Government decisions on income redistribution and public production
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7 Time preference of the government and different tax systems

7.1 Introduction

Government decisions do not only depend on the political influence structure, but also on the policy instruments that are available. In this monograph, the government does not decide on which policy instruments to use. In Part I we studied the impact of public goods and social security. In Part II we introduced a second public good, which was assumed to influence production in the private sector and in the public consumption sector. Thusfar, we assumed that the costs of public production were financed by levying an income tax. In this chapter the features of this tax are compared with other taxes. Apart from the comparison of different tax systems, we will also investigate the importance of the time preference of the government.

In the model presented in Chapter 4 the government makes decisions with respect to income redistribution and public production. The decisions of the government are in accordance with the maximization of the value of the political interest function. This function embodies the interests of representative individuals of social groups. The political interest function, as presented in the model of Chapter 4, is dynamic. Its dynamic structure is based on the dynamics in the interests of those groups that are able to influence government decisions. Social groups are not only promoting their current interests, but also their future interests. The rate with which future interests are discounted and the time horizon may differ between groups [cf. VAN VELTHOVEN (1989)]. However, in our model it is assumed that all social groups have an infinite horizon and maintain the same discount rate. This leads to the dynamic political interest function presented in Chapter 4 [see eq. (4.21)]. In the model at hand, wealth is not intertemporally redistributed by explicit intra- or intergenerational redistribution mechanisms (e.g. private savings, private or public debt, bequests, private or public pension schemes), but by investments in public capital.

The extent to which the government discounts future interests determines the time preference of the government. The model distinguishes only one discount rate. Although this gives a fairly rudimentary modeling of the dynamics in the political decisionmaking process, there are nevertheless some interesting insights that can be obtained from the presence of these dynamics. These insights are discussed in Section 7.2.
Chapter 7

The second issue that will be discussed in this chapter, concerns the tax system. As mentioned in Chapter 1, HARBERGER (1962) introduced the applied general equilibrium analysis of the economic effects of taxes. Whereas partial equilibrium models only take account of the impact of a change in the tax system on decisions of agents that pay the taxes (direct effect), general equilibrium models also take account of the impact on the decisions of other agents (indirect effect). The general equilibrium analysis of HARBERGER (1962), for example, led to the result that the corporate income tax is not only borne by capital in the corporate sector, but also by capital in the noncorporate sector, while labor decisions are hardly affected by this tax. Harberger was interested in the efficiency and distributional effects of taxes. These issues also appear in most of the later general equilibrium studies that followed Harberger. To determine the efficiency and distributional effects of a tax, different methods and measures have been proposed. This is not the place for an elaborate discussion [see, e.g., SHOVEN AND WHALLEY (1977, 1992), BALLARD (1990b)]. We will focus here on some applied general equilibrium studies that compare the efficiency and distributional effects of different tax systems. WHALLEY (1988) observes, in this respect, that applied general equilibrium models show more substantial efficiency and redistributive effects of changes in the tax system compared to the earlier received wisdom, that was based on macroeconomic or partial equilibrium models.

Taxes affect not only prices and income, but also the decisions made by economic agents. As regards the latter, in particular the influence of taxes on labor supply, savings and investments receive, attention. Several tax reforms have been proposed to reduce the distortions of current tax systems.\(^1\) A first type of tax reform to be discussed concerns the change of an income tax into a wage tax to reduce the distortions on investments. In SUMMERS (1981b), this leads to a welfare gain, which is rather small if the interest elasticity of savings becomes small. Labor supply is, however, fixed in this study which implies that the wage tax can be regarded as a lump sum tax. According to Summers, the welfare gain will also

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\(^1\) A tax reform leads to a change in the tax base. Changes in the tax system that consist only of changes in tax rates are not discussed in this section. See, e.g., KELLER (1980) on changes in the rates of value-added and income taxes, SLEMROD (1983) on indexing taxes, PIGGOTT AND WHALLEY (1985) on U.K. taxes, JUDD (1985a, 1987) on factor taxes and investment tax credits, CONRAD AND HENSELER-UNGER (1988) on German income taxes and GELAUFF (1992) on Dutch income taxes. The impact of the progressiveness of taxation is not only in GELAUFF (1992), but also in BALLARD ET AL. (1985) and AUERBACH AND KOTLIKOFF (1987). BALLARD ET AL. (1985) discusses, in addition, the relation between the level of the income tax rates and the revenues (Laffer curve).
occur if the labor-leisure choice is endogenized. The decision with respect to labor supply is endogenous in Hutton and Kenen (1996). Their results support Summers’ view. Auerbach and Kotlikoff (1987) employ an overlapping generations model with endogenous labor supply. They conclude that the reform to a wage tax leads to welfare losses, if the intertemporal elasticity of substitution is not too small. Auerbach and Kotlikoff also give a distribution of the welfare loss over the different cohorts. The tax reform leads to an increase in the capital stock, but reduces labor supply. It turns out that the older generations benefit from the tax reform, while the younger generations face a welfare loss. The youngest cohort currently alive has the largest welfare loss. The welfare loss of future generations is slightly smaller than the loss of the youngest generation.

In Summers (1981b) as well as Auerbach and Kotlikoff (1987) also a second type of tax reform, implying a switch from an income tax to a consumption tax, is studied. The aim of this reform is to promote savings. Both studies conclude that this reform leads to a welfare gain. The welfare gains are, however, substantially smaller in the latter study than in the former. The consumption tax is not only more efficient than the income tax, it is also more efficient than the wage tax. Both studies find, furthermore, that the results of the reform to a consumption tax are less sensitive to the choice of the values of the parameters than the results of the reform to a wage tax. Auerbach and Kotlikoff find a strong increase in capital formation, while the effect on labor supply is small and may be either positive or negative (dependent on the values of the parameters). The positive welfare effect is due to the fact that consumption from wealth is more heavily taxed, while the accumulation of new wealth (new savings) is less heavily taxed. The tax on consumption out of wealth cannot be avoided, which makes it nondistortionary. Therefore, the older generation, that possesses a relatively large part of current wealth, is confronted with a welfare loss, while the younger generations and the unborn generations benefit from the tax reform. The distribution of the welfare gain over the different cohorts for this tax reform is, thus, the reverse of the distribution for the reform to the wage tax. The positive welfare effect of the switch to a consumption tax is supported by Ballard et al. (1985) and Hutton and Kenen (1996), whereas Jorgenson and Yun (1986b) find positive welfare effects if they apply consumption tax rules to capital income. Howitt and Sinn (1989) use a dynamic optimal taxation model to analyze the application of consumption tax rules to capital income. In that case the reform may have a negative effect on social welfare during the adjustment path. They conclude that the
reform is welfare reducing if the consumption tax converges too slow to its optimal value.

Apart from the wage and consumption tax, **Auerbach and Kotlikoff (1987)** discuss other tax reforms that stimulate investments. First, the taxation of capital income is discussed. They demonstrate that a reform of the income tax into a capital income tax leads to a welfare loss, because capital formation decreases strongly. Only the very young generations and the first new generations benefit from the tax reform. The explanation for the welfare loss for the older generation is similar to the explanation of the welfare loss of the switch to a consumption tax. The welfare loss of the generations that will be born after a number of years is due to the decrease in the capital stock. The negative effect of this tax reform suggests that a positive effect on welfare can be obtained if taxation of capital income is eliminated. In that case, the income tax is reformed into a wage tax. Auerbach and Kotlikoff notice, furthermore, that an income tax with full deductability of investments is equal to a consumption tax. The aforementioned results of **Auerbach and Kotlikoff (1987)**, therefore, suggests that an introduction of an investment tax credit is more beneficial than an elimination of the tax on capital income. This result is supported by the analysis in **Bovenberg and Goulder (1989)**, where intergenerational as well as labor-supply effects are neglected, while international effects are introduced. If international mobility of capital is taken into consideration, the transfer of welfare gains to foreign owners of domestic capital is larger for a cut in the capital income tax than for an investment tax credit. **Bovenberg (1993)** considers intergenerational and international effects in the model and finds similar results. A tax reform that eliminates the investment tax credit for the finance of a reduction in the corporate income tax is studied in **Goulder and Summers (1989)**. They distinguish five production sectors, which allows them to take account of intersectoral effects. In such a model, the proposed reform has a negative effect on capital accumulation, which is in line with the results in the papers mentioned before. **Pereira (1994)** discusses the reintroduction of the investment tax credit after the Tax Reform Act of 1986. The model in that paper allows for endogenous labor supply decisions as well as for government deficits. It turns out that the reintroduction of the investment tax credit leads to a welfare loss. The size of this loss depends on the way that the government finances

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2 This reform is in the U.S. Tax Reform Act of 1986. **Henderson (1991)** reviews general equilibrium studies that analyze the consequences of this reform act. The features of the different reforms that were debated during the preparation of this Tax Reform Act are discussed in **Aaron et al. (1988)**.
the investment tax credit. The welfare loss is relatively large if the tax credit is
deficit financed and the size of the government is not allowed to change. If,
however, the government re-optimizes the level of public spending, the welfare
loss is significantly smaller.

