Government decisions on income redistribution and public production
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8 Summary and conclusion

8.1 Summary

The use of macroeconomic models for policy evaluation has been criticized since the mid-seventies. The poor forecasts of these models after the oil shock in 1973, and the consequent difficulties to give an adequate policy advice, are attributed to the weak behavioral underpinning (the Lucas critique) and to the neglect of the governmental decisionmaking process. To meet these points of critique, models are needed with appropriate microeconomic foundations, allowing for endogenous government behavior. In this monograph, some models were presented that are intended to contribute to the development of such models. This was done by incorporating a positive, public choice model of government behavior into an applied general equilibrium model. We opted for an applied general equilibrium model, instead of a microfounded macroeconomic model, because such a model seems better suited for the study of distributive and allocative effects. As regards political decisionmaking, four important models were discussed in Chapter 1: the median voter model, the electoral competition model, the interest function approach and the Leviathan model. These four models follow the public choice approach, which implies that the behavioral assumptions from (neoclassical) economic theory are used for the description of the behavior of the different political agents. We concluded in Chapter 1 that the interest function approach is the most promising model of the four models mentioned, because it incorporates the interests of the four main types political agents: voters, interest groups, bureaucrats and politicians. We refer to the (applied) general equilibrium model with endogenous government behavior as the political economic general equilibrium model.

In Part I, a political economic general equilibrium model was developed that is analytically solvable. The analytical tractability of the model allowed us to obtain results that hold for a large range of parameter values. It gave us, in addition, a better understanding of the main mechanisms of the model. The price we had to pay for the analytical tractability is the use of relatively simple functional forms and the neglect of intertemporal decisionmaking. In Chapter 2, an analytical model was presented that contains some of the basic features of the models presented in this monograph. Apart from assuming utility maximizing consumers (with utility depended on private commodities, leisure and a public good) and profit maximizing producers, it stipulates the political interests of individuals, the decisionmaking process of the government, and the tax-transfer system. Government decisions follow from the maximization of
the value of the political interest function. This function is a weighted sum of the political interests of the different social groups. The relative weights are determined by the political influence of the social groups. The political interests of a social group are reflected by the (indirect) utility function of a representative individual of that group. The model differs, in that respect, from earlier applications of the political interest function approach [cf., e.g., VAN WINDEN (1983) and VAN VELTHOVEN AND VAN WINDEN (1985, 1986)], where the political interests are not explicitly derived from utility. The tax-transfer system consists of two parts: a uniform income tax used for the finance of the production costs of the public goods and a self-financing redistribution system, consisting of group-specific transfers (special provisions). The two public budgets, for the finance of the provision of public goods and for the redistribution of income, are assumed to be balanced.

In Chapter 2 we studied political decisionmaking with respect to the provision of public consumption goods and the redistribution of income. For reasons of exposition, we distinguished only one social group of capital owners and one social group of workers, while the number of private as well as public goods was restricted to one. The comparative static results for the political interest weights show that, if the individuals of the different social groups have identical preferences, the production levels in the private and the public sector are not affected by a change in the political influence structure. In that case, only a redistribution of income appears, which does not affect production. Apart from identical preferences, homothetic utility functions and the lump-sum character of the redistribution system are important for that result. If preferences are not identical, the preference with respect to leisure is important for the results. If the political influence of the social group with a higher preference for leisure increases, private and public production levels will decrease. In some situations, that were discussed in Section 2.4.2, the increase in political influence of a social group may even go with a decrease in the utility of that group.

The relevance of the use of a political economic general equilibrium approach was demonstrated in Chapter 2 by comparing comparative static results from such an approach with the results from a traditional general equilibrium approach. The latter approach is used to study the effects of a change in a policy variable, while the positive approach also takes account of the reason why the policy variable changes. For example, if the traditional approach is applied to the private sector part of the model of Chapter 2, an increase in the income tax rate would lead to a decrease in private production. If, however, a positive approach is used, and the increase of the
income tax is due to a decrease in the preference for leisure of the capital owners, an increase in the income tax goes with an increase in private production.

Another issue, that was introduced in Chapter 2, concerns tax reform. Comparing the results for the tax-transfer system with the results for the group-specific lump-sum tax system. It turned out that the latter tax system is Pareto superior to the former. The lump-sum tax system is, however, not for all parameter configurations Pareto superior to a tax system that only consists of an income tax, with no special provisions. The explanation of this result is that in a system with group-specific taxes, total full income of the individuals of a social group can be taxed away if this social group has no political influence. This is not possible in a system that only consists of uniform taxes. We closed the section on tax reform with a discussion on the costs of tax reforms.

