Part III – Government, policies and institutions

10 Government services

"Economic history is overwhelmingly a story of economies that failed to produce a set of economic rules of the game (with enforcement) that induce sustained economic growth". [Douglas North].

Learning Goals:

- Understand market failures and the role of government.
- Understand the optimal intervention rule in the model with public inputs
- Acknowledge the main sources of government failures and their implication for economic performance

10.1 Introduction

This chapter focuses on the role of government in providing essential goods and services that competitive markets do not generally produce. This includes the law and its enforcement, market regulations, and infrastructure. Without a minimum provision of these key ingredients, incentives to produce and invest will be lower, and the private economy will not operate efficiently. This does not imply that the larger the public provision the better: government activities are financed with taxes that are a source of inefficiency. A well-balanced intervention shall therefore weight the benefits of providing essential inputs to the economy against the distortionary effects of taxation. In this assessment, one must also consider the government' own limitations: because of different types of government failures, there is waste in the process of transforming tax proceeds into public services.

This chapter addresses the trade-offs involved in the public provision of goods and services that are essential to economic activity. Section 10.2 briefly reviews the role of government in the economy. Section 10.3 extends the basic Solow model by adding a government sector that collect taxes and provides a public input. Section 10.4 analyses the trade-offs involved in government intervention. Section 10.5 summarises the main ideas.

10.2 The role of government

10.2.1 Why do we need a government?

In his masterpiece, Wealth of Nations, Adam Smith used the metaphor of the "invisible hand" to argue that the public interest would be best served if governments allowed selfish individuals to pursue their own interest. The "profit motive" would lead individuals, competing against each other, to supply the goods other individuals wanted at the lowest possible price. Because only agents producing at the lowest possible cost would survive, in a free-market system resources would not be wasted, and the economy would operate at its maximum level of efficiency. Smith ideas have influenced nineteenth-century economists, like John Stuart Mill, who advocated the doctrine of the *laissez faire*. According to this doctrine, the government should not interfere with the private sector, regulating or controlling the production. Free competition would serve the best interest of the society. At the other extreme of the economic thinking, the nineteenth-century philosopher Karl Marx argued that capitalism leads to grave income inequalities, and advocated a greater role for the state in controlling the means of production.

Economics has progressed a lot since then. With no question, the "invisible hand" argument still has great appeal. In general, there is a much-supported proposition that greater economic freedom and private entrepreneurship are at the heart of successful economy. However, there is also a recognition that free market tends to produce too much of a range of undesirable outcomes, such as pollution and too little of a range of some essential goods and inputs to production, such as roads and public infrastructure. Economists refer to these problems collectively as "market failures". Market failures include inadequate provision of public goods, externalities, imperfect competition, missing markets, information failures, and persistent unemployment. When there is a market failure, the market mechanism does not produce the most efficient outcome.

Governments can do things that private agents cannot do. On the revenue side, government have the power to force citizens to pay taxes: if they don't, the government can confiscate their assets. On the expenditure side, government can create institutions and agencies to organize the society, enforce the law, protect people, and regulate markets. Government intervention can profoundly influence economic outcomes. If the intervention is successful, private incentives will become more aligned with the social interest. This, in turn,

will induce a more efficient allocation of resources. As claimed by the Nobel Laureate Douglass North and his co-author Robert Thomas (1973), "getting the prices right" (that is, making individuals capture the social returns to their actions as private returns) is good for growth[193].

10.2.2 From pure public goods to publicly provided goods

Public goods are a particular category of goods, which differ from private goods in two main characteristics. First, they are non-excludable: if a non-excludable good is produced at all, it will be technically impossible to prevent someone from consuming it. Examples of non-excludable goods include street lightning, clean air, radio broadcast, and low inflation. Private markets do not work at all well when goods are not excludable. Since these goods are freely availableto anyone, noone will be willing to pay for it, prefering instead to *free ride* on whatever production comes its way. The implication is that it will be impossible to finance the provision of non-excludabçe goods through the price mechanism[194]. The government can fix this, because it has the power to collect taxes, which revenues can be used to finance the provision of non-excludable goods.

Second, Public goods are non-rivalrous: extending their supply to an additional user does not decrease the quantity available to other users. For example, if you eat an apple no one else can eat the same apple. The apple is a rival good. In contrast, the benefit of a clean environment to one person does not diminish the enjoyment of others. A clean environment is non-rival. Other goods that are non-rival include cable TV, knowledged, low inflation, and the rule of law. Non-rivalry makes exclusion inefficient, even if it is achievable. Consider, for

[193] North, D., Thomas, P., 1973. The rise of the Western World, Cambridge UK: Cambridge University Press.