A final reform that is proposed to stimulate investments is the integration of the
corporate and personal income tax. In BALLARD ET AL. (1985), different proposals
to eliminate the double taxation of dividends are analyzed, which all lead to a
positive welfare gain. It is conjectured that integration leads to a more efficient
allocation of capital, because double taxation may reduce overall rates of return
and may lead to a bias towards debt financing. Income groups with a high capital
income to labor income ratio benefit more from the tax integration than income
groups with a low ratio. In their study the low and high income groups receive a
high proportion of their income from capital, implying that the integration is most
beneficial for these groups. The welfare gain differs between the proposals.
Integration of the taxes can be reached by eliminating the corporate income tax or
by deducting dividends from either the corporate income tax or personal income
tax. It turns out that elimination of the corporate income tax leads to a higher
welfare gain than deduction of dividends. The elimination of the corporate income
tax leads also to a more progressive distribution of the welfare gains. HOWITT AND
SINN (1989) find, in contrast, that integrating corporate and personal income taxes
leads to a welfare loss if this is done by phasing out the dividend tax and
increasing the income tax.\footnote{PEREIRA (1991) compares the effects of integration of corporate and personal income
taxes for two tax systems: the U.S. tax system before and after the Tax Reform Act 1986. Under the old tax regime integration (by eliminating the corporate income tax) leads to a higher welfare gain than under the new tax regime. Pereira concludes that, in so far as the intertemporal and intersectoral effects of the corporate income tax are concerned, the Tax Reform Act has improved economic efficiency.}

In most of the studies discussed thusfar, the provision of public goods is not
affected by the tax reform. An exception is PEREIRA (1994), where the benevolent
government is allowed to re-optimize the level of the public good. In KELLER
(1980) public consumption is a composite of private goods. In that case, a change
in the tax rates leads to a change in the level as well as the composition of public
consumption, which has an effect on the different input factors that are
distinguished. Keller concludes that the most dominant effect of a change in the tax
rates does not come from the influence on private sector decisions, but from the
influence on public spending. The model presented in Chapter 4, gives a rather comprehensive description of decisionmaking on public goods, which makes it interesting for an analysis of Keller’s findings.

In Section 7.3 a number of tax reforms will be investigated. First, the tax-transfer system presented in Chapter 4 is compared with a tax system that only consists of an income tax, without special provisions. Then, the tax-transfer system will be compared with, respectively, a labor income or wage tax, a value-added tax (being equal to a consumption tax in our set-up), a sales tax and a lump-sum tax. All these tax systems are analyzed with and without special provisions. For the tax-transfer system we noticed in Chapter 6 that, if the political influence structure changes, the government will not use public goods for the redistribution of income because the special provisions are more efficient for this purpose. In Section 7.4 the impact of changes in the political influence structure are examined for the income tax, without special provisions. Section 7.5 concludes.

7.2 Time preference of the government

7.2.1 Introduction

In this Section the impact of the time preference of the government is analyzed. Sections 7.2.2 and 7.2.3 discuss the effects of a change in the time preference, where the former concentrates on the steady state effects, whereas the latter goes into the transition effects. In Section 7.2.4 attention is paid to the possibility that social groups value their future wealth differently. It will be assumed that capital owners are more interested in the future than workers. The idea is that capital owners may be more forward looking than workers because of their investment decisions. An increase in the political influence of capital owners then leads to an increase in the government’s concern for the future. Finally, the transition effects of a simultaneous change in the political influence structure and the time preference of the government are discussed in Section 7.2.4.

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4 We also studied a corporate income tax, with or without special provisions. However, the tax base for the corporate income tax was too small to produce an internal solution. Therefore, we will not discuss this reform in this chapter.
7.2.2 The impact of a change in the time preference of the government

In our discussion we will focus on an increase in the time preference of the government. This implies that the government attaches a larger weight to the future interests of the social groups. In eq. (4.21) this corresponds with an increase in the discount factor \( \frac{1}{1 + \rho} \) and a decrease in the discount rate \( \rho \). The effects of a change in the discount rate are presented in the Tables 7.1 - 7.4.

A decrease in the discount rate makes that future interests of the social groups are better promoted by the government. The government will, therefore, enlarge the redistribution of wealth from the present to future periods. The government can do this by holding larger public capital stocks. The larger public capital stocks in the new steady state go with higher public investments. For the last unit of capital, the government is willing to pay a higher price. Therefore, the shadow price of capital increases, causing the marginal social costs to increase. The higher public capital stocks have, furthermore, a positive effect on public production. This effect is most prominent for the production of the public production good (infrastructure). The higher level of the public production good goes with an increase in labor demand by this public sector. The increase in the level of the public consumption good is, however, less strong. The extra production can be generated with the extra capital stock and the extra infrastructure. Therefore, this sector does not employ additional workers. The increase in marginal social costs and in the production costs in the public sector leads to an increase in the income tax.

The extra demand for investment goods by the government has a positive effect on the production level in private sector 1. The increase in the production level requires extra capital and labor. Therefore, the capital stock and the demand for labor of sector 1 increase. The extra demand for commodity 1 enables the capital owners in sector 1 to raise the price of the commodity. The higher production level and the higher commodity price increase the returns in sector 1. The higher return and the fixed labor cost share, which is due to the Cobb-Douglas production function, lead to higher profits in sector 1, notwithstanding the small increase in the investment cost share. The higher profits allow capital owners in sector 1 to raise dividend payments. Production in sector 2 only shows a negligible increase.

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5 Note that for the public sectors the shadow price of capital is equal to \( q_j(t+1)/(1+\rho) \), \( j = p, s \). Because the discount rate \( \rho \) decreases, the value of \( q_j(t+1) \) may decrease, while the shadow price of capital \( [q_j(t+1)/(1+\rho)] \) increases.
Table 7.1  Effects on capital and shadowprice of capital
Change in time preference of the government

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>( K_1 )</th>
<th>( K_2 )</th>
<th>( K_s )</th>
<th>( K_p )</th>
<th>( q_1 = q_2 )</th>
<th>( q_p = q_s )</th>
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</thead>
<tbody>
<tr>
<td>0.05</td>
<td>511.69</td>
<td>369.57</td>
<td>89.075</td>
<td>166.84</td>
<td>.36961</td>
<td>.002186</td>
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<tr>
<td>0.02</td>
<td>520.43</td>
<td>369.21</td>
<td>102.94</td>
<td>194.11</td>
<td>.36733</td>
<td>.002131</td>
</tr>
<tr>
<td>0.08</td>
<td>504.65</td>
<td>369.53</td>
<td>78.437</td>
<td>146.16</td>
<td>.37147</td>
<td>.002242</td>
</tr>
<tr>
<td>0.20</td>
<td>486.14</td>
<td>368.00</td>
<td>52.774</td>
<td>97.269</td>
<td>.37684</td>
<td>.002474</td>
</tr>
</tbody>
</table>

Table 7.2  Effects on labor demand, leisure and the wage rate
Change in time preference of the government

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>( L_1 )</th>
<th>( L_2 )</th>
<th>( L_s )</th>
<th>( L_p )</th>
<th>( \ell )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>236.10</td>
<td>327.93</td>
<td>121.04</td>
<td>52.629</td>
<td>.26230</td>
<td>.64091</td>
</tr>
<tr>
<td>0.02</td>
<td>238.77</td>
<td>325.75</td>
<td>120.41</td>
<td>52.706</td>
<td>.26237</td>
<td>.64513</td>
</tr>
<tr>
<td>0.08</td>
<td>234.03</td>
<td>329.56</td>
<td>121.57</td>
<td>52.587</td>
<td>.26226</td>
<td>.63749</td>
</tr>
<tr>
<td>0.20</td>
<td>229.20</td>
<td>333.66</td>
<td>122.49</td>
<td>52.412</td>
<td>.26223</td>
<td>.62776</td>
</tr>
</tbody>
</table>

Table 7.3  Effects on production and dividends
Change in time preference of the government