The basic model presented in Chapter 2 was further developed in Chapter 3 to study aging and social security. We focused on the following issues related to aging: the effects on social security benefits and premiums, and the possible impoverishment of the aged; the possible crowding out of public goods if social security expenditures increase; the effects on private output; and the exacerbation of intergenerational conflict. To study these issues, we introduced two elements in the model that are often neglected in the literature that investigates the consequences of aging. First, we took account of motives of other-directedness that individuals may have. Interest in the utility of others may be due to, for example, pure altruism or to a positive subjective probability to become a member of another social group (mobility or insurance motive). Second, we introduced a group of retirees with capital, allowing us to study the impact of the, empirically observed, increase in the size of this group. In total, six social groups were distinguished: capital owners, who receive income from the capital they possess, the labor they supply and from special provisions; workers, receiving labor income and income from special provisions; retirees and disabled individuals who receive income from capital endowments and the social security system; and retirees and disabled individuals who only receive income from the social security system. We introduced a separate group of disabled individuals because there is an overrepresentation of almost-retired individuals in this group. Moreover, it offered the opportunity to analyze the implications of an increase in the number of retirees for this group, such as the crowding out of social security benefits for the disabled and conflicts between retirees and disabled individuals.
To analyze the impact of aging, we derived the comparative static results of a change in the number of retirees (group size), a (consequent) change in the capital endowments of retirees, a change in the political influence of retirees, and a change in the care for the utility of retirees by other individuals (motive of other-directedness). In addition, attention was focused on the impact of an increase in the retirement age and the capital endowment of the elderly. In general, no definite conclusions could be obtained, since most of the results were ambiguous. To arrive at more definitive results the assumption was made that the elderly and disabled have a relatively higher preference for the public good than workers and capital owners. Furthermore, the analysis was illustrated with a numerical example.

From the analysis in Chapter 3 we concluded that an increase in the number of retirees without capital only appears to affect the level of transfers to retirees. If, however, the number of capital-owning retirees increases, both the provision of public goods and private output are positively affected while the transfer (pension) to retirees, as well as the pension premium, decreases. The tax rate is not affected. These effects are reinforced if, in addition, capital per retiree increases. In general, however, we cannot conclude that the welfare of all retired individuals will be improved if a fraction of them becomes less dependent on transfer income through the possession of capital. Except for the effect on the transfer, these results for an increase in the number of retirees (with capital) are strongly in contrast with the conventional wisdom.

The above results change only slightly if an increase in the number of retirees leads to an increase in the political influence of this group. In that case, the positive effect on private output is weaker, while the positive effect on the provision of the public good is stronger. An increase in the political influence of the elderly leads, furthermore, to an increase in the tax rate and the pension premium, while the influence on the transfer to retirees is ambiguous. Similar effects are observed if capital owners and workers care more for the utility of retirees (reflected by an increase in the other-directedness parameters). The effect on the transfer to retirees, however, is now unambiguously positive. With respect to the generally expected exacerbation of intergenerational conflicts as a consequence of aging, we concluded in Chapter 3 that this may not occur insofar as aging is accompanied by an increased probability for nonretirees to become a retiree (captured by the other-directedness parameter) or by a relative increase in the number of capital owners among the retirees. Intergenerational conflicts are also not exacerbated by an increase in the retirement age, because this increase leads to an increase in the public pension and the
utility of the (remaining) retirees. The only social group that may not benefit from an increase in the retirement age are workers, who are confronted with a decrease in their utility if they have a low preference for the public consumption good and a relatively weak political influence.

The direction of the effects on private and public output and taxation of a change in the number of disabled individuals, their capital endowments, political influence, and other-directedness parameters are in accordance with the effects of the changes in the corresponding parameters regarding retirees, while the direction of the effects on social security transfers and premiums is only slightly divergent.

Most of the results that were presented in Chapter 3, and summarized above, do not hold for all parameter configurations. Without restrictions on the parameter set, most results were ambiguous. In order to arrive at more definitive results the (empirically plausible) assumption was made that the elderly care relatively more about public goods and services than workers and capital owners. Nevertheless, the analysis of simultaneous changes in parameters produced only limited insights because of ambiguous effects. More definitive results of such simultaneous changes were obtained for a numerical example.

In Part II we presented a numerically solvable general equilibrium model. This was motivated by the conclusion that further development of the analytical model could only offer a limited number of new insights, due to the complexity of the model. In addition to issues raised in Part I, attention was focused on the economic impact of a public production good (infrastructure). For that purpose, in particular the production side of the positive general equilibrium model of Chapter 2 was further developed. The most important new elements concern the investment decisions, the dependence of production on infrastructure, and the distinction between two private production sectors. Investment decisions in the private sectors are obtained from the maximization of the value of the firm, which consists of the discounted sum of dividend payments over an infinite horizon. From this objective the optimal levels of dividends and investments are determined. This so-called q-theory of investments introduces adjustment costs, which are due to the installation of new capital. According to the q-theory, investments depend on installation costs and on the shadowprice of capital. Hayashi (1982) showed that the shadowprice of capital (the marginal q) is equal to the asset price (the average q) if debt maintenance, tax deductions of past investments and imperfect competition are neglected. However, in Chapter 4 we demonstrated that the introduction of a public production good implies
that the asset price does, in that case, not only depend on the marginal benefits of private capital (given by the shadowprice of capital), but also on the marginal benefits that the firm obtains from the public production good. The neglect of this latter effect may explain the poor empirical support for Hayashi's proposition that the marginal q equals the average q. As a consequence, investments do not only depend on the asset price, but also on the marginal benefits of the public production good.