[194] Sometimes, spontaneous voluntary associations emerge to collectively assure the provision of non-excludable goods. For instance, groups of neighbours in a resident area organize themselves and pay voluntarily for local security. But these associations work better within a small number of members, as they are in general fragile to the free-rider problem.

example, an uncongested bridge. The social cost of having one more individual crossing the bridge is zero: thus, the service provided by the bridge is non-rival. It is however possible to restrict the access to the bridge and charge a toll (crossing the bridge is excludable). Charging a toll is however inneficient: if the marginal costs of crossing the bridge is zero, why should people pay for it? The problem is that without revenues the bridge will not be built. The government can fix this by publicly providing the bridge. Along the same reasoning, government often try to increase the availability of non-rival goods to the society in general, because their consumtion is valuable and the marginal cost is nill. An example of this is information. Information is non-rivalrous but is not always available to all users. By providing weather forecast services, publishing national statistics, by forcing firms to label their food products with the true caloric content, by forcing banks to indicate explicitly the effective rate of interest on their loans, governments help valuable information to leak out and diffuse, increasing efficiency.

Some goods start out as non-rival and become rival because of congestion effects. Returning to the bridge example, if more and more individuals crossed the bridge, the facility may become congested. In this case, the conclusion regardless restricting access changes completely: with congestion, the social marginal cost of an extra individual crossing the bridge (defined in terms of the time lost by the others trying to cross it) becomes positive, which implies that charging for its use becomes desirable. This is why it makes sense to introduce tolls in congested roads during peak traffic, but not when facilities are underutilized.

A good that is both non-rival and non-excludable is called public good. A classical example of a public good is national defence: once a nation is protected from foreign invasion, there are no additional costs of extending this protection to more citizens: national defence is a non-rival good. Furthermore, it will be impossible to exclude anyone from this protection. Undoubtedly, national defence is among the most fundamental public goods: without it, the well-functioning of the economy could be at stake. Other fundamental public goods include public order, property rights and the enforcement of contracts. The free-market system requires that entrepreneurs who invest in risky businesses have some likelihood of obtaining profits to reward their investment and risk. The legal system must therefore protect property ownership, including against theft and vandalism. On the other hand, enforceability of contracts is a necessary condition for individuals to engage in beneficial exchange and fully enjoy the benefits of specialization. Defence, public order, protection of property rights, and contract

enforcement may be seen as the foundations on which the market economy rests. Without them, there could be no market economy.

A different category of goods refers to those that are rival in consumption, but which consumption cannot be excluded. Goods in this category are called "common goods". A classic example is the stock of fish in international waters: the fish is a rival good, but non-excludability in fishing may lead to a coordination failure, called the "tragedy of the commons": people with access to the "common pool" will try to extract as much as possible without taking into account (because each individual is small) the impact of their actions in the aggregate. This will ultimately lead to over-fishing and resource depletion. In this case, excludability would be desirable. Governments can fix this, by coordinating the extraction activity, setting limits to each fisherman, and ensure sustainability.

Some goods are purely private - in the sense that they are rivalrous in consumption and exclusion is feasible - but that tend to be undersupplied in a laissez faire because the cost of provision is more than what individuals are willing to pay. This includes investment in human capital. Education and health services are private goods in technical terms, because the cost of extending the supply to more users is positive (they are rival) and exclusion is relatively easy. Still, due to the positive *externalities* involved (the community as a whole benefits from a higher education level and from a lower incidence of diseases) these services will be under-supplied in a laissez faire. In these cases, private provision is feasible (the good is excludable), but government intervention may help boost usage to a level closer to the social optimum. A similar reasoning applies to goods that, because of high fixed costs, require a minimum scale to be produced in market conditions. For instance, it may become prohibitive for a private company to offer posttal services in a small and remote community. The society may however decide that postal services should be equally available to all citizens, irrespectively of their residence, because of the positive externalities involved. Other desirable services that may fail to spring thorugh market mechanisms include unemployment benefits, social security, research and development. Wherever the social benefits of having these services exceed the social costs, there is scope for the governemnt to step in and ensure a minimum provision.

In practice, government intervention covers many different areas, including health, education, infrastructures and communication networks, environmental management, water and sanitation, information and communication, scientific research. Because there is no clear-cut distinction between goods that shall only be provided privately and goods that can be

provided publicly, the adequate amount of public intervention is a matter of dispute in the economics profession.

10.2.3 Intervention options

Government intervention may be achieved through different instruments. One option for governments is to take *direct action*, providing the goods and services themselves. For example, if a government believes there is insufficient supply of education services, it can decide to provide it itself by operating public schools. But public provision does not necessarily imply state ownership. For example, the government can assign rights to private entities to run highways, ports or airports, under certain conditions. But big questions like the location and design of infrastructure are decided by the government because the market cannot do it adequately.

Some market failures may be corrected *at distance*. Through taxes, subsidies, and rewards, the government has the potential to manipulate relative prices so that private incentives align with the public interest. For example, governments can promote the use of energy-efficient cars by taxing less efficient cars more. In education, the government can subsidize private institutions that provide educational services or directly support students with education vouchers.

Finally, the government can intervene through regulation and legal sanctions. Governments have the right to create rules that regulate or otherwise restrict private activities in order to minimize the incidence of undesirable outcomes. In most countries, government agencies regulate what people can eat and drink, what kind of houses they can live in, how many hours an employee can work at most, how much pollution a factory can produce.

In general, government intervention and regulation impose costs on economic agents by restricting their choices. Given that government intervention is also a source of inefficiency, governments must balance the benefits of addressing market failures with the intervention-related costs they impose on society.