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>( X_1 )</th>
<th>( X_2 )</th>
<th>( G_1 )</th>
<th>( G_p )</th>
<th>( d_1 )</th>
<th>( d_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>286.55</td>
<td>323.16</td>
<td>125.53</td>
<td>87.102</td>
<td>.38245</td>
<td>.38832</td>
</tr>
<tr>
<td>0.02</td>
<td>291.44</td>
<td>323.24</td>
<td>127.51</td>
<td>91.930</td>
<td>.38932</td>
<td>.38828</td>
</tr>
<tr>
<td>0.08</td>
<td>282.61</td>
<td>322.85</td>
<td>123.80</td>
<td>83.121</td>
<td>.37709</td>
<td>.38816</td>
</tr>
<tr>
<td>0.20</td>
<td>272.24</td>
<td>320.97</td>
<td>117.99</td>
<td>71.920</td>
<td>.36367</td>
<td>.38700</td>
</tr>
</tbody>
</table>

Table 7.4  Effects on special provisions, taxes, utility and political influence
Change in time preference of the government

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>( \sigma_{c1} )</th>
<th>( \sigma_{c2} )</th>
<th>( \sigma_u )</th>
<th>( \tau_h )</th>
<th>( T )</th>
<th>( U_i = P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>-.30537</td>
<td>-.31124</td>
<td>.077077</td>
<td>.24175</td>
<td>132.93</td>
<td>2.19475</td>
</tr>
<tr>
<td>0.02</td>
<td>-.31156</td>
<td>-.31052</td>
<td>.077760</td>
<td>.24710</td>
<td>136.80</td>
<td>2.20101</td>
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<tr>
<td>0.08</td>
<td>-.30056</td>
<td>-.31164</td>
<td>.076525</td>
<td>.23772</td>
<td>129.99</td>
<td>2.18822</td>
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<td>0.20</td>
<td>-.28860</td>
<td>-.31193</td>
<td>.075066</td>
<td>.22758</td>
<td>122.49</td>
<td>2.16259</td>
</tr>
</tbody>
</table>
The extension of infrastructure leads to a shift in input from capital and labor to infrastructure.

The reason that production in sector 2 hardly increases lies in the fact that the decrease in the discount rate of the government has a negligible effect on the decisions of the consumers. The intuition behind this result is as follows. The higher public capital stocks, generated by the lower discount rate, raise the income tax rate. The increase in the income tax rate leads to a decrease in the shadow price of leisure. Consumers are, therefore, willing to consume more leisure, which causes labor supply to decrease. However, the demand for labor increases, because both public sectors and private sector 1 expand their production. The higher demand for and the lower supply of labor lead to a higher wage rate. The increase in the wage rate has an upward effect on the shadow price of leisure. It follows that the overall effect on the shadow price of leisure of the increase in both the income tax rate and the wage rate is negative, but very small. Total after-tax labor income, therefore, decreases slightly. Because the change in total dividend income (the sum of the payments in sector 1 and 2) is also very small, total spending of consumers on private consumption goods hardly changes. The higher price of the commodity that is produced in sector 1 leads, however, to a decrease in the consumption of that commodity. This decrease does not only occur for domestic demand, but also for export demand. The decrease in the revenues from the export of commodity 1, the infinitesimal small changes in import demand and the equilibrium condition for the trade balance cause the price of domestic commodity 2 to decrease. The lower price of commodity 2 pushes up the export of commodity 2, which leads to an increase in the yields from exporting commodity 2 and an equilibrium of the trade balance. The lower price of domestic commodity 2 also raises the domestic consumption of this good.

As regards the redistribution of income it is obtained that the higher dividend payment in sector 1 and the lower dividend payments in sector 2 lead to a higher contribution of capital owners in sector 1 and a lower contribution of capital owners in sector 2 to the redistribution of income from capital owners to workers. Disposable income and the utility level become identical for all individuals, because individuals have the same preferences and the political influence structure is in accordance with the numerical strengths of the social groups. The increase in utility that occurs after the decrease in the discount rate is in particular due to the higher level of the public consumption good.
The comparative static effects of an increase in the discount rate have the opposite sign of the effects of a decrease in this rate. The interpretation of these effects can easily be derived from the above discussion of the comparative static effects of a decrease in the discount rate.

7.2.3 Transition effects of a change in the time preference of the government

The transition paths for a lower time preference (discount rate \( \rho \) increases from 0.05 to 1.00) are given in Figures 7.1 - 7.8. The parameter set that is used for the analysis of transition paths was presented in Appendix 5.A.2. That appendix also gives the results for the initial steady state and the new steady state. The most important difference between this parameter set and the one used for the analysis in the previous subsection is that workers care more for the public consumption good and for leisure than capital owners.

If the time preference of the government decreases, the government will invest less in public capital (cf. Figure 7.1). Public investments fall, which leads to a substantial decrease in the public capital stocks (cf. Figures 7.1 and 7.5). The government finds the public capital stocks too high. The price the government is willing to pay for extra capital (i.e. the shadowprice of capital) then decreases (cf. Figure 7.4). The lower capital stock in the public production sector goes with a lower level of the public production good (infrastructure). In the public consumption sector the government is able to increase the production level in the first few periods. This is done by employing more civil servants in this sector (cf. Figure 7.2). The lower investments of the government have a negative effect on the production in sector 1, the sector where the investment goods are produced. The decrease in production in sector 1 is so strong that investments and employment in this sector decrease, notwithstanding the lower level of infrastructure. The lower investments reduce the capital stock and the shadowprice of capital in sector 1.

The government faces lower investment costs and higher labor costs, because employment in the public consumption sector is higher. On balance total production costs of the public sectors decrease. Lower public expenditures enable the government to cut the income tax rate, which has a positive effect on the disposable income of consumers. The consumption of private commodities increases in the first periods. This has a positive effect on the production level in
private sector 2. The higher production level of the public consumption good and the increased consumption of private commodities lead to an increase of the utility of individuals of all social groups (cf. Figure 7.8). The higher utility levels have a positive effect on the value of the political interest function in the first periods after the change in time preference, as is to be expected if the government is less interested in the future.

The negative effect of less public investment on the public capital stocks becomes stronger over time. The investment-capital ratio increases, however (cf. Figure 7.5). The government is willing to pay a higher price for extra capital than it did in the first periods, which is reflected by the increase in the shadowprices of public capital. The consequence of the continuing decrease in public investments is that the government cannot retain the production level in the public consumption sector. Production in both public sectors, therefore, decreases after the first few periods (cf. Figure 7.3). The ongoing decrease in public investments also leads to a further decrease in the production of private sector 1.

The decreasing production levels in the public sectors go with decreasing production costs, which allows the government to cut the tax rate further. The lower income tax rate pushes up the shadowprice of leisure. Leisure becomes less attractive, which motivates consumers to supply more labor. On the other hand, lower production in the public sectors as well as in private sector 1 negatively affects labor demand. This causes the wage rate to decrease. The decrease in the wage rate is so strong that after-tax labor income, \((I-T_h)P_L\), decreases in the new steady state. This has a positive effect on total labor supply. Although there is a strong erosion of the tax base, because both labor income and capital income (dividends) decrease, the government is still able to decrease the income tax rate, because the decrease in public production costs is much stronger. The lower income tax rate cannot prevent after-tax full income from falling. The decrease in full income holds down the spendings of consumers, which has a negative effect on the consumption of private commodities. The decrease in both private and public consumption leads to a decrease in utility for all individuals (cf. Figure 7.8). The value of the political interest function, therefore, starts to decrease after a few periods and continues to decrease until the new steady state is reached.

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6 In fact, the value of the political interest function is defined over the entire time-horizon [see eq. (4.21)]. We will here, however, refer to the value of one period.
Figure 7.1 Transition effects on capital stocks if time preference of government decreases

Figure 7.2 Transition effects on labor demand if time preference of government decreases
Figure 7.3 Transition effects on production if time preference of government decreases

Figure 7.4 Transition effects on shadow price of capital if time preference of government decreases
Figure 7.5 Transition effects on the investment-capital ratio if time preference of government decreases.

Value

Sector 1  Sector s
Sector 2  Sector p

Figure 7.6 Transition effects on the labor-capital ratio if time preference of government decreases.