In the model of Part II, the q-theory of investments is also applied to investment decisions in the public sectors. As in Part I, the production of public goods is assumed to depend on capital and labor as inputs, whereas the production of the public consumption good depends in addition on the public production good. The optimal investment in public capital follows from the maximization of the value of the dynamic political interest function. Apart from the investment in public capital, the maximization of the value of the dynamic political interest function determines the provision of the public consumption good and the redistribution of income over the social groups. As in Part I, the redistribution system is assumed to be self-financing.

In this model, investment decisions depend on the expected (marginal) benefits that these investments will have in the future, which are captured by the shadowprice of capital. The expectations with respect to these benefits can be formed under different rules. In Chapter 4 we compared four expectation rules: lagged, static, adaptive and rational expectations. To study the differences in the transition path for the four different expectation rules, we introduced a technological shock that makes production in both private sectors more dependent on infrastructure. It turned out that, although all expectation rules lead to the same new steady state, this steady state is earlier reached under the static, adaptive and rational expectation's rule than under the lagged rule. In the latter case, transition paths show a cyclical pattern towards the new steady state, whereas the transition path is monotonic for most variables if the rational expectation rule holds, because individuals foresee the long term effects of the technological change. If expectations are static or adaptive, the government overestimates the marginal benefits of extra investments in public capital. As a consequence, the production level and the capital stock of both the public consumption and the public production good are too high (that is, higher than the new steady state level) for a short period, which is corrected by a cut in investment. Compared to rational expectations, investment in the private sectors is more rapidly reduced if expectations are static or adaptive, but these reductions are not so strong that the production levels and the capital stocks in the private levels become too low. Lagged expectations, on the other hand, lead to overinvestment in the public sectors and to
underinvestment in the private sectors. The transition paths show a cyclical pattern towards the new steady state.

With respect to consumption, we abstracted from intertemporal decisions in Part II. However, a nested structure was adopted for the utility function, which leads to differences in substitutability of commodities that are at different levels of the utility tree. By assuming a CES type of utility function greater flexibility was obtained with respect to own-price and cross-price elasticities. Furthermore, we introduced two different types of private commodities. These private commodities were further subdivided in a domestic and a foreign commodity, which were assumed to be imperfect substitutes (Armington condition). In Chapter 5 we re-examined the conclusion formulated in Chapter 2 that the political influence structure does not affect the levels of production if individuals have identical preferences and the government can use lump-sum transfers to redistribute income. It turned out that this result does not hold if the utility function is of the nested CES type. However, a change in the political influence structure leads to very small changes in production levels, whereas the effect on income redistribution is still strong. Hence, we concluded that a change in the political influence structure leads, in particular, to a redistribution of income and welfare, but hardly leads to a change in the production levels. Moreover, it was shown that this conclusion is still valid if the utility function is quasi-homothetic, instead of homothetic.

The political influence structure did have an effect on production levels if individuals of different social groups have different preferences. For the example that we studied (workers have a stronger preference for leisure and the public consumption good than capital owners) it turned out, however, that a change in the political influence structure hardly affects the level of the public consumption good, unless the increase in the political influence weights of capital owners is very strong. We concluded from this result that the government will use the special provisions to redistribute income, because these special provisions are the most efficient instruments. If the increase in the political influence of capital owners is very strong, special provisions do not suffice and the government requires additional instruments, such as the level of the public consumption good to bring the distribution of welfare in accordance with the political influence structure.

The impact of the influence structure on the value of the political interest function was also analyzed in Chapter 5. It was shown for the case that individuals have identical preferences, that the political interest function had the lowest value in a situation
where the political influence is equally distributed over the social groups (that is, when the political influence is determined by the numerical strength of the social groups). This result is due to the fact that the public consumption good has its highest level in a situation with an equal distribution of political influence, where it should be noticed that the production costs of public goods is financed with a distortionary tax. As explained in Chapter 5, this result changes somewhat if individuals have different preferences.

Apart from the impact of changes in the political influence structure, we also studied the effects of a change in preferences in Chapter 5. It turned out that a decrease in the preference for private commodities and a simultaneous increase in the preference of either leisure or the public consumption good, leads to an increase in the utility of all social groups and the value of the political interest function, whereas production and investment in the private sector and total employment decrease. If the decrease in the preference for private commodities goes with an increase in the preference for the public consumption good, the income tax rate and tax revenues increase. In that case, a seemingly ‘poorer’ economic performance (in terms of a decrease in private production and private investments, and an increase in the tax rate and tax revenues) goes with an increase in the utility levels and the value of the political interest function.

