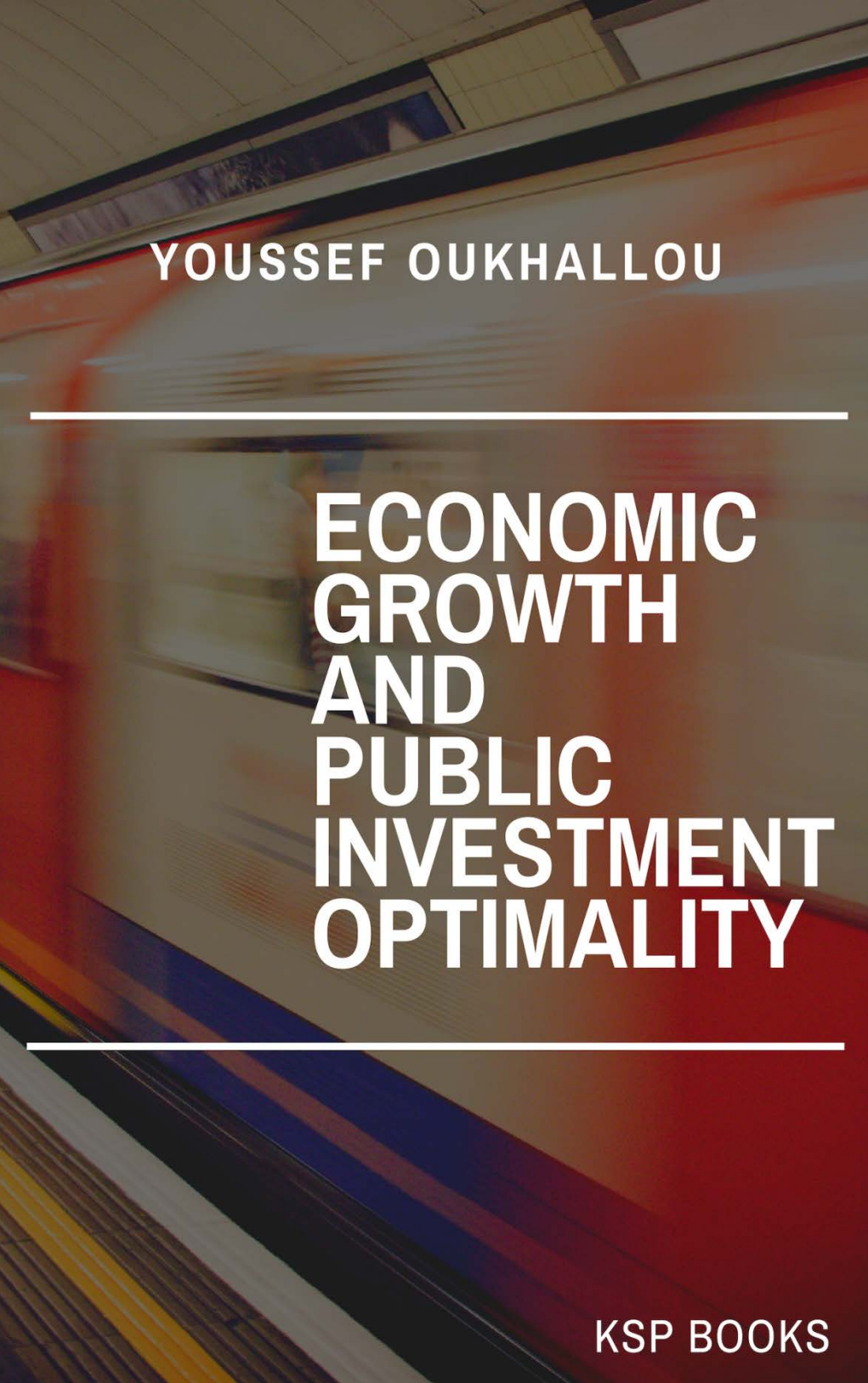
YOUSSEF OUKHALLOU
ECONOMIC GROWTH AND PUBLIC INVESTMENT OPTIMALITY
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Economic Growth and Public Investment Optimality

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Economic Growth and Public Investment Optimality

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Preface

This book investigates the relation between economic growth and public investment expenditures. It examines the level and means to improve the macroeconomic effectiveness of government investment spending and explores the concept of optimality under the constraint of debt sustainability. Additionally, this research analyzes the legislative and institutional factors that could slow down the effectiveness of investment expenditures, and provides hints on how the reduction of corruption could help fiscal policy converge toward optimality. The first chapter sheds light on economic growth in the literature as a core variable of the economic activity, its determinants and the role of investment, particularly public investment, as a potential contributor. The second chapter focuses on public investment's macroeconomic effectiveness, as the first leg of optimality. The emphasis is laid on the examination of the macro-financial framework of Morocco as an example of developing countries, followed by a larger benchmark panel data model. Afterwards, I estimate public investment expenditures' impact on GDP, along with other variables

such as GFCF and public consumption. The third chapter introduces debt sustainability as the second component of public investment optimality. The twofold concept of optimality is then encompassed in an experimental small scale macroeconomic model for public investment policy analysis, on which a series of policy shocks is driven in order to further discuss different hypotheses. Throughout this book, I reveal that the macroeconomic impact of public investment expenditures is below the effectiveness levelhence could not logically be optimal even if public debt is found to be sustainable. Subsequently, a number of effectiveness-oriented institutional recommendations are prescribed. The policy simulation also suggests that an increase in public investment spending that is not totally or predominantly matched with a rise in public revenues has a larger and longer negative impact on public debt than a positive one on GDP growth. On overall, public investment's optimality in the realistic framework of a developing economy seems to be strictly conditioned by a cumulative series of positive variations combined with the improvement of profitability-based selectivity of investment projects, under the constraint of a debt ratio that should not exceed 60 percent.

Youssef Oukhallou
June 10, 2019

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Introduction

In the contemporaneous context where the international markets and a large number of economies struggle to get back on track amid the repercussions of the recent international crisis, the main concern of public decision makers has consisted on macroeconomic stability, economic growth and price developments. A particular interest has been given to the interaction of these different variables with fiscal policy's implications. The emphasis laid on this topic was echoed in many recent academic research papers.

The 2008 financial crisis, which has clearly jeopardized the public finance stability in the euro zone, has been recently a consistent food for thoughts in the economic literature. The assessment of fiscal policy's implications found its way back to the headlines in many papers, beyond the linear straightforward correlation stipulating that an increase in government spending would imply an improvement of the economic activity in general. It is worth reminding ourselves that, in the aftermaths of said financial crisis, a large number of governments were bound to interfere in order to stem the liquidity void caused by toxic financial assets, making the discretionary choice of a drastic increase in most categories of their expenditures, particularly investment spending, which evidently amplified the budgetary deficits. The latter, financed mostly by sovereign debt, laid to a drastic jump in the public debt-to-GDP ratio in many countries, notably in the euro zone (e.g. Greece, Spain and Italy). Ergo, the cost of government debt, represented by bonds premiums and

different interest rates, reached vertiginous heights as to match the risks' magnitude, thus seriously threatening the chances of an economic recovery in the EU.

This phenomenon of drastic increases in deficits and public debt has also been observable in Morocco. From 2008 to 2017, government debt has grown quasi-exponentially, with an average yearly increase of 8.79 percent. Government debt went from 325.8 billion MAD in 2008 to 692.2 billion MAD in 2017, and the government debt-to-GDP jumped from 45.4 percent to 64.5 percent, respectively. The fiscal deficits reached critical levels, at 6.6 percent in 2011 and 7.2 percent in 2012, as opposed to a mild surplus of 0.4 percent in 2008. This was, to some extent, reflected on the cost of public debt in terms of interest, which moved from 17.46 billion MAD in 2009 to 27.88 billion MAD in 2017. This negative evolution on both fronts raises many challenges –and questions, regarding the public finance sustainability.

On the other hand, Morocco also suffered directly from the economic implications of the international crisis, and this was observable in the dynamics of GDP growth, which went from an average of 5 percent from 2000 to 2008, to hardly 3.5 percent from 2009 henceforth. This sagging trend has been the direct consequence of the drop in foreign demand on goods and services that is addressed to Morocco, as caused by the recession in its first economic partner, i.e. the EU. The Moroccan kept yielding a year-to-year positive evolution though, mostly driven by the domestic part of the aggregate demand, which has been increasing significantly.

And as part of the aggregate demand, public investment stands out as a superior determinant of economic growth and development according to the theoretical and empirical literature. And as the Moroccan GDP continues to sluggishly evolve (e.g. a 1.2 percent growth rate in 2016), thereby failing to meet the minimum momentum required to reduce the deficits in terms of economic and human development, the examination of government investment policy and the means to improve its macroeconomic impact become crucial. On the other hand, the improvement of the effectiveness of investment expenditures' influence on output dynamics should be considered in a durable

perspective; hence, it cannot be tackled without considering fiscal constraints, namely public debt.