10.3 A simple growth model with government spending

This section presents an extension of the Solow model to illustrate the efficiency gains arising from the public provision of essential inputs to production, as well as the trade-offs

involved. Since the model assumes diminishing returns to capital, the relationship between optimal intervention and efficiency translates into *level effects*[195].

10.3.1 Private productivity and public inputs

Consider an economy with a large number of equal firms. Each firm produces a homogeneous consumption good according to the following production function:

$$Y_{it} = A_t K_{it}^{\beta} N_{it}^{1-\beta} \quad , \quad (10.1)$$

where N refers to labour and K refers to private capital (which may include human capital).

In what follows, public provision is modelled as affecting directly the efficiency parameter, A - say, through lower costs in transacting. Formally, let' assume:

$$A_t = Ae^{gt}, \text{ with } A = \left(\frac{G_t}{Y_t}\right)^{\eta} \text{ and } \eta > 0. \quad (10.2)$$

In this equation, we distinguish two components: one related to "efficiency", the constant A, and the other related to "technological change", which in this model is assumed to evolve exogenously. The first component is determined by the supply of government services, G . You may think this term as including public services like national defence, public order, the rule of law, protection of property rights, market regulation, public infrastructure, etc[196]. Equation (10.2) states that the public input is essential to production: if G is zero, private output will be zero (for instance, without a minimum protection of property rights, production cannot take place). An increase in G raises the marginal products of capital and labour.

[195] A similar formulation can modelled in terms of the AK model, with the difference that efficiency will affect growth rates (some exercises in the appendix).

[196] Note that since G is a flow variables, so it does not measure the stock of public infrastructure itself, but instead the user cost of providing that infreastructure (cost of capital, mantainance, depreciation).

10.3.2 Congestion versus non-congestion

According to (10.2), the output of the average firm *i* rises with the provision of the public input *relative* to the size of the economy (*Y*). The implicit assumption is that the public input is *rival* or subject to congestion: for a given level of public provision, *G*, the amount of public input available to each firm declines as output (Y) increases. An alternative specification would be to assume that the public input was non-rival, and hence a *pure* public good.

To distinguish the two cases, consider the constitutional law and its enforcement. The constitutional law is purely non-rival, in the sense that it will serve a country population, irrespectively of its size. The enforcement of the constitutional law, in turn, is subject to congestion: the larger the population, the more courts and the more police services will be needed to enforce the law, everything else constant. Many governmental activities, such as highways, fire services, police and courts are subject to congestion.

The distinction is more than conceptual. In terms of the model, if the public input was assumed non-rival, the productivity term should depend on G, not on G/Y. In that case, the model would display a scale effect whereby, all else equal, larger economies should be richer or grow faster. Since this does not happen in the real world., we proceed with the case with rivalry.

10.3.3 The aggregate production function

To see how aggregate output relates to the availability of public input, just sum the production function (10.1) across firms (remember they are all equal) and substitute (10.2). You'll get:

$$Y_t = G_t^{\frac{\eta}{1+\eta}} K_t^{\frac{\beta}{1+\eta}} L_t^{\frac{1-\beta}{1+\eta}} \quad . \quad (10.3)$$

An interesting feature of this (aggregate) production function is that it still exhibits CRS, but now including the contribution of government services (note that the sum of the three exponentials is equal to one). Moreover, the public input exhibits decreasing marginal returns: that is, each extra road or mains water pipe has a positive impact on total factor productivity that is lower than of the road or the water pipe before. This raises the question as to whether expanding too much public provision might be inefficient. In particular, if the public input

crowds out private capital, beyond a certain point, additional provision will have a negative impact on output. The following model stresses this point.

10.3.4 Factor income shares

In what follows, let's assume that the public provision is financed with a tax proportional to income, τ. Each firm maximizes:

$$\pi_{it} = (1-\tau)Y_{it} - (r_t + \delta)K_{it} - w_t N_{it} \quad . \qquad (10.4)$$

The first order conditions of profit maximization are:

$$\frac{\partial \pi_i}{\partial N_i} = (1-\tau)(1-\beta)\frac{Y_{it}}{N_{it}} - w_t = 0, \quad \text{and} \qquad (10.5)$$

$$\frac{\partial \pi_i}{\partial K_i} = (1-\tau)\beta\frac{Y_{it}}{K_{it}} - (r_t + \delta) = 0. \qquad (10.6)$$

Since all firms are equal, this leads to the following factor income shares:

$$\frac{w_t N_t}{Y_t} = (1-\beta)(1-\tau) \text{ , and} \qquad (10.7)$$

$$\frac{(r_t + \delta)K_t}{Y_t} = \beta(1-\tau) \quad . \qquad (10.8)$$

10.3.5 The market failure

Because the public good in *non-excludable*, it enters the production functions of individual firms in the form of an externality. The relevant production function for private decisions is therefore (10.1), where A_t is taken as given. Because government services arise as an externality, private firms do not consider them as an input to production. They *perceive* the contribution of physical capital to output as equal to β (as implied by 10.1), which is higher than the *actual* contribution, $\beta/1+\eta$, (as implied by 10.3). This means "prices are not right": without intervention (e.g, without the tax on production), factor rewards will *not be aligned* with their effective productivities.