Throughout Part II we paid attention to the impact of an enlargement of infrastructure on the economic performance. In our political-economic model the government cannot extend infrastructure at will. The expansion of infrastructure is the result of a change in parameters or exogenous variables. In Chapter 5 we studied the effects of an expansion of infrastructure that was originated by a change in preferences. An increase in the preferences of all individuals for the public consumption good at the cost of their preference for leisure, leads to an expansion of the public consumption good as well as the level of infrastructure. In that case production in private sector 1 increases, while production in sector 2 decreases. Furthermore, all social groups face an increase in their utility. However, if the expansion of infrastructure follows from an increase in the preference for private commodities at the cost of the preference for the public consumption good, private production increases whereas utility decreases.

The impact of the public production good (infrastructure) on production and utility was further analyzed in Chapter 6. In that chapter we particularly investigated the impact of infrastructure if an expansion followed from changes in technology and the political influence structure. If the government extends infrastructure because a
technological change makes private production more dependent on infrastructure and less dependent on private capital, the expansions of infrastructure goes with less private production, an increase in capital productivity and a drop in the productivity of labor and infrastructure in the private sectors. If, however, the technological change is concentrated in private sector 1, these effects occur only in this sector, while production in sector 2 is positively influenced by the expansion of infrastructure. In both situations, the expansion of infrastructure leads to a decrease in utility and the value of the political interest function.

The expansion of infrastructure may also follow from a change in the political influence structure. Consider a situation where workers have a higher preference for public consumption than capital owners. An increase in the political influence of capital owners at the cost of the political influence of workers leads in that case to an expansion of infrastructure. Private production and the utility of capital owners are positively affected by this expansion, whereas the utility of workers is negatively affected. The value of the political interest function only increases if there is a strong increase in the political influence of capital owners.

Apart from the effects of the expansion of infrastructure on private production and utility levels, we studied in Chapter 6 the impact of changes in productivity of the different input factors on private production and utility, which was motivated by BAUMOL (1967). The unbalanced growth hypothesis of Baumol, saying that a sector with a lower labor productivity faces a lower growth in output, was studied in Chapter 6 by means of a comparative static analysis. This implies that the influence of an uneven change in labor productivity on the steady state values of production levels is studied instead of the influence on the growth rate. Our results support the hypothesis of Baumol. However, the unbalancedness may be mitigated by infrastructure, because the increase of production in the sector with a strong increase in labor productivity leads to an expansion of infrastructure, which is also beneficial for the stagnant sector. Due to the productivity growth, all social groups end up with a higher utility level. With respect to the increase in productivity of infrastructure it was also found that production in a sector that remains more dependent on infrastructure will fall short of the production in sectors with a stronger increase in productivity. Because the latter sectors are less dependent on infrastructure, the government will be inclined to reduce the level of infrastructure, which has an additional negative effect on the production in the stagnant sector.
In Chapter 7 the time preference of the government and tax reform were discussed. With respect to the time preference of the government it appeared that the government increases the public capital stocks if the government cares more about the future (has a lower time preference). The higher public capital stocks go with an increase in the production levels in the public sectors and as a consequence with a higher tax rate. The consumption of private commodities is hardly affected. The production in the private sector 1, where commodities are produced that can be used for consumption and investment, increases because of the stronger demand for investment goods by the government. Finally, an increase in the utility levels is observed. This increase is in particular due to the higher level of the public consumption good. The analysis of the transition path shows that this positive effect on utility levels only holds in the long run. In the first periods after the increase in the time preference of the government utility levels are smaller. From this analysis we can conclude that an expansion of infrastructure goes with an increase in private production, the level of the public consumption good and the utility of members of all social groups if this increase is due to the fact that the government cares more about the future.

The effects of a tax reform are in the model with identical preferences and political influence in accordance with numerical strength, dominated by the intention of the government to reduce the differences in utility between social groups. 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 exist. If the tax system contains special provisions, the government will use these to equate utilities. In the absence of special provisions the government will rely on other policy instruments (taxes and public goods) for that 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, which 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.

We compared the income tax with a wage tax, a value-added tax, a sales tax and a lump-sum tax. The taxes differ in efficiency because they differently affect decisions of consumers and producers, in particular decisions on labor supply, savings and investments. In our model taxes have also a different effect on the (input factors of) public goods. The income tax and wage tax affect the labor demand in the public sectors whereas the value-added tax and sales tax do not affect this demand.
Consequently, the levels of the public goods are substantially higher if the value-added tax or sales tax is operative. In comparing the tax systems with special provisions it turns out that the highest utility levels are reached 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 of a tax system without special provisions leads not only to efficiency effects, but also to equity effects. 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. In comparing the different tax systems without special provisions, capital owners are best off under a uniform lump-sum tax, followed by the labor tax, whereas the value-added tax and sales tax give the lowest utility for capital owners. Workers would, in contrast, prefer the value-added tax, followed by the income tax. The labor tax gives the lowest utility for workers, followed by the uniform lump-sum tax. The political interest function reaches the highest value if the uniform lump-sum tax is operative, whereas the value-added tax is not far behind.