In this sense, this book investigates the relation between economic growth and public investment expenditures. It examines the level and means to improve the macroeconomic effectiveness of government investment spending and explores the concept of optimality under the constraint of debt sustainability. Therefore, we endeavor to answer a number of questions throughout this dissertation: Is government investment optimal in Morocco? Is public investment spending macro-economically effective? How should it interact with the constraint of public finance sustainability? Does the latter affect the extent to which investment expenditures could influence economic growth? Does the current legislative and institutional framework facilitate the implementation process of investment projects? Are there any actual differences in terms of macroeconomic productivity between government investment spending and current expenditures in the short and medium terms? What are the mechanisms through which public investment policy could be improved?

In our attempt to answer these questions, we lay down an initial set of hypotheses. The first hypobook emphasizes the importance of budget efficiency, whether through the fight against corruption or the enforcement of macroeconomic profitability-based selectivity of investment projects and government spending in general. As for the second hypobook, it states that from a *transitional dynamics* perspective, public investment is supposed to have a larger effect in small and middle-income countries such as Morocco where the stock of infrastructure is lower compared to developed economies. Here, the margin of improvement in terms of infrastructure is substantial, among other development and economic variables. And according to the third hypobook, the higher is the public-private investment substitutability the more important is the crowding out effect, which drives a downward influence on public investment's influence on economic growth. The substitutability is more observable in advanced economies than in Morocco and other comparable countries, which could explain why the public investment multiplier effect is found to go

up to 1.4 in middle-income countries while it is weak –and even negative in some cases- in advanced economies (Hemming *et al.*, 2002).

Besides from those three main hypotheses, we also stipulate hypothetically that the Moroccan investment policy is unlikely to be effective, hence could not logically be optimal even if public debt is found to be sustainable. Also, past a debt sustainability threshold, fiscal policy in general, and particularly public investment spending, generates a negative impact on GDP dynamics. Finally, we make the assumption that investment policy that is run in compliance with debt sustainability would tend to have a longer and larger influence on the economic activity.

These questions and hypotheses being established, the first chapter start by shedding light on economic growth in the literature as a core variable of the economic activity, its determinants and the role of investment, and particularly public investment, as a potential contributor. In this framework, growth theorists agree in principle that public and private investments play a decisive role in the sense that they enhance the economy's productivity, particularly by driving an upward influence on technology and education, among other physical and social variables. Public investment's particularity lays in the fact that it is sought to provide key infrastructural components, which theoretically constitute the fundamental basis for any economic activity. Regardless of the specific magnitude of its impact on GDP and productivity according to different empirical studies, a large part of the theoretical and empirical literature recognizes public investment to be a superior determinant of economic growth. In the seminal neoclassical model motivated by Baxter & King (1993), public capital is typically modeled as an unpaid factor with a significant marginal product in the private sector production function. This implies that, besides from its "ordinary" effects like any economic agent's consumption, the government can also provide a positive externality on the private inputs' productivity through public investment.

Nevertheless, the relationship between public investment and output growth remains non-linear and the debate unfasten, starting from the Keynesian-Classical controversies, down to the

divergent empirical findings regarding the very impact of public spending, particularly investment, on GDP growth. Based on the different research works reviewed in this book, it would be difficult to definitely ascertain the extent of the relationship between public investment expenditures and the economic activity. A large number of empirical studies confirmed the existence of a significant upward influence of public investment on economic growth and, in some cases, on private investment. However, several other authors found public capital to be of no avail when it comes to promoting output growth, and some even came up with the conclusion that public spending has a detrimental macroeconomic effect. Those two perspectives are conciliated in this book by linking the significance of public investment's impact on GDP growth, to various levels of crowding-out, efficiency, investment project selectivity and public-private capital substitutability, among other factors. Thus, the difference in terms of public investment's macroeconomic influence from a country to another could be explained by the crowding out hypobook, and the possibly low or negative marginal productivity of public investment. Other than these elements, there is another plausible explanation, i.e. the potentially high level of taxation that often results from further public investment once it exceeds a specific level, which could trim down GDP growth and disturb private investment and saving.

In the second chapter, the emphasis is shifted toward the examination of the Moroccan macro-financial framework as well as a benchmark panel data model, in light of the main hypotheses initially established in this book. The discussion of the stylized facts of GDP is the occasion to bring up the economic volatility that is driven by the relatively small share of industry and the unpredictable agricultural output, substantially tributary to weather conditions. As for public capital spending, the stress should be put on the main categories of institutions that contribute to overall public investment in the Kingdom, with the perspective of narrowing our scope of investigation on the contributor with the most relevance to the problem statement mentioned above.

In the first modeling exercise in this book, we consider Morocco as part of a group of developing countries, in order to compare the

latter's characteristics with a certain number of advanced economies in light of the aforementioned hypotheses. With this perspective in mind, we estimate a panel data model with a total of ten developed and developing countries. Afterwards, we estimate public investment expenditures' impact on GDP in Morocco, along with other variables, such as GFCF and public consumption. In this particular estimation, we use a GLS time series model. When analyzing the econometrical results, it would be crucial to bear in mind that Morocco is in fact a developing country, which implies shortages in infrastructure and very low public private capital substitutability, hence a very limited crowding out effect. Moreover, in the logic of transitional dynamics, Morocco remains way below the threshold beyond which the returns of capital spending start to diminish or become counterproductive.

Based on the econometrical assessment and the examination of the institutional characteristics that are linked to government investment, and in order to improve its macroeconomic, we motivate an initial series of recommendations that hinge upon legislation and regulation, as well as the very shaping of investment policy.

After examining the idiosyncrasies of the Moroccan framework in terms of GDP dynamics and its relationship with public investment, and after having considered investment expenditures' macroeconomic effectiveness in Morocco both individually and as part of a benchmark of countries, we shift the analysis in the third chapter toward what we consider to be the second condition of public investment optimality (after effectiveness), i.e. public debt sustainability. We start the last chapter by discussing the historical evolution and stylized facts regarding government debt as a newly introduced variable. After getting an empirical sense of the latter variable, we turn toward defining the concept of public investment optimality, and how government debt's evolution operates as one of its major underlying constraints. It is worth noticing in this framework that, when examining debt sustainability according to the literature, the definitions given by different authors to sustainability vary quite often, covering from the relation between public debt and government's solvency, to the potential impact of public debt on the macroeconomic aggregates.

And when tackling the notion of optimality in the literature, we briefly cover most definitions, starting from the growth-maximizing public investment rate to tax-driven fiscal optimality. By the end of this discussion, a twofold concept of public investment optimality is introduced, where we explicitly combine macroeconomic effectiveness as discussed in chapters I and II, with the constraint of public debt sustainability. This conception of government investment optimality should enable the analysis to go from the monotonic relationship between economic growth and public investment studied in the first two chapters of this book, toward defining the level of public investment that allows for a productivity-enhancing macroeconomic effect without jeopardizing either the public debt sustainability or the tax pressure. The objective is to enable the assessment of the extent to which government investment expenditures can effectively support the economy without compromising a given sustainable budget equilibrium.

In this framework, we build a small scale macroeconomic model for public investment policy analysis. It is inspired from the strand of New Keynesian reduced-form models that are directed toward monetary policy analysis. The model is then augmented by a twofold fiscal component, in order to include public debt sustainability as a constraint for government investment spending. The logic of the fiscal reaction function joins to some extent Collignon's (2012).

The model encompasses four main blocks: the aggregate demand, represented by an IS curve that explains output dynamics through a number of expected and lagged variables, including public investment expenditures; a Phillips curve that defines the price level according to expected inflation and GDP dynamics; a monetary policy rule, where we made the assumption that the central bank follows a Taylor-type pattern that links the evolution of the interest rate with inflation and GDP dynamics; and the twofold fiscal system that should help provide insights on the relation between public investment expenditures and government debt. The model is shaped so as to remain parsimonious and coherent, thereby providing a clear understanding of the structural relations between the main variables. It is also perceived in a

stochastic environment, for the reason that the shocks are random, meaning that there should be an aggregate uncertainty regarding the future.

We calibrate the model based on an eclectic method combining estimation and stylized facts-based adjustments, because it is important for this type of models to have a minimum of statistical foundation; but in order to be useful for fiscal policy makers, it is important for it to accommodate their view about the economy. The point is to parameterize the model based on not only the econometric estimates, but also the stylized facts of the Moroccan economy and the examination of the characteristics of the model's equation system as well.