Note that, if no tax was collected, the capital and labour income shares would be, respectively, β and $1-\beta$. This means that all output would be exhausted on the rewards to these two factors, with nothing left to finance the public input. Since, according to (10.2) the public input is essential to production, without government intervention, this economy would not exist al all.

10.3.6 Getting the prices right

As equation (10.7) and (10.8) suggest, the government can use the tax rate so as to get the factor rewards aligned with the public interest. The optimal tax rate, you may guess, is the one that turns the *after-tax* factor income shares, (10.7) and (10.8), equal to the *actual* contributions of capital and labour to output, as stated in (10.3).

Analytically, you may obtain the optimal tax rate τ^G (where the superscript *G* refers to the Golden Rule), solving the following equation:

$$\frac{\beta}{1+\eta} = \beta\left(1-\tau^G\right)$$

This gives:

$$\tau^G = \frac{\eta}{1+\eta} \qquad (10.9)$$

This discussion reveals that not all taxes have adverse effects: in some cases, an appropriate choice of the tax rate constitute an effective tool to get incentives right. The mechanism is simple: since the public good is subject to congestion, when a firm expands production imposes a negative externality on other producers, via lower availability of public input per unit of output. Setting a tax that is proportional to output, the government has a perfect mechanism to deal with the congestion problem: a rise in the level of production by an individual firm suffers a penalty equal to the cost it imposes on others. Moreover, this penalty generates government revenues exactly on the amount needed to finance the increase in *G* that is necessary to compensate the rest of the economy for the erosion of public services per unit of output.

10.4 Intervention trade-offs

10.4.1 Unproductive public expenditures

In order to make the model more interesting, let's assume that a constant fraction ϕ of the tax proceeds are lost in *unproductive* uses. Because of excess bureaucracy, badly designed contracts, corruption, or other inefficiencies, part of the tax proceeds will not translate into the provision of public input. Box 10.1 describes different reasons why government actions may result in waste. Box 10.3 shows an attempt to assess how efficienctly OECD countries are transforming taxpayer money into public services.

In our model, total "unproductive expenditures", denoted by Φ will be:

$$\Phi_t = \phi \tau Y_t \qquad (10.10)$$

In this chapter, we take ϕ as an exogenous and constant parameter. In Chapter 13 we will work out a model where this parameter is endogenous.

The government budget is assumed balanced each moment in time:

$$G_t = \tau(1-\phi)Y_t \qquad \phi \geq 0 \qquad (10.11)$$

Equation (10.11) shows that, when ϕ is positive, taxes are higher than the minimum needed to finance a given level of public provision.

Box 10.1. Governments fail, too

The discussion in Section 10.2 suggests that the government *has a role* in altering the working of private markets in desirable ways. A great deal of controversy exists, however, on the extent to which government intervention can *do better* than markets. The reason is that governments have their own failures in achieving their stated objectives. Even assuming that decision makers really want to maximize social welfare, there are good reasons to believe that they may not be able to reach the most efficient outcome.

In general, one may distinguish four categories of government failures[197]:

1- *Limited information*: the optimal intervention requires a correct assessment by the government on the nature and the size of the market failure. However, the decision-maker perception may be different from the real world. Due to limited mental capacity by which to process information, governments do not have in general the information required to do what they would like to do. Limited information may preclude the government from correctly distinguishing whether its actions are really needed and to which extent. For example, the government would like to make sure that only disabled people were receiving social assistance. But it is often costly to avoid the free riding of healthy individuals pretending to be disabled. Spending more resources on screening may improve the information available to the government, but at the cost of less resources being available to the social programme.

2- *Limited control over private market response*: the success or failure of programmes in the public sector depends not only on public actions but also on how the private sector responds. For example, by introducing an unemployment benefit, the government does not know the extent to which individuals will adjust, spending more time in unemployment, searching for better jobs. Because the links between policy and outcomes (e.g, multipliers) are not well known, the intervention design and magnitude often fails to be adequate.

3- *Limited control over bureaucracy*: bureaucrats don't face the same kind of pressures on them to cut costs that firms operating in competitive markets have. To the extent that their expenses are not perfectly monitored, they may well become prodigal, spending more than the strict necessary to implement their programmes. Moreover, in many countries, public servants cannot easily be dismissed or rewarded for good performance, so bureaucracies have neither the carrots nor the sticks to provide strong individual incentives. Often, the success of a policy relies on the ability and the honesty of the entrusted officials.

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[197] Stiglitz, J., Rosengard, J., 2015. *Economics of the Public Sector*. WW Norton and Co,

4- *Limitations imposed by political processes*: even if the decision maker perceived the world as it really was, the political process through which decisions are implemented opens the door for deviations from public interest. Representatives often have incentives to act in favour of particular groups or to adopt (populist) policies that the majority of the electorate perceives to be correct, even if they know they aren't. State ownership, subsidized loans, agricultural supports, for example, are often used to serve political goals of governments, at the cost of the social interest.