In Chapters 5 and 6 we studied the effects of a change in the political influence structure if the tax-transfer system (that includes special provisions) is operative and individuals have identical preferences. We concluded that such a change leads to a redistribution of income, but hardly affects the production levels. In Chapter 7 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 exists. It turns out that input and production levels are affected in that case. In particular the level of the public production good, that is an important instrument for the government to redistribute income if special provisions are absent, appeared to be sensitive for the political influence structure. The level of the public production good increases if the political influence of capital owners increases. It appeared that this is not only beneficial for capital owners but also for workers if the increase in the political influence of capital owners is not too strong. Therefore, an expansion of
infrastructure induced by an increase in the relative political influence of capital owners is in this situation positive for all social groups.

8.2 Concluding remarks

8.2.1 Introduction

In the prologue of this monograph we motivated the relevance of an integrated analysis of political and economic decisionmaking. The integrated models that we presented in the remainder of this monograph gave an underpinning of this motivation. First, it appeared that the economic impact of a policy change did depend on the underlying structural changes in preferences, technology or political influence (see, e.g., the examples in Section 2.5 and the discussion on the different structural changes that affect the expansion of infrastructure in Part II). Second, the presence of public goods or institutions gave some interesting insights, that are neglected in ordinary applied general equilibrium analyses: the presence of private pension schemes (reflected by capital owned by retirees) affects the sustainability of public pension schemes (cf. Chapter 3); the presence of a public production good (infrastructure) affects the asset price (cf. Chapter 4) and the presence of public production affects the impact of a change in the tax system, because public goods, or its input factors, are differently charged under different tax systems (cf. Chapter 7). Although the design of the models we presented in this monograph was partly based on the particular issue that was investigated, we tried to come to a model that contains the mechanisms that are in our view most important for a political economic applied general equilibrium model. The model that was presented in Part II contains, in our view, the main mechanisms. The behavior of public sector workers (see below) and savings deserve perhaps a more elaborate exposition.

There are two ways to proceed. A first option is to study specific political-economic issues with small-scale models that comprise the main mechanisms for that issue. A second option is to develop a large-scale model that gives a more careful description of the economic and political situation of a particular country and extends for that purpose the number of private sectors, social groups and departments, takes account of intermediate transactions between sectors, incorporates debt formation in private and public sectors, and distinguishes not only a pure public production and public consumption good, but also publicly provided private goods and public goods that are used for consumption as well as production. Such a large-scale model also requires
a careful estimation or calibration of the economic and political parameters. Apart from determining the political parameters, the second option is rather straightforward [see for the calibration of political parameters RUTHERFORD AND WINER (1990) and for the estimation of these parameters VAN VELTHOVEN AND VAN WINDEN (1986)].

In the remainder of this chapter we will discuss some presumptions and methodological issues regarding the model that was presented in Part II and offer suggestions how they can be further analyzed while using a small-scale model that is based on the model presented in Part II.

**8.2.2 Group membership and social mobility**

After discussing the empirical literature with respect to decisionmaking on public issues in Chapter 1, we concluded that, although public decisions are based on individual considerations, these decisions can better be understood when account is taken of the relevance of social groups in the process of political decisionmaking. The economic foundation of social groups makes the integration of a political model that distinguishes social groups (such as the political interest function) into an economic model that describes the economic decisionmaking of the members of these groups (as is the case in an applied general equilibrium model) particularly interesting. Such an integrated model allows us to take account of economic feedback mechanisms on political decisions. These economic mechanisms may also affect the size and political influence weights of the social groups. In the models presented in this monograph we neglected these effects and presupposed exogenously given political influence weights and numerical strengths of social groups. This feels in particular uncomfortable for the modeling of the political influence of workers. Although we are able to determine the number of workers employed for each sector separately, we did not distinguish separate groups of public and private sector workers in the political submodel, whereas we gave in Chapter 1 some arguments why public sector workers (bureaucrats) are best regarded as a separate group for the study of political decisionmaking. However, if separate groups of public and private workers are distinguished but workers of these different groups have identical preferences, receive similar income and have a political influence that only changes endogenously if the numerical strength changes, this distinction adds little. The distinction may be interesting if the impact of a change in the political influence of public sector workers differs from a change in the private workers' political influence. We are now working on an extension of the model that allows for Niskanen's budget maximizing
bureaucrats. Public sector workers, employed in two public departments with separate budgets, are able to increase their budget through fringe benefits and 'leisure on the job'. Both instruments have a positive effect on the utility of public sector workers. The government decides upon the budget for the department, which depends on the optimal level of the public good produced by the department (following from the maximization of the value of the interest function) and the costs of one unit of this good in the previous period. The departments also maximize the value of an interest function, which may differ from government's interest function, and decide upon the spending of the budget. They may use part of the budget for fringe benefits and allow for leisure on the job (unproductive working hours). The political influence weights in the interest function depend on the endogenous numerical strengths of the different social groups, where private sector workers and the workers of the different departments are regarded as separate groups.