And pursuant to the discussion on public investment optimality, a debt sustainability threshold is introduced in the model. We set the threshold at a debt-to-GDP ratio that is equal to 60 percent of GDP, based on the buckle of the literature and as stated in article 104 of the Maastricht Treaty and detailed in article 1 of the Protocol on the Excessive Deficit Procedure. Through this experimental parameterization, the deviation of the debt ratio from the sustainability threshold is thus taken into account in the very behavior of government investment spending, in a simulation-oriented model.

By the end of the third chapter, we mostly drive a series of shocks based on different scenarios, in order to further discuss some hypotheses developed throughout this book and to offer additional policy recommendations, particularly regarding government investment. The model should also provide reliable information on the *optimal combination* so as public investment can drive an upward influence on the economic activity (*effectiveness*), without jeopardizing the budget *sustainability*.

1. Public investment and output growth in the literature

Introduction

In the most common definition, public investment is materialized by the allocation of resources meant to provide goods and services that are either impossible for the private sector to efficiently supply or are such that only one supplier could invest in them economically, i.e. natural monopolies (Lee, 2017). It is run through central or local governments or through publicly owned industries or corporations.

The concept has emerged historically from the need to provide said goods, services or infrastructures which are often deemed to be of vital national interest. Public investments are usually large in scale and the private sector is involved in a most of them, often as a contractor within the framework of procurement, but also as a partner, in the case of public-private partnership projects. The spectrum of public investment covers several types of projects, such as dams, water, electricity, education, healthcare, sewage systems, telecom infrastructure, roads, highways and logistics. And all these elements are practically linked to the economic activity, with a significant ripple effect, as economic development and infrastructure are favorable to economic growth.

On the other hand, the concept of economic growth is still considered to be quite "modern", or at least the great attention that has been given to its mechanisms and to the improvement of its

pace. Yet, it is a phenomenon that had seen the light back in the 18th century (Bairoch, 1993; Easterlin, 1996).

According to several empirical studies, economic growth plays an important role in the shaping of the living standards of a given population. Differences between countries in terms of growth rates are shown to lead, if maintained over a long period of time, to noteworthy gaps in human welfare between their respective populations. Some authors demonstrated the latter statement through a comparison between the East Asian economies and the Sub-Saharan African ones since the 1960s, i.e. more or less the end of the colonization. The stark difference between these two sets of countries in terms of economic growth rates over the past decades and the respective average level of living standards has been used by some proponents of the Trickle Down theory in order to defend that economic growth actually "trickles down" to all the population, thereby contributing directly to the human development. Linking economic growth to –human- development has also been the subject of an important number of research papers during the last four decades. As an example, Rosenberg & Birdzell (1986) defend that in the short run people have the tendency to believe that the gains from economic growth are experienced exclusively by the wealthy. However, both authors explain that, in light of the accumulated economic growth through the twentieth century, working classes in developed countries were prospering and growing as a proportion of the whole population, as the incidence of poverty itself was reduced from 90 percent of the population to 20 percent more or less, depending on the country and on the definition criteria of poverty.

This argument is confirmed by Crafts (2003), who illustrates the propitious impact of economic growth on human development by showing its correlation with life expectancy and how the latter contributes to the enhancement of living standards.

In the first section of this chapter, we review the literature regarding the impact of public spending on the economy, particularly public investment expenditures. The chapter starts with a description of the main contributions of the Keynesian and the Classical school to the debate concerning this specific question. Then, we switch the focus to discussing economic growth, its

determinants and the role played by Growth Theory models in the shaping of a sound conception of how economies work and how governments could drive effective pro-growth policies. This is followed by a discussion on the role of variables such as infrastructure, managerial organization and resource allocation, as further potential determinants of growth and economic development.

As for the second section, the emphasis is laid on different empirical findings in developed countries, but also in low and middle-income economies, in order to have a general idea about the mainstream characteristics of both categories as regards to fundamental factors of GDP growth and the role of public investment.

The aim here is to come up with a sound theoretical and empirical framework in order to establish credible hypotheses for the case analyzed in this research, i.e. the Moroccan public investment policy and its impact on economy and on public finance sustainability.

Theoretical and conceptual background

The origins of the debate regarding the effectiveness of public investment as a determinant of economic growth go back to the fundamental discussion regarding the very role that should be given to the government in terms of economic policy, and the impact of the latter on the macroeconomic aggregates. Initially, two main strands of economists can be underlined in this framework.

The first one argues in favor of an advanced role for economic policy and government investment spending, and presents them as significant determinants of output growth that generate a crowding in effect on private investment. As for the second one, mainly led by proponents of the Classical school, the accent is put –among other elements, on the crowding out effect of public expenditures, the hypothesis of self-regulating (self-clearing) economies and the ineffectiveness of fiscal policy based on the hypothetical predominance of Ricardian households among economic agents.

This twofold section provides insights regarding the main aspects of this debate at the theoretical level. In subsection 1.1.1 the light is shed on the main contributions of the Keynesian and the Classical schools to the debate concerning this question in general. In subsection 1.1.2, we turn into the concept of economic growth, its determinants and the role played by Growth Theory models in the shaping of a sound conception of how economies work and how governments could drive effective pro-growth policies. This is followed by a discussion on the role of variables such as infrastructure, managerial organization and resource allocation, as further potential determinants of growth and economic development.

The Classical and Keynesian debate

In order to assimilate the advanced elements that are analyzed in the sections below, it is important to set a theoretical background through the discussion of the contributions of both the Keynesian and the Classical orthodoxies. This would enable us afterwards to assess the validity of each hypothesis based on empirical evidence and to eventually establish a conception of how the government should intervene, and the constraints that need to be considered in order for economic policy, and public investment in particular, to have a net positive macroeconomic effect.

In this subsection, we start with a presentation of the Classical framework before switching focus to the Keynesian theoretical contributions.

The Classical framework

As they consider the economy to be hypothetically functioning using all its resources[1], the orthodox proponents of the classical school argue that the government's role should only consist on ensuring a secure and competitive business environment, thus allowing economic agents to reach their respective optimums. In this frame, the "invisible hand" theory states that, through natural market adjustment mechanisms (e.g. perfectly flexible price

[1] The full employment hypothesis is one of the fundamental mainstays of the classical orthodoxy.

system, a fictional Walrasian auctioneer…), the economy is likely to reach its optimal equilibrium; hence, any further public intervention would simply clog the latter process. This state of mind explains the lack of classical research documents that tackle either the factors that determine aggregate demand or the public policies that could be used to stabilize aggregate demand in order to push the economy toward full employment, since the latter would be "the normal state of affairs" (Snowdon & Vane, 2005).

As regards to unemployment, it is tributary –in the classical point of view- to labor market rigidities, which is a market like any other, and not to an insufficient demand for goods (and services). Hence, it would not be influenced by cyclical economic policy since aggregate demand does not play a key role in these fluctuations.

Therefore, the economy's stability would require no active economic policy to be implemented by the government. As a matter of fact, Léon Walras's theory of general equilibrium shows, under neoclassical framework, the impossible existence of general overproduction crises. Public authorities' role should be limited to maintaining price stability by controlling the issuance of money. Fiscal policy would be of no avail and public deficits are to be proscribed in order to avoid crowding out and to meet budget neutrality. Only public interventions that aim to establish or restore the flexibility of the markets, particularly labor's, are allowed.

Clearly, budgetary equilibrium is a fundamental mainstay of the classical conception of public finance management. The State, which powers are limited, must be confined to find the necessary resources to finance its limited sovereign spending. In this perspective, public deficits are not only illogical, but hazardous as well. And there is no such a place for public investment either. As for the budgetary surplus, it represents an unjustified levy on productive wealth and might lead to a wasteful financial use.

This theoretical orthodoxy can be illustrated, yet in a lesser extent, through the European Stability and Growth Pact (SGP), which specifies that the fiscal deficit must not exceed 3 percent of GDP and public debt 60 percent. "Non-compliance with the Pact can lead to the imposition of sanctions for euro area countries. This

can involve annual fines for euro area Member States and, for all countries, possible suspension of Cohesion Fund financing until the excessive deficit is corrected"[2]. The underlying logic here is that public deficits have mostly negative economic effects for a country and its partners, which is quite close to the aforementioned classical hypothesis. Furthermore, in most OECD countries, the rise in public debt during the 1990s led their respective public authorities to focus on limiting public deficits and building up for a long-term equilibrium, at the expense of both long/medium term public investment and cyclical fiscal policy.

Crowding out and the ineffectiveness of fiscal policy

An expansionary fiscal policy, when public spending is debt-financed, would crowd out private capital market agents. It would lead to an increase in the government's demand for means of payment, thereby causing a potential raise in interest rates. This principle finds its foundation in the works of David Ricardo (Sraffa, 1951).

