX

The household's optimal program

39.   The optimal program of the household can be determined by setting up the Lagrangian maximisation program:

$$\mathcal{L} = E_{t0}\left[\sum_{t=1}^{T+T_R} \beta^{t-1}\left(\prod_{j=1}^{t} s_j\right)\{u(c_t, h_t, P_t)\right.$$

$$\left. - \lambda_t[a_{t+1} - (1 + (1-\tau_R)r_t)a_t + (1+\tau_C)c_t - Yd(\varepsilon_t, h_t, P_t) - tr_t]\}\right]$$

40.   The first-order conditions of the Lagrangian write as:

$$\frac{\partial \mathcal{L}}{\partial c_t} = 0 \Leftrightarrow \frac{\partial u}{\partial c_t} = \lambda_t(1 + \tau_C) \qquad (1)$$

$$\frac{\partial \mathcal{L}}{\partial h_t} = 0 \Leftrightarrow \frac{\partial u}{\partial h_t} = \lambda_t \frac{\partial Yd(\varepsilon_t, h_t, P_t)}{\partial h_t} \qquad (2)$$

$$\frac{\partial \mathcal{L}}{\partial P_t} = 0 \Leftrightarrow \frac{\partial u}{\partial P_t} = \lambda_t \frac{\partial Yd(\varepsilon_t, h_t, P_t)}{\partial P_t} \qquad (3)$$

$$\frac{\partial \mathcal{L}}{\partial a_{t+1}} = 0 \Leftrightarrow (1 + (1-\tau_r)r_t)\lambda_t = \beta s_{t+1}\lambda_{t+1} \qquad (4)$$

41.   Using $u(c_t, h_t, P_t) = \left(\frac{c_t^i(1-h_t^i)^\eta}{\gamma}\right)^\gamma - \theta_P P_t^i$ as the functional form for the utility of households, equations (1) and (2) allow determining the optimality condition for consumption and hours worked:

$$\frac{\frac{\partial u}{\partial h_t}}{\frac{\partial u}{\partial c_t}} = \frac{\frac{\partial Yd(\varepsilon_t, h_t, P_t)}{\partial h_t}}{(1+\tau_C)} \Leftrightarrow (1+\tau_C)\frac{\eta \cdot c_t}{1-h_t} = \frac{\partial Yd(\varepsilon_t, h_t, P_t)}{\partial h_t}$$

42.   Moreover, writing $\bar{s} = \sum_{t=0}^{T+T_R} n_t s_t$ where n_t is the weight of the nth generation, and combining equations (1) and (4), one can derive the equilibrium on the asset market:

$$(1 + (1-\tau_r)r_t)\frac{\partial u}{\partial c_t} = \beta s_{t+1}\frac{\partial u}{\partial c_{t+1}}$$

$$\Rightarrow r_t = \frac{\beta\bar{s} - 1}{1 - \tau_r}$$

given that $c_t=c_{t+1}$ and $h_t=h_{t+1}$ in steady state.

The macroeconomy

43.   The macroeconomic equilibrium is determined through the firm's problem, which can be solved by maximising the following Lagrangian:

$$\max_{i_t, \mathcal{V}_t, n_{t+1}, k_{t+1}} \mathcal{L} = E_{t0}\left[\sum_{t=0}^{\infty}\left(\frac{1}{1+r_t}\right)^t \{(1-\tau_\pi)(Y(A_t, k_t, n_t, h_t) - w_t h_t n_t - i_t - \zeta \cdot w_t \mathcal{V}_t)\right.$$

$$\left. + \lambda_t[k_{t+1} - (1-\delta)k_t - i_t] + \mu_t[n_{t+1} - (1+\sigma)n_t - m(U_t, \mathcal{V}_t)]\}\right]$$