Apart from the mobility between private and public sector workers, others types of mobility between different social groups can be introduced, which leads to a further endogenization of group membership and political influence weights. Types of social mobility that may be taken into account are for example mobility between: different groups of capital owners; workers and capital owners; skilled and unskilled workers; and between capital owners and workers, on the one hand, and dependents, on the other. The incorporation of most of these types of mobility requires that capabilities of individuals are taken into account [cf., e.g., Kanbur (1979)]. Such an extension of the model is interesting from a political-economic perspective, because capabilities depend not only on (natural) abilities but also on education, which is in most democratic countries largely provided by the government. The decisions of the government on educational expenditures depends on the political influence of the different social groups. Social groups may not only differ in their (financial) endowments but also in their intellectual endowments or (natural) abilities, which may lead to a difference in the interest for education between social groups. These differences in endowments may imply that social groups do not have similar interests with respect to expenditures on education. It may, inter alia, be analyzed whether the way that education is financed (private, public or mixed) affects the educational participation of the different social groups.

Education is not only an investment in the capabilities of individuals (hereafter, human capital) but also in the 'knowledge' of a society, which can be regarded as a public good. The public good can be modeled analogously to the public production good that was incorporated in the model of Chapter 4. The public good 'knowledge' may be
labeled 'knowledge infrastructure', to distinguish it from the public production good that was presented in Chapter 4, that may be labeled 'physical infrastructure'. Both types of infrastructure affect the asset price (cf. Section 4.7) and it is interesting to analyze the differential impact of these types of infrastructure on the asset price.

To apply human capital in a production process, it must be adjusted to the specific skills that are required for that production process. These adjustment costs may be regarded as learning by doing or learning on the job and can be modeled analogously to the adjustment cost of physical capital (cf. Chapter 4). The presence of adjustment costs for human capital implies that human capital is not fully mobile. Workers can not easily move from one sector to another, because every sector demands workers with different skills. For the public sector this may lead to a mismatch in the distribution of workers over the different departments. If the government has limited possibilities to fire public sector workers, some departments may have a surplus of workers, who can only be employed on another department if their skills are adjusted. The mismatch of public sector workers may have a negative effect on the productivity of the departments and lead to a public budget that is too high [compare the model of HAAPARANTA AND PUHAKKA (1993) that was discussed in Subsection 1.4.3]. The cocooning of departments, discussed in Chapter 6, depends in that case on adjustment costs required for (physical) capital and for human capital. Thus, the introduction of education opens not only the possibility to explain the mobility between social groups endogenously, but it allows also for an endogenous explanation of limitations in the mobility.

8.2.3 The separation of powers

In Section 1.3 we compared four different approaches with respect to the modeling of political decisionmaking and motivated our choice for the interest function approach by referring to the fact that this approach takes, inter alia, account of the interests of bureaucrats and lobbying. Although these elements can be incorporated in the interest function, we did not further develop them but concentrated instead on the modeling of an integrated political-economic model. The description of the interests of public sector workers that was presented above, gives suggestions for a more elaborated treatment of these interests and for feedback mechanisms between economic developments and the political influence weights. Lobbying activities can be modeled more explicitly by following GROSSMAN AND HELPMAN (1995, 1996a), where political
influence weights also depend on contributions of lobby groups [see Subsections 1.3.4 and 1.5.4].

A second argument that was given for the choice of the interest function approach concerns the description of a representative democracy. We argued in Section 1.3 that the probabilistic voting theory and the interest function approach better describe the mechanisms in a representative democracy than the median voter theory and the Leviathan model of Brennan and Buchanan. In the formal derivation of the interest function approach, it is assumed that the representative democracy consists of a two-party system, where the executive and legislative powers are in the same hands. With respect to the latter PERSSON ET AL. (1996) note that under a separation of powers a system of checks and balances can be designed, which improves the accountability of the elected politicians (and other officials) and leads, as a consequence, to a higher utility of voters. Although their results are quite appealing, PERSSON ET AL. (1996) do not give an indication of the magnitude, because their simple description of consumer behavior (and the absence of producers) neglects economic feedbacks. It is important to know the magnitude, because the game-theoretic approach that they use rapidly increases the complexity of the model. We may investigate this magnitude by combining the main elements of their political model with a simple applied general equilibrium model.