In this regard, it is possible to make a distinction between a quantity effect on the volume of available capital and a price effect concerning the level of interest rate in the case of government bonds. The latter can only discourage investment or even the purchase of durable goods by households, which would hold back the anticipated activity growth due to a rise in public expenditures and a drop in private spending. The decrease in investment in response to a higher interest rate leads to a fall in capital accumulation and output, reducing the supply at the goods market. If the expansionary fiscal policy is associated with sustained deficits, the increase in debt further improves private wealth and private spending at a given interest rate, thereby increasing further the interest rate and accentuating the decline in capital accumulation (Blanchard, 1985).

The crowding out concept refers to "all the things which can go wrong when debt-financed fiscal policy is used to affect output" (Blanchard, 2006). In this context, Blanchard argues that, while the

[2] See the Treaty on the Functioning of the European Union (TFEU), part III: Union policies and internal actions - article 126

initial focus was on the slope of the LM curve, crowding out now refers to a "multiplicity of channels through which expansionary fiscal policy may in the end have little, no or even negative effects on output".

Thus, following the Ricardian equivalence of debt and taxation, which gained notoriety after Barro's (1974) seminal paper, budget deficits (e.g. expansionary fiscal policy, further public investment, tax reduction…) financed by the issuance of government bonds have no effect on aggregate demand or on interest rates, as the increase in public debt is offset by an increase in savings. Besides, changes in the pattern of taxation that keep the pattern of spending unaffected do not influence the inter-temporal budget constraint of the private economy and therefore may have a small effect on private spending (Barro, 1974).

In a nutshell, this theorem stipulates that by the end of the process, the private sector would be "impoverished" because of the second-round decrease in public spending and/or the additional taxes, in a way that the initial enrichment due to public budgetary stimulus would be neutralized. Rational consumers perceive a temporary raise in deficit as an increase in taxes in the future; ergo, they discount future taxes leaving private consumption unchanged, even in the short term.

Nevertheless, it is important to note that the Ricardian argument does not make void any fiscal policy. As a matter of fact, if the government binds tax cuts to public spending cuts, the permanent household income increases, which stimulates consumption and reduces national savings. Furthermore, some taxes which induce strong inter-temporal substitution, such as an investment tax credit for firms, will have stronger effects if they are temporary. However, we should bear in mind that it is the expected decline in government expenditures that has real effects, not tax cuts. But here again, various forms of direct crowding out may be at work. Public spending, whether ordinary purchases or investment expenditures, may substitute perfectly or imperfectly for private spending, so that changes in public spending may be directly offset, fully or partially, by consumers or firms.

Even when public spending is on public goods, the effect on aggregate demand would depend on whether the change in

spending is thought to be permanent or temporary. Permanent changes, financed by a permanent increase in taxes, are most likely to generate a proportional decrease in private expenditures; as a result, total spending would stay the same. Transitory changes in public expenditures, associated with a momentary raise in taxes, lead to a smaller reduction in private spending and thus to an improvement of the total spending.

As for Barro's proposition, its close relationship with the work of David Ricardo was first pointed out by Buchanan (1976), who proposed to name it "Ricardian equivalence". Barro's model indicates that consumers have finite lives and care about the welfare of their descendants, providing them with positive bequests[3]. Therefore, their behavior would be similar to the one if they had infinite lives, and provided that the government cannot postpone indefinitely the repayment of the bonds issued, the repayment and the interests that consumers receive are equal to the sum of the principal and taxes levied to pay interest. The reduction in government savings is completely offset by an increase in private savings, leaving unchanged national savings. Following this logic, government bonds would not be net wealth. On the other hand, this economist defends that if a tax cut is associated to a reduction in government's investment or consumption expenditure by the same amount, the real effect would be an increase in private consumption, hence the similarity with the Ricardian perspective. The effect would be the same if the government announces a future reduction in its expenditure, leaving taxes unchanged. Let us keep in mind that the mechanism at work in this case is that permanent income increases, in the first case because the reduction in taxes is immediate, and in the second because consumers would be expecting the reduction at some point.

According to Barro's (*ibid.*) model, the total utility of the individual representing the generationt, denoted (V_t), depends on

[3] Proponents of the traditional approach are convinced that the tax increase will not affect the current generation but future generations; to them, the public debt is a transfer of wealth from future generations of taxpayers to the current generation.

consumption (C_t), and the utility of his descendants (V_{t+1}) (altruism), such that:

$$V_t=U(C_t) + \beta V_{t+1}$$
$$V_t=U\ (C_t) +\ \beta U\ (C_{t+1}) + \beta^2 U\ (C_{t+2}\ ) + \beta^3 U\ (C_{t+3}) + \ldots$$

In this case, the rise in debt due to a tax cut only increases the income of the individual and not the family lineage. If he does not consume the disposable income provided by the initial tax cut, the representative individual would increase his savings, which will be the inheritance of his descendants who will have to pay the second-round taxes that aim to clear the debt. In order for the principle of equivalence to be valid, the intergenerational transfer mechanism must be operative, in the sense that individuals must actually plan to leave their descendants a positive support. Thereupon, Barro strongly motivates –mainly altruist- rational expectations.

However, more than a few criticisms were raised regarding this very theorem and its behavioral micro-foundations. We can state for instance the one, mainly developed by Buchanan (1976), which concerns the very questionable aspect of households' expectations; the tax illusion and uncertainty about the evolution of inter-generational assets, income and consumption push one to seriously doubt the effective existence of altruistic rational expectations and their capacity to neutralize a wealth effect. A second critique has been the argument that households might naturally choose very different strategies from the ones introduced by Barro.

On the other hand, if the future tax liability arising out of debt-financed increase in public spending per example falls on a future generation, then it can be argued that the present generation will be wealthier. Barro has argued, however, that the existence of bequests implies that the present generation will enhance their saving so as to increase their bequests to their children in order to pay for the future tax liability. Barro's argument that the existence of bequests implies concern by parents about the tax burden their children will come up against, has itself been subjected to a number of criticisms.

In order to understand -in a simpler pattern- crowding out and how it affects fiscal policy's potential effectiveness, we believe that one should draw their attention to the fact that the classical analysis, which was backed up by several neoclassical theorists, does not actually seek to demonstrate the ineffectiveness of economic policy; the latter is simply presupposed. As mentioned above, the paradigm starts here in a situation of full employment, which leads to axiomatically assume the uselessness of any economic policy, even if it concerns infrastructure investment.

One of the classical premises that are most relevant to this question would be Say's Law. The next subsection aims to explain this theory and its implications on economic policy in general, and public investment spending in particular.

The Say's Law implications

One of the hallmarks of the Classical paradigm is that the supply creates its own equivalent demand, since the act of production generates income simultaneously, providing thereby more purchase power to absorb the initial increase in output. Thus, there would not be such thing as an aggregate demand deficiency that could alter full-employment; this hypothesis implies that the market is guaranteed no matter what is the level of production. Economic policy would not be needed to push the economy toward an optimal equilibrium. These elements sum up, to some extent, the main idea Jean-Baptiste Say was defending in his *Treatise on Political Economy*, initially published in 1821.

Nonetheless, Say's law does take into consideration the fact that a supply surplus could occur, as well as a misallocation of resources. However, this disequilibrium is set to be only temporary and cannot take place for goods and services as a whole.

According to the literature, Say's law has a weak version and a strong one. The first specifies that any expansion on the supply side of the economy involves inevitably a symmetrical increase in the demand side, without linking the variation of production with full-employment. As for the strong version, it stipulates that in an economy composed of competitive markets, full-employment could be automatically established (Ttevithick, 1992). In other words, this version is in accordance with labor market equilibrium.

The consistency of the arguments introduced by Say was enhanced by other classical elements of analysis, regarding notably investment, saving and the interest rate. In this context, the flexibility of the interest rate is of great importance, because the interest would change in order to reconcile the desires to save and invest, even though the decisions to save and invest are made by different types of economic agents in the Classical framework. For instance, when the interest rate increases, it encourages the savers/households to substitute more of the present consumption with future consumption. Saving is considered, in this context, as a supply of funds in the capital market, and since it is positively correlated with the interest rate, several Classical economists consider consumption to be conversely linked to interest. As for investment, which represents the demand in the capital market, it holds evidently a negative relation with the interest rate. In the case of divergences between saving and investment, the interest varies until equilibrium is reached in the capital market, and the economy as a whole. This model is in absolute contrast with the Keynesian theory, which states that the adjustment happens through a quantitative response.

Following the Classical model, the interest rate is an adjustment variable that is determined by the laws of the market. The markets get back to equilibrium using only intrinsic variables. As a consequence, there is no need for a fiscal or monetary expansion in order to help the economy reach back its optimal equilibrium. In fact, Say's law suggests that any public intervention is likely to clog this process.