All in all, while market failures provide a motivation for government intervention, governments should in each case assess the extent to which they can do better than the market. In some cases, such an assessment may lead to the conclusion that the costs of intervention exceed the benefits, so it is better not to intervene after all. Government actions should be directed only to those market failures where there is clear understanding that government intervention can make a significant difference.

Box 10.2. Normative versus positive economics

When economists evaluate alternative policies, weighing their various benefits and costs, they are engaging in normative economics. When they describe the economy and build models to predict the effects of policies or the behaviour of governments, they are involved in positive economics.

Normative economics is concerned with what "should be" or how governments should act. Should they intervene? What are the most effective means? What are the ideal policies? Positive economics is concerned with "what is" or why policymakers do what they do. It incorporates the role of political pressures, institutional constraints and ideological issues. Normative economics makes use of positive economics.

The market failure approach to the role of government is largely a normative approach. Provides a basis for identifying situations in which the government should do something. In positive analyses, the consequences of government actions must also be described. In this assessment, a critical question is to what extent the government can do better than the market.

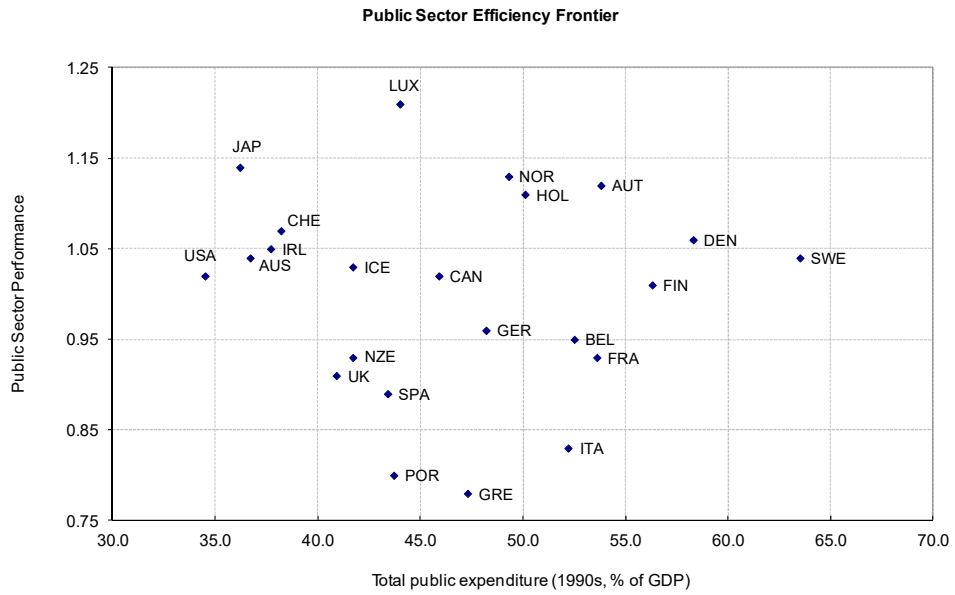
Box 10.3 The public services efficiency frontier

The question as to whether governments could make a better use of taxpayer money has always attracted the interest of academics and practitioners. An illustration of such an attempt is in Figure 10.1[198]. In the figure, the vertical axes is an index of "Public Sector Performance", defined as an average of seven sub-indicators, measuring the outcomes of intervention in key policy dimensions: the quality of public administration (confidence in the administration of justice, the size of the shadow economy, red tape and corruption); education achievements (secondary school enrolment, scores obtained by students in international tests); health (infant mortality, life expectancy at birth), public infrastructure (quality of communication and transport infrastructures), income distribution (income share of the poorer 40%), macroeconomic stability (volatility of GDP, inflation) and macroeconomic performance (per capita GDP, GDP growth and unemployment rate). The horizontal axis measures the total public expenditures of the government sector as percentage of GDP, which can be interpreted as input to public sector performance.

According to these figures, the countries with highest public sector performance are Luxembourg, Japan, Norway and Austria. In this sample, Japan is outstanding, as it achieves a high level of public performance with low levels of government expenditure. In contrast, Greece, Portugal and Italy spend much more than the United States, Japan, Switzerland and Austria, and yet are the worst performers in terms of the public sector efficiency index. These figures suggest that these countries had muchto gain if they achieved higher efficiency in the use of taxpayer money.

Figure 10.1 Public Sector efficiency in 23 OECD Countries (2000)

[198] Afonso, A., Schuknecht, L., Tanzi, V., 2005. Public Sector Efficiency: an International Comparison. Public Choice 123, 321-347..



Source: Afonso et al (2005).