Index

Sector 1  Sector s
Sector 2  Sector p
Figure 7.7 Transition effects on labor productivity if time preference of government decreases

Index

Figure 7.8 Transition effects on utility levels and value of political interest function \((P)\) if time preference of government decreases

Index
Figure 7.9 Transition effects on capital stocks if time preference of government decreases and the political influence of workers increases

Figure 7.10 Transition effects on labor demand if time preference of government decreases and the political influence of workers increases
Time preference of the government and different tax systems

Figure 7.11 Transition effects on production if time preference of government decreases and the political influence of workers increases

Figure 7.12 Transition effects on the shadowprice of capital if time preference of government decreases and the political influence of workers increases
Figure 7.13 Transition effects on the investment-capital ratio if time preference of government decreases and the political influence of workers increases.

Figure 7.14 Transition effects on the labor-capital ratio if time preference of government decreases and the political influence of workers increases.
Figure 7.15 Transition effects on labor productivity if time preference of government decreases and the political influence of workers increases.

Figure 7.16 Transition effects on utility levels and value of political interest function (P) if time preference of government decreases and political influence of workers increases.
7.2.4 Time preference of social groups and time preference of the government

In Section 7.1 it was noticed that the time preference of the government is based on the time preferences of the different social groups. The time preference of the government can be interpreted as an influence weighted representation of the time preferences of these groups. Consequently, a change in the time preference of the government may be the consequence of a change in the time preferences of these social groups, or of a change in the political influence structure. Suppose, for example, that workers are less interested in their future wealth than capital owners. An increase in the political influence of workers then implies that the government attaches a higher weight to the time preference of workers. Because the time preference of workers is lower than the time preference of capital owners, the composite time preference of the social groups decreases if the political influence of workers increases. In this section we analyze the effects of such a change in the time preference of the government and assume that the discount rate $\rho$ increases from 0.05 to 1.00 and the political influence weight of workers $v_w$ from 0.80 to 0.95. The effects are presented in Figures 7.9 - 7.16. The results are compared with the results of the previous subsection, where the lower time preference of the government did not go with a change in the political influence structure.

The increase in the political influence of workers has a negative effect on the production levels in the private sectors, because workers have a higher preference for the public consumption good and a lower preference for private commodities than capital owners (cf. Figure 7.11). Instead of an increase in the production of private commodity 2 in the first few periods, that was observed in the situation that the change in time preference was not due to a change in the political influence structure, the production of private commodity 2 decreases immediately after the change in time preference and political influence (compare Figure 7.11 with Figure 7.3). On impact, the relative decrease in production in sector 2 is even stronger than in sector 1, where production suffers from both lower private consumption and lower public investments. Although public investment decreases right after the change, as a consequence of the lower time preference of the government, the decrease in public investments is more gradual than the change in private consumption, that comes with a shock in the first period after the change (cf. Figures 7.9 and 7.13). It follows, therefore, that the production in private sector 2 hardly changes after the shock in the first period, while the more gradual decrease in the production level of sector 1 continues till the new steady state level is reached.
The initially higher production level of the public consumption good is accompanied by an increase in the income tax rate. Lower public investment cannot keep the tax rate from increasing. However, the income tax rate decreases after the first few periods, because both the production level of the public consumption good and public investment then decrease. The larger political influence of workers has a positive effect on the utility of this group, whereas the utility of capital owners strongly decreases. The utility levels of all social groups decrease after the first few periods, however, because of the smaller public capital stocks (cf. Figure 7.16). Notwithstanding these reductions, the utility level of workers as well as the value of the political interest function are higher in the new steady state than in the initial steady state.

In summary, the effects in the first period after the change in the time preference and the political influence structure are dominated by the redistribution of income that follows from the change in the political influence structure. Over time, the change in time preference becomes more prominent and the consequences of the erosion of the public capital stocks become more and more obvious.

7.3 Tax systems

7.3.1 Introduction

In this section the implications of a reform of the tax-transfer system are discussed. Section 7.3.2 starts with discussing the effects of a reform of the tax-transfer system into a uniform income tax system. The difference between the two tax systems are the special provisions. In the model that was used in the previous chapters, the government can use these special provisions to redistribute income between the social groups. As discussed in Chapter 5, the government has an incentive to equate the utilities of the (representative individuals of) social groups if they have identical preferences and, in addition, the political influence structure is in accordance with the numerical strength of the groups. If the tax-transfer system is operative, the government uses the special provisions to equate utilities. In the absence of special provisions the inclination to equate utility is still the driving force of government behavior, but the government does not have the efficient instruments to do so. This inclination also holds for other types of tax reform. A second mechanism that holds for all tax systems follows from the assumption that the government neglects the price effects of policies. The government only takes
account of the impact of the tax system on the after-tax full incomes of different social groups. The tax reforms that will be discussed in Sections 7.3.3 - 7.3.6 have an effect on both prices and the after-tax full income. The assumption that the government neglects price effects makes that there is a difference between the actual results (which are given by the model) and the results expected by the government.

In Section 7.3.3 the reform of an income tax into a labor income tax is discussed. Section 7.3.4 discusses the features of a value-added tax, while Section 7.3.5 goes into the effects of a sales tax. Finally, Section 7.3.6 presents the effects of a reform to a lump-sum tax, where uniform as well as a group-specific lump-sum taxes are analyzed. All tax systems, except for the group-specific lump sum tax system, are analyzed with and without special provisions.

7.3.2 Income tax

The tax-transfer system analyzed so far consists, on the one hand, of a uniform income tax \( (r_h) \) that generates the government budget necessary for the finance of public production, and, on the other hand, of group-specific special provisions \( (o_i) \) that enable the government to redistribute income between the social groups. It was noticed in Chapter 2 that a reform of this tax-transfer system into a tax system that only consists of a uniform income tax does not influence the private and public production levels if individuals have identical preferences. The reform leads to a redistribution of income from workers to capital owners, but this redistribution of income has no effect on production levels. In this section it is analyzed whether this conclusion still holds for the dynamic model presented in Chapter 4. The results of a switch to a system without special provisions are presented in Tables 7.5 - 7.9.

The removal of special provisions leads to changes in the production levels, as can be read from the first two lines in Table 7.7. The two main differences with the model in Chapter 2 that lead to this result are the functional form of the utility functions and the presence of a public production good. In Chapter 2, a Cobb-Douglas utility function was assumed, while the model in Chapter 4 uses a nested CES function. Under the Cobb-Douglas assumption a change in the distribution of income over the social groups has no effect on private and public production levels, as long as individuals have identical preferences. In case of a nested CES
function a change in the distribution of incomes does have an effect on production levels, though the effects are rather small. This effect was already discussed in Chapter 5 [cf. eq. (5.1)]. Regarding the second difference it is noticed that, in the absence of special provisions, the government can, to a certain extent, use the public production good to redistribute income between capital owners and workers. For example, a higher level of the public production good has a direct, positive effect for capital owners, through higher dividend payments. Although the government will have to increase the income tax rate to finance the extra public costs that go with an increase in the public production good, which has a negative effect on the income of all individuals, this negative effect of the higher tax rate is for the capital owners smaller than the positive effect of the extra dividend payments. Furthermore, the higher level of the public production good has an indirect, positive effect for all individuals, because this higher level reduces the unit costs of private goods, which enables firms to reduce prices. All in all, a higher level of the public production good leads to an increase in the utility of capital owners and to a decrease in the utility of workers.

When special provisions are available as instruments the government will use these to redistribute income between social groups. When preferences are identical and political influence weights are equal to the numerical strengths of the social groups, the government will redistribute income from capital owners to workers to equalize the utility levels. If the tax-transfer system is reformed to a tax system that only consists of an income tax, special provisions are no longer available. Redistribution of income from capital owners to workers is now only possible by reducing the level of the public production good. The lower level of the public production good leads to a reduction in dividend payments and in the income tax rate, as can be read from Tables 7.9 and 7.8, respectively. The lower dividends have a negative effect on the income of capital owners, while the lower income tax rate has a positive effect on the income of all individuals. Overall the effects are negative on the incomes of capital owners and positive on the incomes of workers. The government is, thus, able to redistribute income from capital owners to workers, but the use of public goods for redistribution goes with efficiency costs. Therefore, the redistribution is not so strong that all individuals will end up with the same utility levels, as was the case before the tax reform. The reform has a positive effect on the utility level of capital owners, while its effect on the utility level of workers is negative. The absence of special provisions to redistribute income efficiently in the new tax system implies that the tax reform leads to a lower value of the political interest function.
Table 7.5  Effects on capital and shadowprice of capital  
*Change in tax structure*

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Table 7.6  Effects on labor demand and leisure  
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Table 7.7  Effects on production and commodity prices

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Table 7.8  Effects on wage rate, special provisions tax rates and tax revenues

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Workers are confronted with a loss in disposable income after the tax reform, because they lose their positive transfer. In order to compensate this loss in income, workers are willing to supply more labor. For capital owners an opposite change in behavior is observed. Entrepreneurial disposable income increases, because they are no longer obliged to pay a transfer to the government. Therefore, they prefer more leisure, and offer less labor. Total labor supply increases, however, which causes the wage rate to decrease. The lower wage rate has, in return, a negative effect on the disposable income of both capital owners and workers. Aggregate disposable income decreases, which leads to a reduction in the consumption of private consumption goods. This negatively influences production in the private sector, particularly, because the prices of private commodities increase. The higher prices are due to the higher costs per unit of production. The decrease in the level of the public production good makes that the private sectors, as well as the public consumption sector, require more labor and own capital per unit of production. The labor input per unit of production will, in particular, increase. The private sectors and the public consumption sector profit, in this respect, from the lower labor input in the public production sector and from the larger labor supply. This increase in labor input per capita is so strong that the labor input in both private sectors as well as in the public consumption sector increase, although production in these sectors decreases.