Using Say's law along with flexible wages, prices and interest rates, the Classics refute the hypothesis of an effective cyclical policy on the demand side of the economy[4]. They are willing to argue in favor of possible changes in the structure of final demand but totally disprove long-drawn-out demand deficiency and involuntary unemployment. This is consistent with the

[4] It is worth mentioning, in this regard, that Robert T. Malthus argued that a general excess of the supply of goods and services was possible. This Classical heterodox economist anticipated Keynes by laying emphasis on demand as the determining factor of aggregate output.

ineffectiveness of public policies in regulating the aggregate demand, since there is no problem in the first place.

The Keynesian perspective

In an obvious contrast with the Classical framework, the Keynesian school laid an elaborate emphasis on economic policies, whether at the monetary or the fiscal level. This interest came from the hypothesis that public decision makers are forced to intervene at the macroeconomic stage since the markets are inefficient (sticky prices, information distortions…) and one could not rely on their potential adjustment mechanisms to set the economy back on the tracks of optimality whenever there is a recession.

The General Theory sets the broad lines of what John M. Keynes considered to be the optimal economic policy, although it does not explicitly examine the impact of change in public spending, whether stimulated by government expenditure or variations in tax rates. Besides, the book's complexity and its lack of mathematical evidence made it possible for several economists to come up with various theoretical interpretations[5].

However, the literature is almost unanimous when it comes to Keynes's conception of how the economy works, according to which the under-employment could be durable while competition mechanisms are of no avail. The eminent economist argues that only a public intervention could boost aggregate demand, notably via deficit financing, in order to help the economy converge toward full-employment equilibrium. Of course, in the Keynesian conception, the most important part of public policies' influence is driven on aggregate demand (consumption and investment) since targeting the supply-side of the economy is likely to be a sluggish process, particularly because this would require a modification in the economy's production capacities. Therewith, Keynes defends that the level of output and employment is actually tributary to aggregate demand, as public authorities can interfere to influence the effective level of the latter in order for the economy to converge toward full employment swiftly. In this case, fiscal policy is usually recommended given that its impact is "more direct,

[5] See for example Klein (1947); Kahn (1984), and Phelps (1990).

predictable and faster acting on aggregate demand" than monetary policy's one (Snowdon, & Vane, 2005).

In this sense, one of the main aims of writing the General Theory was to reverse Jean-Baptiste Say's Law. In the canonical Keynesian model, it is the effective demand that determines output and employment; the level of the interest rate is defined by the interaction of supply and demand in the money market rather than by saving and investment decisions. Through the multiplier effect, changes in investment's marginal efficiency would lay a significant impact on *real* output; saving would then adjust to investment via variations in income. Thus, in the model motivated in the General Theory, any inequality between planned investment and planned saving would lead to quantity adjustments rather than variations in the interest rate. This scientific proposition squarely refutes Say's Law.

Another point of divergence between Classics and Keynesians is the fact that the latter consider the economy to be in equilibrium even if there is still –involuntary- unemployment. The Classical school defends through the Walrasian theory that all markets must be in equilibrium, including the labor market, in order for the economy to reach a global equilibrium. Keynesians consider this condition to be inconsistent with the economic reality, arguing that historical data proved several economies to evolve quasi-structurally in under-employment equilibriums.

As a matter of fact, the Keynesian school refuted several other classical hypotheses regarding the real macroeconomic effects of economic policy. These elements, among other critics and theoretical arguments, are discussed in this subsection in order to expand the primary theoretical background and to lead the way to a soundly founded empirical analysis of economic policy in general, particularly fiscal policy and public investment.

Discussing the IS Curve

The Keynesian equilibrium was the first attempt to illustrate Keynes's theory on national income, and constitutes a basis for the IS curve. The latter shows the relation between the interest rate and the level of income associated with the equilibrium in the goods and services market; it is a noteworthy component of the Hicksian

IS-LM model, which was the first solid modeling experience of the Keynesian orthodoxy and had a "tremendous influence on the direction of macroeconomic policy right up to the mid-1960s" (Mankiw, 2010).

According to Keynes, the main part of an economy's income is determined, in the short run, by the expenditures that households, firms and public authorities would be planning to engage. Following this logic, the more economic agents spend, the more firms can produce and hire workforce, distributing thereby more income back in the economy.

In this frame, allowances must be made between expected expenditures and effective ones. The effective expenses are what have actually been spent on goods and services, and their total amount would equal GDP according to theory (Mankiw, 2010). Thus, the Keynesian equilibrium is set when the effective (Y) and expected expenditures (E_e) are equal.

$$Y = E_e$$

Assuming the canonical version of the model, i.e. with a closed economy, the expected expenditures are the sum of consumption (C), expected investment (I) and public expenses (G).

$$E_e = C + I + G$$

Consumption is initially tributary to disposable income, i.e. income after having subtracted taxes (T). This component of aggregate demand is therefore endogenous; it is also considered to be basically passive.

$$C = c(Y - T)$$

As for expected investment and public expenditures, they are considered to be exogenous, as well as taxes[6]. Consequently:

$$E_e = c(Y - \bar{T}) + \bar{I} + \bar{G} \leftrightarrow \quad Y = c(Y - \bar{T}) + \bar{I} + \bar{G}$$

[6] In the IS-LM model as a whole, investment is treated as being inversely related to the rate of interest, a variable computed within the model by the interaction of the goods and money markets.

In this frame, fiscal policy has an important role to play during recession times, as public authorities could modify their expenditures or/and taxes, thus adjusting the economy's equilibrium. In the first case, when the government rises public spending, it directly increases the economy's global expenditure since public expenses are one of the latter's underlying components. The Keynesians defend that the raise in the effective expenses (income) would be larger than the initial increase in public spending, following a superior-to-one public expenditure-based multiplier effect. This rule of thumb could be explained by the fact that the expansion of public expenditures drives an upward influence on income, thus increasing consumption, which implies another improvement of income, and so on.

In other words, since it has a proportional impact on income, a positive variation in public expenditures ΔG would result in an increase in consumption which equals the marginal propensity to consume c multiplied by ΔG as a first reaction. The second variation in consumption would correspond to the first one multiplied by c again ([ΔG × c^2). In this case, the variation in income ΔY would be equivalent to ΔG plus the series of consumption increases implied by the latter.

This relation can be expressed mathematically by the following equation:

$$\Delta Y = \Delta G + (\Delta G \times c) + (\Delta G \times c^2) + (\Delta G \times c^3) + \cdots + (\Delta G \times c^n)$$

We extract ΔG: $$\Delta Y = \Delta G \times (1 + c + c^2 + c^3 + \cdots)$$

$$\frac{\Delta Y}{\Delta G} = 1 + c + c^2 + c^3 + \cdots$$

In this very case, $\Delta Y/\Delta G$ is the Keynesian public expenditure-based multiplier (k):

$$k = 1 + c + c^2 + c^3 + \cdots \quad (1)$$

We multiply both sides of the equation by c:

$$c.k = c + c^2 + c^3 + c^4 \ldots \quad (2)$$

$$[(1) - (2)] \leftrightarrow k - c.k = 1 \leftrightarrow k.(1 - c) = 1$$

We thus end up finding the following expression: $k = 1/(1 - c)$

According to the orthodox Keynesian model, fiscal authorities have also the possibility of using taxation in their attempt to support the economic activity and help boost income. In this regard, when the government leads an expansionary policy through tax reductions, it is systematically reflected on disposable income, thus on consumption –following a tax-based multiplier. The last-mentioned tax multiplier effect on income is akin to the one with public expenditure increase. In both cases, the initial variation is multiplied by $1/(1 - c)$.

In order to simplify the argumentation, investment was considered above to be exogenous ($\bar{I}$). This obviously unrealistic hypothesis is replaced, when it comes to the IS curve, by an inversely proportional relation with interest rate, a variable determined within the IS-LM model by the interaction of the goods and money markets. As a result, investment becomes endogenous and could depend on cyclical/monetary policy.

The IS curve encompasses different combinations of interest rates and income related to equilibrium in the goods market (Mankiw, 2010). In light of the aforementioned elements, an increase in the interest rate is most likely to discourage firms from incurring further investment. *Ceteris paribus*, the drop in investment would lay downward influence on expected expenditures, thus resulting in a lower level of income. Monetary authorities can also lead an expansionary policy by reducing the main interest rate. The IS curve synthesizes this very relation, along with the Keynesian equilibrium; its slope is tributary to the interest elasticity of investment expenditure and the value of the multiplier. In this regard, the IS curve will be, say, flatter the more investment responds to a variation in the interest rate and the larger is the size of the multiplier. Notwithstanding the degree of its elasticity, investment is in principle explained by the marginal efficiency of capital, i.e. the expected profitability of investment and the interest rate that represents the cost of capital.