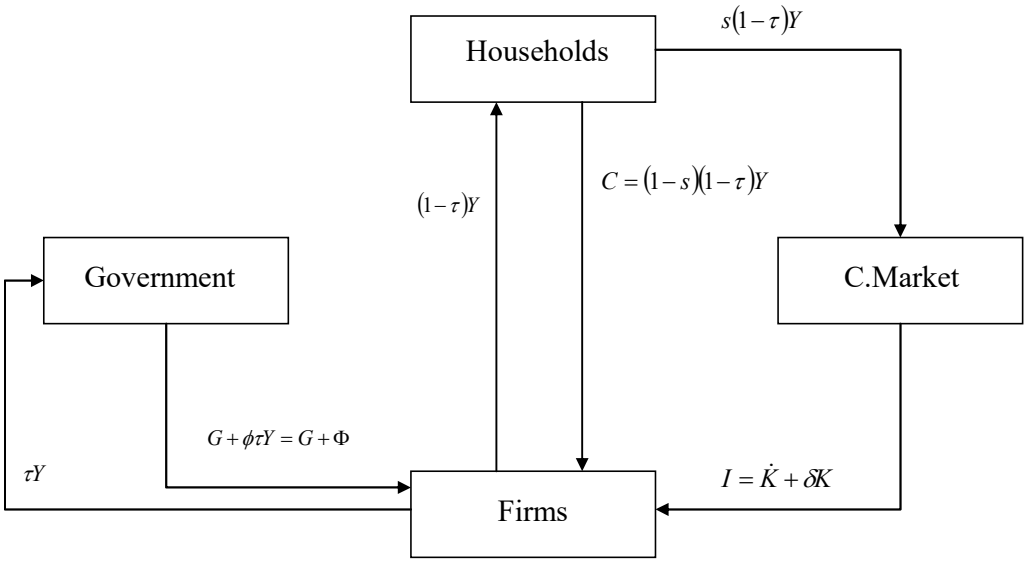
10.4.2 The flow income chart

In our model, output has four different uses: private consumption (C), private investment (I), government productive expenditures (G) and government waste (Φ):

$$Y_t = C_t + \Phi_t + I_t + G_t . \qquad (10.12)$$

All flow identities of the model are displayed in Figure 10.2, which describes the flow income chart of this economy.

Figure 10.2: The flow income chart



10.4.3 The steady state

Comparing to the Solow model, you may guess that the steady state level of per capita income is similar to (3.10), except in that s shall be replaced by $s(1-\tau)$ and A shall be defined as in (10.2). That is:

$$y_t^* = A^{\frac{1}{1-\beta}}\left(\frac{s(1-\tau)}{n+\delta+\gamma}\right)^{\frac{\beta}{1-\beta}} e^{\pi t} = \left[\left(\frac{G}{Y}\right)^{\eta}(1-\tau)^{\beta}\right]^{\frac{1}{1-\beta}}\left(\frac{s}{n+\delta+\gamma}\right)^{\frac{\beta}{1-\beta}} e^{\pi t}. \qquad (10.13)$$

This equation shows that government intervention impacts on the steady state *level* of per capita income through two different channels: On one hand, a higher provision of public input raises the productivity of capital and labour; on the other hand, a higher tax rate reduces the private sector disposable income and by then savings and investment. The next section examines the optimal balance between these two effects.

10.4.4 The golden rule

Suppose you are a benevolent planner who wants to maximize the steady state level of per capita consumption in this economy. To do this, first you need to find out the expression for per capita consumption. Using (10.11) in (10.13) and the equation for consumption in Figure 10.2, you get:

$$c_t^* = (1-s)(1-\tau)^{\frac{1}{1-\beta}}\left[\tau(1-\phi)\right]^{\frac{\eta}{1-\beta}}\left(\frac{s}{n+\delta+\gamma}\right)^{\frac{\beta}{1-\beta}} e^{\pi t} \qquad (10.14)$$

This equation re-states the above-mentioned trade-off, but now in terms of the tax rate, only. It also shows that a rise in government inefficiency, ϕ, by deviating funds to unproductive uses, is equivalent to a decline in the saving rate: it crowds out private investment without any positive impact on productivity. This has an unambiguous negative impact on private consumption per capita.

If you choose the tax rate, τ, so as to maximize (10.14) you'll obtain exactly the "golden rule" tax rate, (10.9)[199]. Substituting (10.9) in (10.13) and (10.14) you obtain the corresponding golden rule paths of per capita income and per capita consumption.

10.4.5 Efficient bureaucracy

As mentioned before, raising government revenues by the amount needed to provide the optimal level of public inputs - as implied by (10.9) - does not necessarily imply that the government *will* actually provide the optimal level of public inputs: remember from (10.11) that, if ϕ is positive, some fraction of the tax proceeds will be wasted in unproductive uses.

With the tax rate satisfying (10.9), the amount of public input in percentage of total output is:

$$\frac{G}{Y} = (1-\phi)\frac{\eta}{1+\eta} \qquad (10.15)$$

This means that, if you forgot to use ϕ as a control variable to maximize private consumption (10.14) you did not act as a genuine benevolent planner. If you were really a benevolent planner you should care for your constituents' money, rather than allowing it to be wasted by your bureaucrats in unproductive uses. You should pay very much attention on the way contracts with the private sector are designed, in order to keep the incentives aligned with the public interest.

Thus, if you were really a benevolent planner, you should also set $\phi = 0$, leading to:

$$\left(\frac{G}{Y}\right)^{G} = \frac{\eta}{1+\eta} \qquad (10.6)$$

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[199] Note that, by abstracting from the consumption-leisure choice, this model does not account for the impact of taxation on the labour supply. This observation illustrates the general claim that the optimal tax structure is highly sensitive to the formulation of the model.