44.   The first-order conditions of this Lagrangian write as:

$$\frac{\partial \mathcal{L}}{\partial \mathcal{V}_t} = 0 \Leftrightarrow \mu_t \frac{\partial m(U_t, \mathcal{V}_t)}{\partial \mathcal{V}_t} = -\zeta \cdot w_t$$

$$\frac{\partial \mathcal{L}}{\partial n_{t+1}} = 0 \Leftrightarrow \mu_t = \frac{1}{1+r_{t+1}}\left\{-\frac{\partial Y(A_{t+1}, k_{t+1}, n_{t+1}, h_{t+1})}{\partial n_{t+1}} + w_{t+1}h_{t+1} + \mu_{t+1}(1+\sigma)\right\}$$

$$\frac{\partial \mathcal{L}}{\partial i_t} = 0 \Leftrightarrow \lambda_t = -1$$

$$\frac{\partial \mathcal{L}}{\partial k_{t+1}} = 0 \Leftrightarrow \lambda_t = \frac{1}{1+r_{t+1}}\left\{-\frac{\partial Y(A_{t+1}, k_{t+1}, n_{t+1}, h_{t+1})}{\partial k_{t+1}} + \lambda_{t+1}(1+\delta)\right\}$$

45.   In steady state, using the notational definitions in paragraph 14 and a Cobb-Douglas production function with capital elasticity α, the first-order conditions result into:

$$\bar{r} + \delta = \alpha \bar{k}^{\alpha-1}(\bar{A} \cdot \bar{h} \cdot \bar{n})$$

$$\bar{\iota} = \delta \bar{k}$$

$$\frac{\zeta \cdot \bar{w}}{q(\bar{\theta})} = \frac{1}{1+\bar{r}}\left\{\frac{\partial Y(\bar{A}, \bar{k}, \bar{n}, \bar{h})}{\partial \bar{n}} - \bar{w}\bar{h} + \frac{\zeta \cdot \bar{w}}{q(\bar{\theta})}(1+\sigma)\right\}$$

$$\bar{n} = \frac{m(\bar{U}, \bar{\mathcal{V}})}{\sigma} \Leftrightarrow \bar{n} = \frac{\bar{\theta}q(\bar{\theta})}{\bar{\theta}q(\bar{\theta}) + \sigma}$$

46.   Using the wage bargaining equation from paragraph 15, the optimal vacancy ratio in steady state will be determined by:

$$\frac{\bar{r} + \sigma}{q(\bar{\theta})} = \frac{1 - \zeta\rho\bar{\theta} - (1-\rho)R}{\rho} - \bar{h}$$

47.

Notes

1. The optimisation process is based on an individual time horizon, hence mortality rates are strictly positive and no account is given of increasing cohort size for younger cohorts due to immigration.

2. The model does not include aggregate uncertainty. Hence, households will invest in different assets so as to equalise the after-tax rate of return.

3. The Work and Benefits Act (WWB) defines social assistance by means of an absolute level. In reality, however, this level is set such as to guarantee at least 50% of the minimum wage, which has been used as a reference for calibrating the model.

4. A 2% reduction is made on the full pension for each year spent outside the Netherlands between the age of 15 and 65.

5. Notice that the assumption about population homogeneity as regards the marital status leads to a sinusoid shape of total hours worked over the life cycle for married workers. This is due to the fact that married workers face no taxes up to 40% of the average wage, where tax rates increase sharply. As young people start their working careers with very low wages, most of them will not be taxed until they are in their early 20ies, when the tax scheme for married workers applied. Once income is taxed, however, marginal effective tax rates are higher than for single earners, implying a reduction of working hours in comparison to their single counterparts.

6. Alternatively, first pillar pensions could be linked to years of contributions, allowing pensioners with longer contribution histories to receive a higher pension, while still guaranteeing a minimum pension (probably at a lower level). Such a modified system would still contain a redistributive element, which could be controlled for by a cap on either pension contributions or pension replacement rates.

7. The proposed flat tax would include a tax credit to keep the progressivity of the tax system, at least as regards the average tax burden.

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