Subsequently, investment would undergo significantly wide fluctuations, since the computation of the aforementioned marginal efficiency is highly linked to expectations, allowing the human optimism/pessimism, but also some factual components, to interfere[7]. This volatility, which could cause "large swings in the state of business", led Keynes to question the significance of interest rate variations' influence on the volume of investment (Keynes, 1937). Over and above, the fluctuant nature of investment would ultimately be reflected on output and, by extension, on employment.

On the other hand, we should bear in mind that the IS curve is also built for a given level of government expenditure, taxation and expectations, so that expansionary fiscal policy would push the said curve to the right, and vice versa. In other words, an increase in government spending -or a tax reduction- is associated with a higher level of income, regardless of the level of the interest rate. Obviously, the curve's "shift" to the right would equal, in this case, the rise in government spending (or the fall in taxation) multiplied by the multiplier k.

The LM Curve

We had the opportunity to mention in a few words how changes in the monetary policy stance could modify the interest rate, thus laying a significant impact on national income and the economic activity[8]. Besides its significant role in the goods market, the interest rate is an adjustment variable for the monetary market for any given level of income; its influence on the demand side of this market is quite noteworthy[9]. In this frame, the IS-LM model

[7] John M. Keynes considers expectations to be often driven by "animal spirits", hence their instability.

[8] In Morocco, interest rate is considered to be the main instrument of monetary policy. The latter is oriented toward quasi-exclusive price stability objectives and does not include any economic targets per say (See Bank Al Maghrib's statute, 2006).

[9] While the money supply is assumed to be exogenously determined by the authorities, the money demand is tributary to interest rates, whether directly for the case of speculative motives, or indirectly when it comes to precautionary and transactional ones.

identifies three motives for holding money, i.e. transaction, precaution and speculation.

The demand for transactions and precautionary purposes is assumed to vary positively with income while the demand for speculative balances is tributary to the present level of interest rate, especially when the latter is compared with the interest level considered as "normal" by economic agents. In this regard, the Keynesian theory postulates that the interest rate, which could be influenced by an internal-debt-financed fiscal policy, lays a proportionally inversed influence on the quantity of the money demanded for speculative motives. As an example, an increase in the interest rate's current level, as compared to its allegedly normal level, would push more economic agents to anticipate a drop in the said interest rate and a growth in bond premiums; as a consequence, there would be a less important quantity of speculative demand for money. So, in order to avoid falling into a liquidity trap per example, monetary authorities should intervene in order to keep the current interest rate from falling beneath the "normal" level.

The idea of a speculative demand for money comes from the assumption, in the IS-LM model as a whole, that money is a financial asset along with bonds. Actually, only money and bonds are considered in this framework. Understandably, the remuneration rate of money is nil; on the other hand, it is perfectly liquid as regards to the allegedly non-existent transaction costs and risks of loss related to the exchange of such a financial asset[10].

As opposed to money, bonds are an imperfectly liquid financial asset seen that it needs to be sold on the market at the risk of making a capital loss if the selling price goes below the original price, and also because a lapse of time is required in order to cash the bonds or to get the principal repaid. Thus, holding bonds could prove to be quite risky when the holders have no visibility of the time they want to undertake future consumption and of the future price of this type of securities.

[10] At this stage, we do not consider the works of Oliver E. Williamson and Ronald Coase (among others) regarding transaction costs. We assume their conclusions are not directly related to the central question treated in the present thesis, and therefore cannot influence the argumentation.

An agent that holds bonds may make a capital gain or loss, depending on interest rate variations. The relation between the interest rate and the returns on bonds comes from the fact that the rate of the latter consists of the interest payment plus the capital gain or loss. In this sense, if the interest rate is expected to rise sufficiently in the future to provide a negative rate of return on bonds, then agents would speculate by only holding money in their portfolio until the interest's trend becomes descendant, hence the importance of expectations in determining the Keynesian speculative money demand.

As mentioned above, it is because of expectations' volatility that the Keynesians consider the money demand function to be unstable. They argue that expectations have the tendency to skew the prediction of the money demand; the latter is supposed to be tributary to only two variables, i.e. income and the interest rate.

Still, the *value* of both money and government bonds is negatively correlated to the level of interest rate. According to the literature, the relation between bond prices and the interest could be written as follows:

$$B = \frac{\bar{R}_n}{(1+i)} + \frac{\bar{R}_n}{(1+i)^2} + \cdots + \frac{\bar{R}_n + P}{(1+i)^n}$$

Where B denotes the bond's price, $\bar{R}_n$ the fixed annual return that one gets for holding the said bond during n periods, and P the principal which is only repaid at the end of the n periods. Computationally, the present function becomes simpler to work with in an infinitely-lived consolidated fund, where the bond's structure is time-invariant and time-symmetric.

Through this basic equation, the negative correlation between bond prices and the interest rate is tangible. When the interest rate rises, the price of the bonds in circulation is bound to drop. This variation takes place in order to equalize the rate of return on bonds issued at different dates at different coupon rates (Levacic, & Rebmann, 1982). As a consequence, the opportunity cost of holding money instead of bonds becomes substantial; this observation explains the tendency for the money demand to alter inversely with the interest rate.

Based on Keynes's liquidity preference theory, a drop in the money supply increases the interest rate. Following the same logic, a rise in the money supply drags the interest rate downward. This postulate can be illustrated if we hypothetically assume per example that the central bank decides to trim down the nominal money supply (M). This variation would ipso facto affect the real money supply (M/P), since prices are supposed to be fixed in the Keynesian IS-LM framework. Thus, the supply of real balances moves to the left. The equilibrium interest rate then increases as a reaction of this change in real money demand. This progression in the interest rate would evidently push economic agents to reduce the real monetary balances they are holding. The same logic applies if the central bank leads a monetary supply expansion.

From this theory, it is also possible to lay emphasis on the relationship between income and the interest rate. When income increases, the money demand curve is shifted to the right. In order to set back equilibrium in the real monetary balances market, and when the real money supply remains unchanged, the interest rate is bound to rise.

The IS-LM Model and Economic Policy implications

As we mentioned earlier, the government leads a budget deficit when public expenditures are set to exceed the public revenue, usually in order to support economic growth, among other cyclical objectives. In the IS-LM framework, the said deficit is either financed by the issuing of government bonds or by an expansionary monetary policy. Following the same logic, a fiscal surplus –resulting from a raise in taxation or a decrease in public spending, would help buy back bonds or reduce the money supply. Hypothetically, the nominal level of the money supply is likely to remain unchanged if the government issues/redeems bonds of an amount equal to the budget deficit/surplus, since public securities could play an adjustment role when it comes to money balances. This hypothesis, which theoretically neutralizes the potential monetary effects of the public deficit/surplus, makes it possible to sort out the *pure* fiscal policy implications on the

economy from the "collateral" monetary effects[11]. It also allows us to assume that the LM curve is not likely to react as strongly as it would if there were an increase/drop in the money supply in order to finance the fiscal deficit/surplus.

However, in the Keynesian perspective, an expansionary fiscal policy pushes the real economy upward (output/income, employment…), which implies an increase in the money demand that ultimately leads to a rise in the interest rate, creating thereby a second-round impact at the monetary level[12]. The extent to which the interest rate could change following such an expansionary fiscal policy depends significantly on the money demand's degree of interest-elasticity. The more elastic is the money demand to the interest rate, the smaller is the change that could occur on the latter when the demand for money increases following the positive macroeconomic effects of the fiscal expansion. When the interest-elasticity of the money demand is at its lowest, the expected increase in the real output following a given expansionary fiscal policy is quite weak. A low interest-elasticity in this context means that the interest rate has to increase at an important pace in order to validly interact with the money demand. And since investment is reversely correlated with the rate of interest, the latter would drive, in this case, a downward impact on private investment, which would slow down the economy, thereby partially counterbalancing the propitious macroeconomic effects of the said fiscal policy[13].

[11] At the theoretical level, a pure fiscal policy is when a public budgetary change leaves the money supply unaltered. It is however important to bear in mind that at the empirical stage, a change in fiscal policy usually generates a significant impact on the money supply. See Levacic & Rebmann (1982; 48-49).

[12] In the Moroccan case and based on historical data, it is highly unlikely to observe the indirect impact of fiscal policy on the interest rate, since the latter has been relatively rigid. In this frame, we recommend the use of the weighted average interest rate (TMP), which is more flexible and therefore more representative of what is actually taking place at the monetary market.

[13] According to the theoretical literature, fiscal policy's impact on real output could be effective notwithstanding the drop in the interest rate.

This having been mentioned, it is possible for some monetary components to influence the efficiency of a given fiscal policy –as regards to the real output- depending on the degree of the money demand's elasticity vis-à-vis of the interest rate, even in the Keynesian pure fiscal policy paradigm.