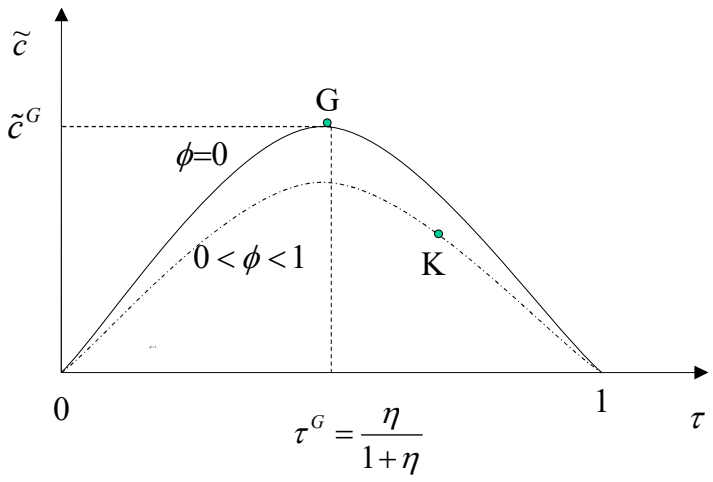
To interpret (10.16), note that producing one unit of public services costs the same as one unit of output (equation 10.12). This means that the natural efficiency condition for the size of the government is $\partial Y/\partial G = 1$. According to (10.3), the marginal contribution of G to aggregate output is $\partial Y/\partial G = [\eta/(1+\eta)](Y/G)$. Substituting (10.15), this gives $\partial Y/\partial G = 1-\varphi$. Hence, only in case ϕ=0 will each resource used in the economy, either in the private sector or in the public sector, worth the equivalent to its opportunity cost and the economy will be operating efficiently.

10.4.6 A Graphical illustration

Figure 10.3 plots the steady state level of per capita consumption (per unit of efficiency labour), according to equation (10.14), as a function of the tax rate, for two different levels of ϕ. The upper curve corresponds to a government without failures ($\phi=0$). The dashed curve corresponds to a case in which $0<\phi<1$, with a lower level of per capita consumption for each tax rate. When ϕ=1, the provision of public input is zero, so per capita income and per capita consumption will also be zero, irrespectively of the tax rate (the curve is flat and coincides with the horizontal axes).

For each given value of ϕ, there is a curve representing the relationship between the government size and the steady state level of per capita consumption. At lower values of τ, the positive effect (i) described in Equation 10.13 dominates the negative effect (ii), so increasing the size of the government raises per capita consumption. As the size of the government rises, the benefits of expanding further the provision of public services declines, while the negative impact of taxation (ii) rises. At higher levels of taxation, the effect (ii) dominates (i), so a further rise in τ decreases the steady state level of per capita consumption.

Figure 10.3. The trade-off between public provision and taxation



Box 10.4. The case with an AK production function

This appendix shows how the model changes when the neo-classical production function (10.1) is replaced by an AK production function:

$$Y_{it} = A_t K_{it} \qquad (10.1a)$$

As before, it is assumed that productivity depends on the provision of a public input, scaled by the level of activity, due to congestion:

$$A = \left(\frac{G}{Y}\right)^{\eta} \quad . \qquad (10.2a)$$

Considering an exogenous saving rate, s, and the income tax, τ, the growth rate of per capita income will be $\gamma = s(1-\tau)A - (n+\delta)$. Using the government budget constraint (10.11), the equivalent to (10.14) in the AK economy is:

$$\gamma = s(1-\tau)\left[\tau(1-\phi)\right]^{\eta} - (n+\delta) \qquad (10.14a)$$

Comparing to the model with diminishing returns in the main text, we see that now government policies impact on *growth rates*, rather than in levels. In this version of the model, maximization of welfare corresponds to maximizing the growth rate of per capita income[200].

In case savings are endogenous, the Euler equation $\gamma = r - \rho$ applies. From profit maximization, the interest rate is $r = A(1-\tau) - \delta$, and the growth rate of per capita income becomes:

$$\gamma = (1-\tau)\left[\tau(1-\phi)\right]^{\eta} - \delta - \rho \qquad (10.14b)$$

In both cases, a figure similar to 10.3 applies, with the difference that in the vertical axes per capita consumption is replaced by its growth rate. As before, there are two opposite effects: (i) a higher provision of public services raises the productivity of private investment, inducing a *faster* capital accumulation; (ii) a higher tax rate reduces the net worth of private investment, inducing a *slower* rate of capital accumulation. The benevolent planner chooses τ and ϕ to maximize (10.14a) or (10.14b), depending on the contextt. This gives (10-9) and (10.16). Again, the optimal policy corresponds to setting the size of government provision proportional to its impact on aggregate production.

10.5 Key ideas of chapter 10

- Because of different types of market failures, in general the laissez faire does not deliver an efficient resource allocation. Market failures include externalities, public goods, common goods, coordination failures, missing markets, high unemployment, information failures, and imperfect competition.
- A fundamental function that underlies the origin of the state is the establishment of essential public goods, such as the rule of law, protection of property rights, and market regulation.
- This chapter presented an extended version of the Solow model accounting for the role of government in providing services that are non-excludable, but essential to the functioning

[200] Barro and Sala-i-Martin, 1995, pp 156.

of a market economy. The implication is that in a laissez fare, there would be no provision and hence no economy at all.