Table 7.9 Effects on dividends, utilities and value of political interest function

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<td>2.23835</td>
</tr>
</tbody>
</table>
7.3.3 Labor income tax

The replacement of the income tax by a labor income tax ($\tau_L$) exempts dividend income from taxation. As can be read from the arbitrage condition [cf. eq. (4.2)], the optimal return on shares is at a lower level of (pre-tax) dividend payments, if dividends are not taxed. The lower optimal level of dividends goes with a lower optimal level of profits and production. Thus, instead of a positive effect on private investments, which might be expected because the tax exemption of dividends would enable firms to use a larger part of their profits for investments, the tax reform has a negative effect on investments. Firms slow down investments and reduce production because capital owners are satisfied with a lower level of (pre-tax) dividends.

A second negative effect on the production levels in the private sectors is the reduction in the level of the public production good. The tax reform reduces the tax base from total income to labor income. If the government wants to keep the production levels of the public goods on the same level as before the tax reform, the government must raise the tax rate, unless the tax base (total labor income) is strongly enlarged by an increase in labor supply or in the wage rate. Although the government is willing to raise the tax rate on labor income, the increase in the tax rate is not strong enough to prevent production in the public sectors from falling. In particular, production in the public production sector suffers from the reduced tax base. The lower level of the public production good negatively influences production in the other sectors.

The higher tax rate on labor income makes that the shadowprice of leisure decreases. In addition, the lower labor demand that goes with the lower production levels in the private and public production sectors cuts the wage rate, which leads to a further decrease in the shadowprice of leisure. Consumers then prefer to have more leisure and reduce labor supply. Although the decrease in labor supply has a positive effect on the wage rate, labor income decreases. If the tax reform from a

---

7 The change in the tax system requires some adaptations in the model that was presented in Chapter 4. Because dividends are not taxed if a labor income tax is operative, the value of the firm [eqs. (4.3) and (4.11)] and the shadowprice of capital [eq. (4.8)] do not depend on the tax rate. The tax rate must also be removed in the arbitrage condition between the returns on shares and bonds [eq. (4.2)]. Furthermore, the budget restriction of consumers [eq. (4.15)] must be altered, so that consumers can spend their whole dividend income on private commodities and leisure. Finally, tax revenues for the government [eq. (4.27)] are now only obtained from the taxation of labor.
income tax to a labor income tax takes place in a situation where there are no special provisions before and after the tax reform, the effects of the reduced labor income on the distribution of income and welfare are rather straightforward. Capital owners are confronted with a negative effect on their labor income. This negative effect is strong because capital owners strongly increase their leisure time. The negative effect on their labor income is, however, offset by the positive effect on disposable income that is due to the tax exemption of income from dividend payments. On balance, the disposable income of capital owners increases, which leads to an increase in the demand for private commodities by capital owners. The higher consumption of private commodities and of leisure leads to an increase in the utility levels of capital owners, notwithstanding the negative effect on utility that follows from the lower production level of the public consumption good. Workers, on the other hand, have only income from labor. The decrease in this income leads to a decrease in disposable income and, thus, in the demand for private commodities. The lower consumption of private commodities and of the public consumption good leads to a decrease in the utility level of workers. The small increase in leisure has a negligible positive effect on the workers' utility. It appears that the fall in the utility of workers is so strong that, in spite of the increase in the utility of capital owners, the value of the political interest function decreases.

If special provisions are present, the government will use these special provisions to redistribute income. Because there are no differences in preferences and the political influence structure is in accordance with the numerical strengths of the social groups, the redistribution of income leads to a situation where welfare is equally distributed over the members of the different social groups. Compared with the original tax-transfer system (income tax plus special provisions), all individuals are confronted with a decrease in utility levels, because the tax reform reduces the utilization of the capital and labor endowments. As a consequence, the consumption of all private commodities and of the public consumption good decreases, which negatively affects utility levels. The extra leisure time gives insufficient compensation for the loss in consumption.

7.3.4 Value-added tax

The value-added tax ($\tau_v$) which is equivalent to a consumption tax in our model, levies a tax on the consumption of domestic and foreign commodities. Sales
revenues from commodities that are sold for investments or exports are exempt from taxation. Consumption of foreign goods is taxed by an import duty, which is assumed to be equal to the value-added tax. Tax revenues in period $t$, $T(t)$, are equal to

$$T(t) = \tau(t) \left[ \frac{p_1(t)}{1 + \tau(t)}(X_1(t) - E_1(t) - I_1(t)(1 + \Phi_1(t))) - I_2(t)(1 + \Phi_2(t)) \right. \right.$$

$$= I_2(t)(1 + \Phi_2(t)) - I_1(t)(1 + \Phi_1(t)) + \frac{p_2(t)}{1 + \tau(t)}(X_2(t) - E_2(t)) + p_1(t)p_2(t)(c_{p1}(t)N_{c1} + c_{p2}(t)N_{c2} + c_{p}(t)N_w)$$

$$+ p_1(t)p_2(t)(c_{p21}(t)N_{c1} + c_{p22}(t)N_{c2} + c_{p2}(t)N_w) \right] \right.$$ (7.1)

where $\tau(t)$ refers to the value-added or consumption tax. Note that $p_1(t)$ and $p_2(t)$ are the consumption prices of the domestic commodities 1 and 2, respectively. Because investment goods are exempted from taxation, the price of the investment goods is equal to the production price of commodity 1, $p_1(t) = p_1(t)/(1 + \tau(t)).$ The other consequences of the reform to the value-added tax can now easily be obtained from Chapter 4 by replacing the sales tax by the value-added tax in that Chapter.

The government perceives a negative effect of the tax on the production price $p_1(t)/(1 + \tau(t)).$ The lower production price leads to a decrease in profits and dividends, and, therefore, in the full income of capital owners. The government perceives, in addition, that the value-added tax does not affect the full income of workers. In the perception of the government, the costs of the production of the public goods are borne only by the capital owners, because the government neglects that producers may shift the value-added tax to the consumers. As was noticed in the introduction of this section, the identical preferences and the dependence of the political influence structure on the numerical strength of the social groups make that the government tries to equate the utilities of the representative individuals of the social groups. In the absence of special provisions the government can only use public production and the finance of public production to equate utilities. The government perceives that only capital owners pay the value-added tax and will, therefore, increase the production of the public goods in order to equate utilities. The income of capital owners then decreases. This negative effect on the utility of capital owners cannot be off-set by the positive effect on their utilities by the higher level of the public consumption good. Workers benefit from the higher level of the public consumption good, while at
least in the perception of the government, they do not contribute to the costs of the production of the public goods. If the value-added tax is operative, workers benefit from higher public production levels, whereas capital owners are net contributors. This is in contrast with the redistribution effects of the income tax and the labor income tax, where public production is more beneficial for capital owners than for workers.

In spite of the government's perception, capital owners will not bear the entire tax burden. Producers shift the taxes to the consumers through higher prices, which makes that workers also contribute to the finance of public production. The demand for private commodities is negatively affected, which reduces the production levels in the private sectors. In particular the production in private sector 2 suffers from the tax reform. Although the production in private sector 1 also decreases, the production in this sector is less influenced by the value-added tax because this sector produces the investments goods that are not taxed. The production level in sector 1 is, moreover, positively affected by the larger investments in the public sector. Whereas profits and dividends in sector 2 are negatively affected by the tax reform, profits and dividend payments in sector 1 increase, in comparison with the income tax system.