At this level, Classical theorists begin their logic with assumptions that share few similarities with the Keynesians'; they end up, however, with an evidently different conclusion. As a common ground, the nominal money supply stays unchanged after an expansionary fiscal policy, since the deficit is financed by the sale of treasury bonds. Nonetheless, this would lead to an increase in the aggregate demand, which would generate significant inflationary pressures and, ergo, trim down the value of the real monetary balances. In order to regulate the disequilibrium that would have been created in the money market between the real balances stock and the demand, the interest rate is supposed to rise. A higher interest rate drives a downward influence on private investment. In the Classical perspective, the counterpart of this impact depends however on whether the fiscal expansion was led through tax cuts or expenditure increases. In the first case scenario, the increase in interest rate would direct the amounts that ought been invested, into additional consumption. In the second scenario, the decrease in investment would "make room" for supplementary public spending. It is through this very mechanism that Classical economists give explanation for the crowding out effect. Seen from this point of view, an expansionary fiscal policy would generate the opposite effects discussed by the Keynesians[14].

Besides from the potential second-round monetary repercussions of fiscal policy, the Keynesians also laid emphasis on monetary transmission mechanisms in the IS-LM framework, following an independent change in the monetary authorities' stance.

The adjustment of monetary aggregates, which is the first prerogative of any central bank, could be led in this context through the open-market buying or selling of government bonds –

However, this hypothesis only stands if private investment is perfectly unresponsive to changes in the interest rate. See Hicks (1937: 147-149).

[14] Also see Levacic & Rebmann (1982; 53).

since they are the only financial assets incorporated in the IS-LM. Namely, it is possible to carry out an expansionary monetary policy by buying public bonds from economic agents and, following the same logic, a restrictive monetary policy by selling the said bonds. Whereas, in order for them to purchase bonds in the open-market, public authorities are bound to increase the bonds prices as to make the ones held by the public –to some extent- less attractive as opposed to money; thereupon, the central bank gets to increase the money supply, through an interest rate reduction, as economic agents become willing to sell a part of the public securities that are in their possession[15]. The same logic applies to the case of monetary contraction, where the purpose is to sell bonds and to decrease the money supply/inflationary pressures.

In the case of a monetary expansion, the initial raise in the monetary supply would cause disequilibrium, since the demand for money does not change as output/income remains the same, *ceteris paribus*. Following this jump in money balances, the demand for goods and services is likely to increase, but so is the demand for government bonds[16]. It is assumed that the bonds supply is not subject to any initial variation. Ergo, the prices of public securities would progress significantly while the interest rate falls. As a result, private investment is supposed to improve as well as consumption, particularly when it comes to durable goods (which could be subject to bank loans). The strengthening of the global demand would eventually drive an upward effect on output and employment, hence the economic role of monetary policy.

However, this transmission mechanism could be of no avail in the case of a highly interest-elastic money demand; the interest rate's decrease would be quite weak after an expansion in the money supply, thereby laying an insignificant influence on

[15] According to the basic IS-LM model that constitutes the backbone of the Keynesian theory, the interest rate and government bonds prices/premiums are conversely correlated.

[16] The proportion of the respective increase in the demand for good and the demand for securities could be approached by the propensities to consume (c) and to save ($1-c$).

investment and durable goods consumption. As a consequence, output would grow in a barely noticeable proportion.

Then again, the neoclassical school advocates an entirely different point of view regarding the monetary transmission mechanism in the IS-LM model. According to the Quantity Theory of Money's neutrality postulate, variations that occur in the money supply would not have any noticeable effect on the macroeconomic aggregates; they are likely to drive influence on only the price level (Humphrey, 1974).

Following the same example developed in the present section, an increase in the money supply would lead to a jump in the demand for government bonds, provided that the nominal demand for money balances stays unchanged, which is likely to bring down the interest rate. As discussed above, the interest variation would help boost investment and consumption of durable goods, thereby enhancing the global demand. As a consequence, the price level is supposed to rise until the real money supply equals once more the money demand. In this case, the LM part of the model would have returned to its initial position, while the real economic variables would fall back gradually to their original values.

Thus, a monetary expansion would not generate any consistent effect on income and employment; it would only lead to a continuous increase in inflationary pressures. In this frame and from a monetary perspective, even the impact of an expansionary fiscal policy on the price level could be quite hazardous, especially when the budget deficit is financed by a monetary expansion.

In the neoclassical conception of the IS-LM model, even when the deficit is financed by public securities, inflationary tensions are inevitable. However, we should bear in mind, in this frame, that the major difference between the neoclassical and Keynesian versions of the IS-LM model is not their specification of aggregate demand, i.e. the IS and LM functions. It is rather the assumptions made about the supply side responses of the economy which result in different conclusions regarding the outcome of public policy on several macroeconomic aggregates, particularly economic growth.

In the next subsection, we deepen the discussion and review modern theories that have tackled the very question of economic

growth, its determinants and the economic policies that could be effective on output, given different types of conjunctures and for differently characterized economies. We start with the main contributions of several economists from the Growth Theory paradigm. The light is shed on the different patterns of growth models and on how public investment expenditures –and economic policy in general, are perceived in each one of them. Then, we switch emphasis to different determinants of GDP growth, where we underline the role of technological progress, investment, but also human capital, education, infrastructure investment, and other variables that are believed to drive a concrete influence on economic growth. The downstream aim is to find out how to fit public investment among those variables and to define the extent to which public policy can help improve of the economic activity in general.

The concept of economic growth in theory

The concept of economic growth is still considered to be quite "modern", or at least the great attention that has been given to its mechanisms and to the improvement of its pace. Yet, it is a phenomenon that had seen the light back in the 18th century (Bairoch, 1993; Easterlin, 1996).

According to several empirical studies, economic growth plays an important role in the shaping of the living standards of a given population. Differences between countries in terms of growth rates are shown to lead, if maintained over a long period of time, to noteworthy gaps in human welfare between their respective populations. Some authors demonstrated the latter statement through a comparison between the East Asian economies and the Sub-Saharan African ones since the 1960s, i.e. more or less the end of the colonization (Snowdon, & Vane, 2005: 589). The stark difference between these two sets of countries in terms of economic growth rates over the past decades and the respective average level of living standards has been used by some proponents of the Trickle Down theory in order to defend that economic growth actually "trickles down" to all the population, thereby contributing directly to the human development. Linking economic growth to –human- development has also been the subject of an important

number of research papers during the last four decades. As an example, Rosenberg & Birdzell (1986) defend that in the short run people have the tendency to believe that the gains from economic growth are experienced exclusively by the wealthy. However, both authors explain that, in light of the accumulated economic growth through the twentieth century, working classes in developed countries were prospering and growing as a proportion of the whole population, as the incidence of poverty itself was reduced from 90 percent of the population to 20 percent more or less, depending on the country and on the definition criteria of poverty.

This argument is confirmed by Crafts (2003), who illustrates the propitious impact of economic growth on human development by showing its correlation with life expectancy and how the latter contributes to the enhancement of living standards.

It is important however to notice that demographic growth could blur the impact of economic growth on development, in the sense that an increase in GDP could be absorbed if matched with a proportional progression in the population. It is also possible to reach higher or lower per capita income through variations in the population. In this framework, Reynolds (1985) makes a distinction between *extensive* and *intensive* growth. The former is when a GDP growth is fully absorbed by a demographic progression with no positive variation in per capita income; the latter is when the GDP growth is more important than the population's expansion.

As History shows, extensive growth had been predominant for centuries, as the large majority of the world population was bound to subsistence standards of living as economies allegedly kept moving forward. This finds explanation in the fact that possibilities for sustained intensive growth were particularly scarce in primary sector-based economies. According to Reynolds (1994), the availability and productivity of land determined the amount of extensive growth, but once the supply of suitable agricultural land was exhausted, decreasing incomes set in. This historical evidence provided contextual background to Robert Malthus's bleak prediction of an ineluctable long-run stationary state where nearly all humankind would be living on the strict minimum.

As for the intensive form of growth, it took place only during a relatively short period of time[17], and it is possible to make a distinction between "Smithian" intensive growth and "Promethian" one, mostly based on their level of sustainability. The former fits partially in the logic described above by Reynolds (1994), in the sense that the growth generated from productivity-enhancing resource reallocation, division of labor and trade, remains limited and the returns end up decreasing *in fine*. On the other hand, "Promethian" intensive growth, which is mainly driven by innovation and investment in new technologies, offers consistent elements of sustainability and provides larger perspectives of evolution for the economy.

In order to get more insight on the ins and outs of the economic growth according to the literature, we start this section by discussing the main contributions of the Growth Theory School, which regroups several economists that dedicated the buckle of their research to this particular topic. Then, we switch emphasis to the determinants of GDP growth, in light of the aforementioned theoretical contributions, among others.