- In the model, the government solves the market failure by coercing people to pay taxes. The optimal intervention involves setting the tax rate so that private prices become aligned with the social interest.
- The model emphasizes the trade-off between the benefits of public provision and the cost of taxation. Since government services exhibit diminishing returns, there is an optimal scale of public provision. Beyond that level, intervention becomes counter-productive.
- The first best policy presumes that there are no losses in the process of transforming tax proceeds into public inputs. In practice, due to different types of "government failures", some fraction of the tax proceeds is wasted in unproductive uses.

Problems and Exercises

Key concepts

- *Market failures. Public goods. Government failures. Intervention trade-offs.*

Exercises

10.1. (**Levels**) Consider an economy with a large number of equal firms. Each firm *i* produces a homogeneous consumption good according to $Y_i = AK_i^{0.5}N_i^{0.5}$. Although each firm considers A as an exogenous parameter, in the aggregate the following condition holds : $A = (G/Y)^{0.5}$. Assume that in this economy the population is constant (n=0), there is no technological progress (γ=0), the saving rate is 27% and the capital depreciation rate (δ) is equal to 2%. (a) Compute the aggregate production function in this economy and explain why there is a market failure. What would happen if there was no government? (b) Assume that the provision of public inputs is financed with a production tax τ, but that a fraction ø of the tax revenues is wasted in unproductive uses. Write down the government budget constraint. (c) Find out the expression for the steady state levels of per capita income and per capita consumption in terms of the fundamental parameters. Clue: remember that $c = (1-s)(1-\tau)y$. (d) Explain, with the help of a graph, the dual effect of the tax rate on the steady s. ate level of per capita consumption. (e) How does ø affect the steady-state of private per capita consumption? Explain. (f) Find out the benevolent planner solution. Is this solution intuitive? (g) Examine the implications of a positive waste ø for per capita consumption and G/Y. Discuss.

10.2. (**Growth**) Consider a closed economy where firms perceive the production function to be of the form Y=AK. In this economy the population is constant, the saving rate is equal to s=0.21, the depreciation rate is equal to δ=0.05, and there is a tax on production at the rate τ . (a) Consider for the moment that A=0.4 and $\tau = 0.4$. Using the equality between savings and gross investment, find out the growth rate of per capita income in this economy. (b) Place the main income identities of this economy in a flow income chart. (c) Discuss, with the help of a graph the dynamic properties of this model. Does this model predict convergence among similar economies? (d) Examine the implications of a

change in the tax rate from $\tau = 0.4$ to $\tau = 0.5$, all else equal. (e) Assume now that $A = (G/Y)$, where G is a non-excludable good. Find out the expression for aggregate output. (f) Explain the market failure. (g) Describe the benevolent planner solution.

10.3. Consider a closed economy where firms perceive the production function to be of the form Y=AK. In this economy the population is constant, the saving rate is equal to *s*=0.24 and the depreciation rate is equal to δ=0.04. Assume also that the government levies a tax τ_K on household's capital incomes. (a) From the firm' maximization problem, find out the expression for the interest rate in this economy as a function of the tax rate. (b) Find out the expression for the household's disposable income. Place the main income identities of this economy in a flow income chart. (c) Consider for the moment that A=1/3 and $\tau_K = 1/8$. Using the equality between savings and gross investment, find out the growth rate of per capita income in this economy. (d) Discuss, with the help of a graph the dynamic properties of this model. Does this model predict convergence among similar economies?(e) Examine the implications of a change in the tax rate from $\tau_K = 1/8$ to $\tau_K = 1/3$. (f) Keeping the tax rate equal to $\tau_K = 1/3$, examine now the implications of a change in the efficiency parameter from A=1/3 to A=1/2. Compare the implications of such a change with a similar change in the context of the Solow model and explain. (g) Assume now that $A = (G/Y)^{0,5}$, where G is a nonexcludable good. Find out the expression for aggregate output. (h) Assuming that the government budget constraint is $G = [\tau_K / (1 + \tau_K)] Y$, compute the growth rate of this economy when $\tau_K = 1/8$ and when $\tau = 1/3$. In light of this new interpretation for A, how would you explain the equilibrium described in e? Compare the 3 solutions with the help of a figure relating the growth rate of the economy with the tax rate (laffer curve). Do any of these correspond to the first best?

10.4. Consider a closed economy where firms perceive the production function to be of the form Y=AK. In this economy the population is constant, $\rho = 0$, and the depreciation rate is equal to δ=0.04. Assume also that the government levies a tax τ_K on household's capital incomes. (a) From the firm' maximization problem, find out the expression for the interest rate in this economy as a function of the tax rate. (b) Find out the expression for the households' disposable income. (c) Assume now that $A = (G/Y)^{0,5}$, where G is a public good. Find out the expression for aggregate output. (d) Considering the government budget constraint $G = [\tau / (1 + \tau)] Y$, find out the benevolent planer solution. Explain it with the help of a graph.