The tax reform leads to a decrease in the utility levels of capital owners and an increase in the utility level of workers compared with the income tax system. The tax reform, thus, enables the government to reduce the inequality in utility levels. This leads, however, to a reduction in the value of the political influence function. The negative effect on the value of the political influence function reverses into a positive effect if the income tax system with special provisions is reformed into a value-added tax system with special provisions. In that case, the government uses the special provisions for the redistribution of income. The public production levels increase and the private production levels decrease, but, compared to the value-added tax system, these changes in production levels are not so strong.

7.3.5 Sales tax

The difference between a sales tax \((\tau_S)\) and the value-added tax is that investment goods are taxed under the former. As in case of the value-added tax, it is assumed that exports are exempted from taxation, while imports are part of the tax base. The consequence of the taxation of investment goods is that the user-cost of capital
increases, which leads to a dramatic fall in the capital stocks in all sectors. In comparison with the value-added tax, the sales tax generates lower production levels in the public sectors and in private sector 1. However, the production in private sector 2 is higher if the sales tax is operative. The lower production level in private sector 1 is due to the negative effect of the tax on the demand for investment goods, that are produced in sector 1, and to the fact that the production elasticity of capital is relatively high in sector 1. Production in private sector 2 is less dependent on capital. The effect of the higher investment costs on the production price is, therefore, smaller in this sector. This effect of a tax reform from a value-added tax to a sales tax is, however, outweighed by the opposite effect of a lower wage rate on the production price (see hereafter). This wage effect is stronger in sector 2 than in sector 1, because sector 2 uses relatively more labor for production. The lower production price and the uniformity of the tax on domestic and foreign commodities makes that the decrease in the consumption price of domestic commodity 2 is stronger than the decrease in the consumption price of domestic commodity 1 and the foreign commodities. Therefore, domestic demand as well as export demand for private commodity 2 are positively affected by the tax reform from a value-added tax to a sales tax, which leads to an increase in the production level of this commodity. The increase in production has a positive effect on the profits in private sector 2, which pushes up the dividend payments. In contrast, private sector 1 faces a negative effect on production, which causes profits and dividend payments to decrease.

As can be read from Table 7.8, the value of the sales tax is lower than the value of the value-added tax, both for the tax system with and without special provisions. Under both the sales tax and the value-added tax, the government tries to equate the utilities levels, while maximizing the value of the political interest function (because of the assumption of identical preferences and political influence weights determined by the numerical strengths of the social groups). In the perception of the government, the sales tax reduces the utilities of capital owners because this tax affects dividends through a reduction in the revenues from production. The value-added tax has not only a negative effect on the utilities of capital owners, but also a positive effect, which is due to the reduction of investment costs (investments are exempted from taxation). Therefore, the government expects that the equation of utilities is reached at a lower value of the tax if the sales tax is operative. In addition, the government is confronted with higher investment costs for public production. The higher costs for the production of public goods leads to a decrease
in the production levels, which induces a reduction in tax revenues as well as in the tax rate.

The higher investment costs in the private as well as the public sectors lead to a reduction in investments. As a consequence, the capital stocks erode. In the new steady state, the negative effect of the tax reform from a value-added tax to a sales tax on the capital stocks leads to a reduction in the value of the political interest function. Only capital owners in sector 2 face a higher utility level. If the tax system also consists of special provisions, the tax reform from the value-added tax to the sales tax has a negative effect on all utility levels as well as on the value of the political interest function. The erosion of the capital stocks is an important reason for this result.

7.3.6 Lump-sum tax

The special provisions in the tax systems discussed above are lump-sum transfers. The government uses these transfers for the redistribution of income between the different social groups. The public production costs are financed with the revenues of a distorting tax. In this section the effects are analyzed of a tax reform to a tax system that uses a lump-sum tax for the finance of public production. First the effects are analyzed when an income tax system (without special provisions) changes into a uniform lump-sum tax system. Then, it is analyzed how the results alter if special provisions are added for the redistribution of income. Finally, this section goes into the features of a tax system with group specific lump-sum taxes that are used for financing public production as well as for redistributing income.

A reform of the tax system to a lump-sum tax system requires some adaptations of the model of Chapter 4. Tax revenues in period t, \( T(t) \), are now equal to

\[
T(t) = s_h(t) \left[ N_{c1} + N_{c2} + N_w \right]
\]  

(7.2)

where \( s_h(t) \) refers to the uniform lump-sum tax. This equation replaces eq. (4.27). Furthermore, the lump-sum tax must be inserted into the budget restriction of consumers [eq. (4.15)]. Finally, all other tax rates must be set to zero in the

\[8\] Note that \( s_h(t) \) is defined as a tax, whereas the special provisions, \( \sigma_i(t) \), are defined as a benefit. A positive value of \( s_h(t) \), thus, implies that taxes must be paid, while a positive value of \( \sigma_i(t) \) refers to extra income that individuals receive from the government.
The tax reform from the income tax to the lump-sum tax raises the shadow price of leisure, which reduces the demand for leisure. The subsequent increase in labor supply has a negative effect on the wage rate. The after-tax income from labor increases, however, because labor income is not taxed. Capital owners profit, furthermore, from the fact that dividends are not taxed. On the other hand, the lump-sum tax has a negative effect on disposable income of both capital owners and workers. It turns out that disposable income of workers is reduced, while the disposable income of capital owners is positively affected by the tax reform. The reform, thus leads to a more unequal income distribution. To mitigate this effect on the income distribution, the government can only use the public production good, as was discussed in Section 7.3.1. Therefore, the level of the public production good decreases.

Although the decrease in the level of the public production good has a negative effect on production in the private sectors and in the public consumption sector, this negative effect is outweighed by the positive effect on production of the development in the labor market. The strong increase in labor supply and the concomitant decrease in the wage rate make that the private sectors and the public consumption sector can increase their employment, while labor costs can be kept within bounds. The production levels then increase in the private sectors as well as in the public consumption sector. For the extra production, these sectors require additional capital. Therefore, capital stocks increase in the private sectors and in the public consumption sector. In the private sectors the unit-cost of production are reduced by the tax reform, which leads to lower commodity prices and higher dividend payments.\footnote{Note the difference with the labor income tax, where only dividend payments are exempted from taxation. The reform to a labor income tax led to a decrease in private production, to lower investments in these sectors, and to a decrease in dividend payments, while a reform to a lump sum tax, where income from dividends as well as from labor are exempted from taxation, has a positive effect on private production levels, investments and dividends.}

The increase in disposable income of capital owners and the decrease in the prices of domestic commodities lead to an increase in capital owners' consumption of all private commodities. Workers' disposable income decreases a bit. The lower prices
of domestic commodities enable workers to consume more of these commodities. Their consumption of foreign commodities decreases, however. With the decrease in leisure time the lower consumption of foreign commodities is strong enough to offset the positive effects on utility that are due to a higher consumption of domestic commodities and of the public consumption good. The utility of capital owners increases, because the positive effects on utility of the higher consumption of domestic and foreign commodities and of the public consumption good outweigh the negative effect on utility of the reduced leisure time. The decrease in the utility level of workers is dominant for the value of the political interest function, so that this value decreases. The tax reform from a system with only an income tax to a system with a uniform lump-sum tax, thus, leads to an increase in production in the private sectors, but this increase in production does not lead to an increase in the value of the political interest function. Only capital owners benefit from the tax reform. Workers end up with a reduction in their utility.

In the tax systems with special provisions the differences in income vanish. If special provisions are added to the uniform lump-sum tax system, the government can use them for the redistribution of income. The level of the public production good, that was used for redistribution in the tax systems without special provisions, can now increase, because it is released from its distribution task. Production levels, labor inputs and capital stocks in all sectors increase, as well as the dividend payments and the wage rate. The redistribution of income through special provisions goes at the cost of the utility levels of capital owners. The increase in the utility level of workers is, however, strong enough to let the value of the political interest function increase.

A comparison of the tax system that consists of an income tax and special provisions with the tax system that consists of an uniform lump-sum tax and special provisions shows that a tax reform from the former to the latter tax system has a positive effect on all production levels, labor input levels, capital stocks, private consumption levels, utility levels and dividend payments. Only the wage rate and leisure decrease.

Finally, a lump-sum tax system is investigated with group-specific lump-sum taxes, that are not only used for the redistribution of income, but also for the finance of the public production costs. Tax revenues in period \( t \), \( T(t) \), are now equal to

\[
T(t) = s_{c1}(t) N_{c1} + s_{c2}(t) N_{c2} + s_{w}(t) N_{w}
\]

(7.3)
where $s_i(t)$ refers to the group-specific lump-sum tax for social group $i$, $i = c1, c2, w$.\(^{10}\) Other adaptations of the model are now straightforward.