A second assumption in our description of the representative democracy that may be too restrictive, at least for most democracies on the European continent, is the presence of a two-party system. A multi-party system is studied in, e.g., SCHOFIELD (1993). Of the differences in the decisionmaking process between a multi-party and a two-party system, coalition formation and the voters’ evaluation of the policy of the incumbent government are of particular interest here. If no party catches the majority of votes in a multi-party system, a coalition of parties must be formed. In the spatial voting setting that is used by Schofield, the policy compromise between the coalition parties may deviate from the policies that they proposed before the elections (compare the results for the two-party system in such a setting in Subsections 1.3.2 and 1.3.5). Thus, the optimal policy proposals for the different parties do not converge. The policy compromise depends on the policy proposals. The optimal proposal of a party may therefore differ from the most preferred policy of the party (unless the party has an extreme preferred policy that makes it unattractive as a coalition partner). The preferred or ideological policy therefore resounds in the optimal proposal and, as a consequence the policy compromise. Although the political interest function is open for ideology and allows even for the application to a multi-party system [see VAN
The incorporation of ideological notions in the interest function is rather ad hoc. A formal derivation of the political interest function in a multi-party system that follows Schofield (1993) would, in combination with an applied general equilibrium model, lead to a fairly complex model. If, however, ideology is regarded as the parties' subjective view with respect to distributive problems, ideology can be incorporated by extending the Nash-form of the political interest function to a CES-form. In such a function the ideological view of the political party is reflected by the substitution parameter in the CES function, where the extreme ideologies are given by the Benthamite objective of maximizing the (weighted) sum of the utilities and the Rawlsian (maximin) objective of maximizing the welfare of the worst-off individual [compare the normative, welfare-economic approach in, e.g., Boadway and Bruce (1984)]. The political influence weights are given by the share parameters in the CES-function.

Another issue that comes in with the multi-party system is how the influence of an incumbent party on the policy comprise can be modeled. Somewhat related to this issue is to what extent voters hold an incumbent party responsible for the policy comprise, because voters may not hold all parties in the coalition equally responsible for this. We will concentrate on policy issues and neglect non-policy issues, such as the competence of the incumbent politicians. To which extent a party is held responsible can be represented by a responsibility weight, that can be determined by the (relative) number of ministers a party has in the coalition [cf. Schram and Van Winden (1989)]. The responsibility weights sum up to one and the weight of oppositional parties is equal to zero. The impact of a party on the policy compromise can now be formalized by a function with the responsibility weights and the ideology parameters of the parties as arguments. With these short cuts we can incorporate the main elements of a multi-party system in the political-economic applied general equilibrium model without a strong increase in the complexity of the model.

With respect to the description of a representative democracy, we should finally mention corporatist institutions, that are not elected by voters but consist of representatives of social or pressure groups. In principle, the interest function approach is open for such institutions. However, if corporatist institutions are more than advisory boards, and they have the power to decide upon some policy variables, these institutions should be modeled separately. The objective of an institution can be reproduced by a political interest function, that reflects the interests of the social groups participating in the institution. The weights that describe the influence structure of an institution differ from the weights describing the influence structure of the
government. If the government is not able to overrule (or veto) policy proposals of institutions, the model with corporatist institutions is rather straightforward. If the government is able to overrule the proposals of institutions the model can be regarded as a two-stage game, where the institutions propose a policy in the first stage and the government decides in the second stage whether it will accept the proposal. In that case, calculations are much more complex.

In the discussion whether the interest function approach gives an accurate description of decisionmaking in a representative democracy, we should also mention the assumption that there is a single-level government. In most democracies decisions are made on more levels and there is a tendency to decentralize power [see RENAUD (1989) for a formal description of a multi-level government]. On the other hand, European countries try to coordinate their policies on several issues. Although this also leads to a reduction of the power of the central governments, it has fairly different, and perhaps more significant, implications for the issues we discussed in this monograph (redistribution, public production, taxation) than decentralization. Apart from the national government and European Committee, the meetings of the political leaders and ministers of the member states have an important role in this decisionmaking process. Decisionmaking on different levels is modeled in a general equilibrium setting in ZODROW (1988) (cf. Subsection 1.5.3) for the federal and state government in the United States, where only the decisions of the state government are endogenously determined. This approach is not very instructive for the analysis of the interrelations between the European and national decisionmaking process. More appealing is a combination of the approaches in RENAUD (1989) and GROSSMAN AND HELPMAN (1995). The multi-level government that is described in RENAUD (1989) can be used to describe the interaction between the national governments, the European Parliament and the European Committee, whereas the Nash bargaining solutions for negotiations on trade policies between different countries in GROSSMAN AND HELPMAN (1995) is useful for a description of the decisionmaking during the meetings of the political leaders and ministers (cf. Subsection 1.5.5 for a further discussion of the latter approach).

Taking account of European integration has not only consequences for the political submodel, but also for the economic submodel. The removal of trade barriers between member states implies that the competition between domestic firms and firms from other European countries increases. If, in addition, capital and labor mobility is incorporated in the model, national governments are seriously restricted in their discretionary power, notwithstanding the presence of adjustment costs for investments.
However, national governments are also able to produce public goods, that may have a positive effect on the competitiveness. In Chapter 4 we concluded that the presence of a public production good leads to a substantial difference between the asset price (the average $q$) and the shadowprice of capital (the marginal $q$). If capital is mobile between countries, the shadowprice of capital will be equal in all countries. However, the asset price can be manipulated by the national government by changing the level of the public production good and tax rates. It is interesting to investigate whether the policies of the national governments converge or that there is some discretion left. Most of these elements can be analyzed in a two-country model with mobility of capital and labor.

8.2.4 Explaining macroeconomic phenomena through political decisionmaking

In the prologue to this monograph the general equilibrium approach was motivated by the type of policies we intended to study: the redistribution of income and the production of public goods. For these policies the distributive and allocative effects are more important than the stabilization effects. Although we still miss a model that can handle all these elements in a way that is theoretically satisfying, there is some progress. From a political-economic perspective it is particularly interesting that recent developments give some clues for relating macroeconomic phenomena to political decisionmaking. In this final subsection we will discuss this for economic growth and market distortions, while using an economic model that is still rooted in general equilibrium theory.

In the last decades growth theory has been searching for an endogenous explanation of the growth rate. In this so-called endogenous growth theory several determinants of growth are given [see, for a review, Romer (1994) and Barro and Sala-I-Martin (1995)]. From a political-economic perspective the studies that relate economic growth to policy instruments are most interesting. In this respect we should mention Alogoskoufis and Van der Ploeg (1990) and Barro (1990), where the dependence of private production on a public good leads to endogenous growth, and Lucas (1988), where endogenous growth follows from human capital. Jones et al. (1993) analyze these origins of growth while using an optimal taxation model. This model is of the general equilibrium type and gives therefore some interesting clues for further analysis of endogenous growth in our political-economic applied general equilibrium model. The presence of endogenous growth allows us to re-examine the impact of the productivity of infrastructure on the growth rate of different sectors.
(analogous to Baumol’s analysis of labor productivity) that we discussed in Chapter 6 while using a comparative static analysis.

Market distortions are not only studied with macroeconomic models but also with disequilibrium models, that are more closely related to the general equilibrium models [cf., e.g., BÉNASSY (1993)]. In these models nonclearing markets are due to exogenously given price rigidities. From a positive perspective, the absence of a behavioral underpinning of the price rigidities makes disequilibrium models less appealing, notwithstanding their careful description of the interrelations between the different markets. Price rigidities are derived from rational microfoundations in modern macroeconomics, and particularly in the new-Keynesian approach. This strand of literature offers several behavioral models that explain why (real) rigidities on labor markets (implicit contracts, efficiency wages, insider-outsiders), good markets (a mark-up under imperfect competition, inventories) or credit markets (imperfect information) may occur [cf. BLANCHARD AND FISHER (1989); see for the labor market also LAYARD ET AL. (1991)]. GORDON (1990) notes, however, that these models are of a partial equilibrium nature and miss therefore interactions and spillovers among markets. More in line with the political-economic approach is HERINGS (1996, 1997), where endogenously determined price rigidities (for example a minimum wage) lead to market imperfections. A probabilistic voting model (cf. Subsection 1.3.5) is used to determine the optimal price rigidities. Although the approach of Herings is fairly theoretical it gives some interesting hints for further research with an applied general equilibrium model. Note that in case of an endogenously determined minimum wage a separate social group of unemployed occurs. The number of unemployed and their numerical strength are in that case endogenously determined, which leads to similar computational complications that we mentioned for the endogenization of the number of public sector workers.

The aforementioned proposals to explain growth and price rigidities from political decisionmaking gives rise to the question how far we can go with the endogenization of political decisionmaking. The policy instruments that the government is allowed to employ are exogenously given in this monograph. On the other hand, we assumed that if a government can employ a policy variable, there is no restriction on the government’s choice of the level of the policy instrument, except for technical restrictions (e.g. budget restriction, nonnegativeness). In Subsection 2.6.3 we already discussed this issue and noticed that constitutional or ideological constraints could

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1 An exception is, e.g., COOPER AND JOHN (1988).
restrict the choice of the policy instruments as well as the range in which the value of the policy variable must lie [cf. BRENAN AND BUCHANAN (1980) and STIGLITZ (1989)]. However, we did not formalize these mechanisms. This can be done by following PERSSON ET AL. (1996), where the constitution restricts the power of decisionmakers (see the discussion in the previous subsection). In Subsection 2.6.3 we also discussed the role of costs on the policy choice and noticed that a change in policy instruments goes with set-up costs of the government and adaptation costs of consumers and producers [cf. VAN VELTHOVEN AND VAN WINDEN (1991); see for set-up costs also HAAPARANTA AND PUHAKKA (1993)]. A model that endogenously determines (changes in) the policy instruments that the government employs, should take account of these costs.