In the tax system with a uniform lump-sum tax for the finance of public production costs and special provisions for the redistribution of income, the presence of a uniform tax has the consequence that all social groups face the same price for the public goods. These identical prices are cropped up in the uniform tax and depend on the (political-influence-weighted) sum of the marginal utilities that the different groups attach to the public goods. With group-specific taxes the production levels of the public goods still depend on the (political-influence-weighted) sum of the marginal utilities, but every social group pays a price for this good that depends on the own marginal utilities. The price not only depends on the marginal utility the social group attaches to the public good but also on the social group’s marginal disutility that is imputed to the tax the social group has to pay.\(^{11}\) It is the presence of these group-specific prices that makes the collection of taxes for the finance of public production costs more efficient. In a uniform lump-sum tax system with special provisions the government is able to redistribute income efficiently through the special provisions. Nevertheless, this system leads to lower utility levels for all groups (and, consequently, to a lower value of the political interest function) than the group-specific lump-sum tax system, because the former tax system misses the possibility to translate the information on group-specific preferences with respect to the public goods into group-specific prices for these goods.

The other effects of this tax system are now rather straightforward. It is easily seen that the government can maximize the value of the political interest function if it reforms the tax system to a group-specific lump-sum tax system. Note that, whereas this tax system leads to the highest utility level for workers, capital owners are better off with the uniform lump-sum tax system without special provisions. This is due to the fact that the latter tax system hinders income redistribution.

\(^{10}\) The group-specific lump-sum taxes are defined as taxes, as was also done for the uniform lump-sum tax. Positive values of these taxes imply that individuals must pay a tax. This is in contrast with the group-specific special provisions, where a positive value refers to a benefit.

\(^{11}\) Note the similarity with Samuelson’s personalized prices and with Lindahl prices [cf. ATKINSON AND STIGLITZ (1980)].
7.4 Political influence in a tax system without special provisions

In Sections 5.2 and 6.2 the effects of a change in the political influence structure was analyzed for a tax system that consisted of a uniform income tax and group-specific special provisions. This change led to a redistribution of incomes through a change in special provisions. As illustrated and discussed in these sections, the effects of the redistribution of income through special provisions on the private and public production levels are rather small if identical preferences are assumed. In this section we analyze whether this conclusion also holds for a tax system that has no special provisions. The results are presented in Tables 7.10 - 7.13.

In case the government does not have the instrument of special provisions to react to a change in the political influence structure, it will have to use other policy instruments to let the outcomes of policies be in accordance with the political influence structure. A government that is confronted with an increase in the political influence of capital owners, with a simultaneous decrease in the political influence of workers, will try to increase the utility of capital owners at the cost of the utility of workers. This can be done by increasing the level of the public production good, for an increase in the level of this goods has a positive effect on profits and, as a consequence, on dividend payments. For the finance of the extra costs that are due to the higher production of the public production good, the government must raise the income tax rate. This has a negative effect on the after-tax dividends that the capital owners receive. It turns out that the after-tax dividends of capital owners in private sector 2 even decrease if their political influence increases. Furthermore, it can be checked that the after-tax wage rate increases if the political influence of capital owners increases. The increase in the after-tax wage rate is, however, very small. The reason for this is that the negative effect of the higher tax rate on the after-tax wage rate is outweighed by an increase of the pre-tax wage rate. The wage rate increases because labor productivity is increased by the higher level of the public production good. Because the shadowprice of leisure is equal to the after-tax wage rate, the demand for leisure hardly changes if the political influence of capital owners changes. These effects on dividend payments, the income tax rate, the wage rate and leisure give the surprising result that the increase in political influence of capital owners increases the level of the public production good, but this increase only leads to a negligible shift in the distribution of after-tax incomes from capital and labor and in the disposable income of the different social groups.
Table 7.10  Effects on capital and shadowprice of capital
*Change in political influence, no special provisions*

<table>
<thead>
<tr>
<th>(\mu_{e1}, \mu_{e2}, \mu_u)</th>
<th>(K_1)</th>
<th>(K_2)</th>
<th>(K_s)</th>
<th>(K_p)</th>
<th>(q_1 = q_2)</th>
<th>(q_p = q_s)</th>
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<td>0.10, 0.10, 0.8</td>
<td>500.04</td>
<td>366.06</td>
<td>88.408</td>
<td>135.53</td>
<td>0.37707</td>
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<td>88.971</td>
<td>172.61</td>
<td>0.36843</td>
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<tr>
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<td>533.19</td>
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<td>0.002401</td>
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Table 7.11  Effects on labor demand and leisure
*Change in political influence, no special provisions*

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<th>(L_2)</th>
<th>(L_s)</th>
<th>(L_p)</th>
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<td>0.3756</td>
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Table 7.12  Effects on production and commodity prices
*Change in political influence, no special provisions*

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<th>(X_2)</th>
<th>(G_s)</th>
<th>(G_p)</th>
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<th>(p_2)</th>
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Table 7.13  Effects on utility, value political interest function and taxes
*Change in political influence, no special provisions*

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<td>2.9153</td>
<td>2.9398</td>
<td>1.9911</td>
<td>2.1516</td>
<td>124.92</td>
<td>0.23131</td>
</tr>
</tbody>
</table>
Although the increase in disposable income from the shift in the political influence structure is rather small, production in both private sectors increases. The reason is that the prices of both private commodities decrease, due to the higher level of the public production good which pushes down the unit-costs of (private) production. These lower prices have a positive effect on the domestic and foreign demand for private commodities. In addition, the production in private sector 1 profits from the extra demand for investment goods from the public production sector, which is due to the higher production level in that sector. Compared with the increase in the private production levels, the increase in the level of the public consumption good is rather small. The reason for this small effect on the production of the public consumption good is that this sector not only faces a higher wage rate but also an increase in the shadowprice of capital. Although the higher level of the public production good has a positive effect on the productivity of labor and capital, the negative effect of the higher wage rate dominates the positive productivity effect on labor input in the public consumption sector if the political influence of capital owners increases. For capital the productivity effect outweighs the price effect and the capital stock increases. If, however, the political influence of capital owners further increases (so that $\mu_j = 0.25$, for $j = 1, 2$), the negative price effect is dominant and the capital stock decreases.

It can be concluded from the above discussion that the increase in the political influence of capital owners leads to a higher level of the public production good. The expected positive effect of the higher level of this good on after-tax dividend payments and the expected negative effect on after-tax labor income is, however, not observed. On the contrary, after-tax labor income increases and after-tax dividend payments for capital owners in sector 2 decrease, albeit that the effects on incomes are rather small. What changes is the consumption of domestic and foreign private commodities and the public consumption good. This positive effect on consumption is faced by all consumers, which implies that the utility of all consumers increases if the political influence of capital owners increases. Consequently, also the value of the political interest function increases. If, however, the political influence of capital owners further increases (so that $\mu_j = 0.25$, for $j = 1, 2$), the negative effect on after-tax dividend payments of capital owners in sector 2 is stronger than the positive effect on after-tax labor income. Therefore, capital owners in sector 2 will in that case consume less of domestic and foreign private commodities. In addition, they are confronted with a decrease in the level of the public consumption good. Thus, although the capital owners in sector 2 have more political influence, they end up with a lower utility level. In
contrast, workers have less political influence, but their utility increases. The utility of capital owners in sector 1 also increases. On balance, the additional increase in the political influence of capital owners has a positive effect on the value of the political interest function.

An increase in the political influence of workers gives the opposite effects of the results discussed for the increase in the political influence of capital owners. This implies that the utility level of workers decreases if their political influence increases.

A change in the political influence structure where capital owners in private sector 2 increase their influence at the cost of the influence of capital owners in private sector 1, leads to an increase in the level of the public production good. This is due to the fact that the value of the marginal product of the public production good is higher in sector 2 than in sector 1 \[ p_2(t) \frac{\partial X_p}{\partial G_p} > p_1(t) \frac{\partial X_p}{\partial G_p} \]. The level of the public production good depends on these values. If the political influence of the capital owners in sector 2 increases, the government will take better account of the interests of the capital owners in sector 2. It is in these capital owners’ interests to increase the level of the public production good. The higher production level of this good has a positive effect on the production in all other production sectors. All social groups benefit from the higher production (including the capital owners in sector 1, who are confronted with a decrease in political influence), which leads to an increase in the utility levels of all social groups and, as a consequence, to an increase in the value of the political interest function.

7.5 Concluding remarks

In this chapter, attention was first paid to the time preference of the government. The effects of a change in time preference were discussed in Section 7.2. Not surprisingly, the government will hold lower public capital stocks if the government cares less about the future (has a lower time preference), which leads to a reduction of the production levels in the public sectors. Although the lower public production levels allow the government to cut the tax rate, they do not go with substantial changes in private consumption. Changes in private production are then dominated by the lower demand for investment goods by the government. Finally, a decrease in the utility levels is observed, which is in particular due to the lower level of the public consumption good. This negative effect on the utility
levels is apparent in the long run, when the new steady state is reached. The analysis of the transition path shows that the utility levels are higher in the first periods after the decrease in the time preference of the government. Utility levels are, thus, higher in the short run and lower in the long run if the government cares less about the future. This result changes, however, if the time preference of the government is linked to the time preference of the (representative individuals of) social groups. A change in the time preference of the government then results from a change in the time preference of the social groups and/or a change in the political influence structure. In that case, the short run effects are dominated by the redistribution effects that follow from the change in the political influence structure. The long run effects are, however, dominated by the decrease in the time preference.

Tax reform was the second topic discussed in this chapter. In Section 7.3, we compared the income tax with a wage tax, a value-added tax, a sales tax and a lump-sum tax. It appeared that the impact of the tax system is dominated by the intention of the government to reduce the differences in utility between social groups. If (representative individuals of) social groups have identical preferences and the political influence structure is in accordance with the numerical strengths of the social groups, the maximization of the value of the political interest function dictates that the government will transfer income from social groups with a relatively high utility level to social groups with a relatively low utility level. Therefore, special provisions are beneficial for workers (the social group with the lowest utility level if a tax system without special provisions is operative), whereas capital owners are confronted with a loss in utility if special provisions are operative. If the tax system contains special provisions, the government will use these special provisions to equate utilities. In the absence of special provisions the government will rely on other policy instruments (taxes and public goods) for this purpose. These instruments are, however, less efficient than the special provisions. Therefore, the government can improve the value of the political interest function in all the tax systems analyzed if special provisions can be employed. This result gives a possible explanation for the observation in STIGLITZ (1989) that a tax system consists not only of an official, uniform part, but also of a semi-official, heterogeneous (in this case group-specific) part.

In the tax systems with special provisions, the taxes are only utilized in the model for the finance of the costs of public production, while redistribution is covered by the special provisions. The presence of special provisions enables the government
to redistribute income in such a way that all individuals have the same disposable income and utility levels. It turns out that the utility levels are highest if public expenditures are financed with group-specific lump-sum taxes. The group-specific lump-sum tax system appeared to lead to higher utility levels than the uniform lump-sum tax system combined with special provisions, which is due to the fact that the marginal utility and disutility an individual receives from the provision of public goods is better reflected by group-specific lump-sum taxes than by a uniform lump-sum tax. As regards the other tax systems with special provisions, utility increases if the income tax system is replaced with a value-added tax system, whereas utility decreases if the reform concerns a sales tax or a wage tax system. The reform to a value-added tax or a sales tax has a positive effect on the levels of the two public goods and a negative effect on the consumption of private commodities. In case of the replacement of the income tax with a value-added tax, the positive effect on utility that goes with an increase in public consumption dominates the negative effect on utility from the lower private consumption. The negative effect is dominant if the tax system is reformed from an income tax to a sales tax. The difference between the value-added tax and sales tax is in the treatment of investment goods. These goods are taxed if a sales tax is operative and exempted under a value-added tax. The exemption of investment goods from taxation appears to have a positive effect on utility. The positive effect on utility of a tax reform from a tax on income to a tax on consumption (the value-added tax) is in accordance with the observations on the consumption tax in SUMMERS (1981b), BALLARD ET AL. (1985) and AUERBACH AND KOTLIKOFF (1987). In these studies the extra savings and investments that are generated by the tax reform are important for the positive effect on welfare. In our model the positive effects follow in particular from a increase in public goods and investments. This suggests that the positive welfare effect of a switch towards a consumption tax would even be more substantial if savings decisions are also taken into account. The result that reform from an income tax to a labor tax did not lead to a positive effect on utility, is in line with the findings of AUERBACH AND KOTLIKOFF (1987). The decrease in labor supply and in the levels of the public goods is accompanied by a decrease in the capital stocks in all sectors. The exemption of capital income cannot prevent the capital stocks from falling. A comparison of the wage tax with the value-added tax suggests that it is more beneficial to allow for tax deductability of investments than to exempt capital income from taxation, which is in line with the analyses in, for example, AUERBACH AND KOTLIKOFF (1987) and BOVENBERG AND GOULDER (1989).
The tax systems without special provisions led to differences in utility between social groups. Reforming the income tax into a uniform lump-sum tax or a wage tax exacerbates the inequality in utility between capital owners and workers, whereas a value-added tax mitigates this inequality. Changing the income tax into a uniform lump-sum tax decreases the utility of workers. The higher utility from extra public consumption and extra consumption of domestic private commodities cannot compensate for the lower utility from the fall in leisure (the reform encourages labor supply) and the consumption of foreign private commodities. It turns out that the value of the political interest function decreases if the tax system is reformed from an income tax to a uniform lump-sum tax. Compared to the uniform lump-sum tax, the wage tax is worse for all social groups. The wage tax is, however, more beneficial for capital owners than the income tax, because dividends are exempted from taxation if the wage tax is operative. The increase in the capital-owners' utility that follows from the increase in leisure time and in the consumption of private commodities outweighs the negative effect of the lower level of the public consumption good on their utility. Workers are confronted with a decrease in their disposable income if the income tax is replaced by a wage tax. Their private as well as public consumption decreases therefore. The concomitant loss in utility is not off-set by the increase in utility through extra leisure time. Of the tax systems that were studied in this chapter, the wage tax without special provisions gave the lowest value of the political interest function. The two indirect taxes (value-added tax and sales tax) give the lowest utility levels for capital owners, among the tax systems without special provisions. Compared to the other tax systems, the levels of the public goods are much higher if an indirect tax is operative, because neither the public goods nor labor input (as well as capital for the value-added tax) for public production are taxed in that case. Although capital owners benefit from the increase in the public consumption good, they are confronted with a loss in disposable income as well as leisure. Capital owners in private sector 1, where a commodity is produced that can be used as a consumption as well as an investment good, would prefer the value-added tax above the sales tax, because the deductability of investment goods under the former tax system has a strong positive effect on the dividends that these capital owners receive. Capital owners in private sector 2 would, in contrast, prefer the sales tax, because the smaller tax base under the value-added tax, and the concomitant increase in the tax rate, has a negative effect on the dividend payments in sector 2. Workers would prefer the value-added tax, because the deductability of investment goods leads to a strong increase in the capital stock of all production sectors. The consequent increase in the level of the public consumption good is then in particular beneficial.
for workers. Compared to the other tax systems without special provisions, the value-added tax leads to the highest utility level for workers.

We, finally, studied the impact of the political influence structure when an income tax without special provisions is operative. In Chapters 5 and 6 we noticed that under the tax-transfer system (that includes special provisions) a change in the political influence structure leads to a redistribution of income, but hardly affects the production levels, as long as individuals have identical preferences. In Section 7.4 we analyzed whether the impact of the political influence structure on input and production levels is still small if an income tax without special provisions is operative. It turns out that in that case a change in the political influence structure does have an effect on input and production levels. In particular the level of the public production good appeared to be sensitive for the political influence structure. This good is an important instrument for the government to redistribute income if special provisions are absent, because the government perceives that it has a positive effect on the utility of capital owners whereas it may negatively affect the utility of workers. However, it appears that an increase in the level of the public production good may also be beneficial for workers. The government will increase this level if the political influence of capital owners increases, at the cost of the political influence of workers. If the capital-owners’ increase in political influence is not too strong, all social groups will benefit. An increase in infrastructure (the public production good) may therefore be beneficial for all social groups if it is initiated by an increase in the political influence of capital owners, notwithstanding the concomitant lower after-tax dividends, higher tax rate and higher tax revenues. A strong increase in the political influence of capital owners further increases the utility of capital owners in sector 1 and workers, whereas the utility of capital owners in sector 2 decreases, because the decrease in after-tax dividends and in leisure becomes too strong. An increase in the political influence of workers gives the opposite effects, which implies that an increase in the workers’ political influence goes with a decrease in their utility.