Main contributions of the Growth Theory

One the most influential contemporaneous schools that tackled the question of the ins and outs of economic growth and helped switch the research paradigm regarding this matter is, without a doubt, the Growth Theory. According to the literature at this regard, the growth theorists make the difference between *proximate* sources of growth and *deep* ones. The main variables that have been examined in the first category are capital and labor, as well as their accumulation and the degrees of their respective productivity, besides from the elements that influence the latter (technology, innovation…). In this framework, Rodrik (2003) argues that, when analyzing the accumulation of the aforementioned production factors in different countries, one cannot miss the significant disparities between the said countries

[17] According to economic history literature, the intensive growth pattern could have been triggered by the industrial revolution. The period of time (several decades) is considered however to be quite small, compared to centuries of extensive growth paradigm.

regarding the amount of success in adopting new technologies, or simply in producing and accumulating the said production factors. Obviously, some economies have more advanced paces than others at this particular level (Rodrik, 2003).

In order to find explanation to these disparities, several growth theorists went beyond the *proximate* determinants. Economists like Rodrik (2003) and Temple (1999) focused on the *deep* (also said *fundamental*) causes of economic growth, which relate to those variables that lay influence on an economy's capacity to accumulate human and physical capital and to invest in the production of knowledge and innovation[18]. In this context, Temple (1999) argues that population growth, income distribution, trade regimes, the size of the government, but also the overall macroeconomic, political and social environments have a tangible impact. Analyzing the *fundamental* determinants of economic growth helped shift emphasis to the institutional aspects of a given economy. According to several World Bank reports, good governance and institutions represent a "crucial precondition for successful growth and development". Moreover, Abramovitz (1986) drew attention to the determinant role of an economy's *social capability* when it comes to economic growth (Abramovitz, 1986).

Some of these hypotheses, among other assumptions, were encompassed in integrated workhorse models in order to facilitate their assessment when it comes to economic implications. According to the literature, there are three main patterns of economic growth theory models. The first one to be ever created was the New Keynesian Harrod-Domar model, developed by the year 1948 by Roy Harrod and Evsey Domar. The emphasis was then significantly shifted toward the neoclassical framework in 1956, with the development of the Solow-Swan growth model. As a response to the theoretical and empirical insufficiencies observed in the neoclassical model, a type of models initially developed by Paul Romer and Robert Lucas, led the way toward *endogenous* growth theory.

[18] The logic is explained in Temple, (1999).

The New Keynesian Harrod-Domar model

The theories behind this model were separately developed by Harrod (1948) and Domar (1947). Their respective works aimed to assess the long-term dynamics of capitalist market economies, thus transcending the initial static Keynesian short-run paradigm. In his research, Keynes argues that investment drives a significant impact on aggregate demand. Harrod and Domar, however, shed the light on the supply-side effect, namely how investment spending helps enhance the productive capacity of a given economy.

The model is based on the assumption that the labor force growth rate is exogenous, and the capital-output ratio has an unchanged value (the technology is assumed to be fixed). Given an economy that encompasses only firms and households, and since national income (Y_t) would in this case equal consumption (C_t) and saving (S_t), we write:

$$Y_t = C_t + S_t$$

In order for the economy to reach equilibrium, all saving must be invested. We write:

$$I_t = S_t$$

As a consequence, it would be possible to say that the national income (which represents also the GDP) equals consumption and investment:

$$Y_t = C_t + I_t$$

Also, given that the capital stock is subject to a persistent depreciation (δ), while investment helps push it upward, it can be written as follows:

$$K_{t+1} = K_t - \delta . K_t + I_t$$
$$\text{Or} \quad K_{t+1} = (1 - \delta)K_t + I_t$$

As mentioned above, the capital-output ratio ($\frac{K_t}{Y_t}$) is supposed to be fixed. This implies that the variations in these two variables are proportional, hence $\frac{\Delta K_t}{\Delta Y_t}$ is also fixed. We write:

$$\varphi = \frac{K_t}{Y_t} = \frac{\Delta K_t}{\Delta Y_t} \text{ Therefore} K_t = \varphi . Y_t$$

It is possible to say that total saving is a certain proportion (τ) of national income:

$$S_t = \tau . Y_t$$

If we take into account the aforementioned equilibrium condition, in which investment is strictly determined by saving:

$$K_{t+1} = (1 - \delta)K_t + \boldsymbol{S_t}$$

After replacing K_t and S_t: $\boldsymbol{\varphi . Y_{t+1}} = (1 - \delta)\boldsymbol{\varphi . Y_t} + \boldsymbol{\tau . Y_t} = \varphi . Y_t - \delta . \varphi . Y_t + \tau . Y_t$

When dividing both sides of this equation by φ then moving Y_t to the left side:

$$Y_{t+1} - Y_t = [(\tau/\varphi) - \delta] . Y_t$$

Dividing by Y_t gives us:

$$[Y_{t+1} - Y_t]/_{Y_t} = (\tau/\varphi) - \delta$$

The left side of this final equation represents evidently the growth rate, which can be replaced for the sake of simplification by the letter G per example. Thus, according to the Harrod-Domar model, economic growth rate is tributary to the saving ratio τ divided by the capital-output ratio φ, minus the capital stock depreciation rate δ. In other words, the more important the saving ratio and the lower is the depreciation rate and the proportion of capital compared to output, the higher is the growth rate. As for the depreciation rate, it was considered by both authors to be of no tangible influence on the economic growth and was not taken into account in several arguments after that.

More saving implies more investment. The mainstay of the Harrod-Domar model is quite simple: more investment and relatively less capital accumulation in order to support GDP growth. Used in development economics research areas, the solution to underdevelopment would be to simply increase resources dedicated to investment. And as the growth rate is positively correlated to the savings ratio in this model, several economists, such as Lewis (1954) and Rostow (1960), focused their research on the means of raising private savings ratios with the purpose of enabling underdeveloped countries to converge toward self-sustained growth. Following this paradigm, public fiscal policy was considered as a prominent tool according to development economics theorists during the 1950s, especially that a budgetary surplus can hypothetically substitute for private domestic savings. Some works also took into account the significant role of foreign aid when reducing the savings gap in developing countries.

However, the main downside of the Harrod-Domar model is the fixity of the capital-output ratio, to which we refer above as φ. In principle, $\frac{1}{\varphi}$ represents the *productivity* of capital; a fundamental concept when it comes to analyzing the effectiveness and efficiency of the investment policy, which is most relevant to the logic developed in the next chapters of this research thesis. Since the capital stock depreciation ratio influence on growth could be neglected, it is possible to state that GDP growth is tributary to the savings ratio multiplied by the productivity rate of capital. The latter variable should not be given. Moreover, according to Griffin (1970), the propitious effect of aid on investment was overrated; as a matter of fact, foreign inflows often led to a decrease in domestic savings alongside a decline in the productivity of capital. Nonetheless, this observation could not be assessed in the Harrod-Domar framework.

Another shortcoming of this model is the hypothesis of zero substitutability between capital and labor, which can be deduced from the abovementioned exogenous aspect of the labor force growth rate and the fixed factor proportions production function. The latter reflects a rigid technology, and strictly limits the margin of fluctuation and evolution regarding this particular aspect,

thereby making it quite difficult for the economy to reach equilibrium with full employment of both capital and labor. As mentioned before, the capital-output ratioφ is assumed to be fixed, which implies that capital and output are bound to progress at the same pace in order to maintain equilibrium. It is worth noticing that Harrod and Domar also put forward the constancy of the capital-labor ratio $\frac{K}{L}$. This means that capital and labor must also increase at the same rate. Thus, if labor is supposed to follow the same rhythm of expansion as the population growth ΔN_t, then the sole way to maintain the economy at equilibrium is for the population growth rate to be the same as the economic growth rate:

$$\Delta N_t = {[Y_{t+1} - Y_t]}/{Y_t} = {\tau}/{\varphi}$$

(Here we neglect the impact of capital depreciation, as mentioned above)

If population growth rate exceeds GDP's variation, unemployment would persistently increase, thereby generating disequilibrium in the labor market and, by extension, in the economy. And if it is underneath the economic growth rate, the capital stock would progressively decrease -in order to match the relative decline in labor, and the growth rate with it until $\Delta N_t = \Delta Y_t$. Otherwise, if labor and capital do not grow at the same pace, the economy would lose its frail equilibrium. This element do not meet empirical evidence, which suggests that production factors progress in different rates and that technology changes can shift the economy into different settings of both factors without necessarily generating disequilibrium and confusion.

In order to respond to the deficiencies of Harrod-Domar model regarding technology and the respective contribution of labor and capital to economic growth, we discuss below some models that tackled these very questions in a more elaborate way.

The Neoclassical Solow-Swan model

Initially developed in the works of Solow (1956) and Swan (1956), this model, best known as the Solow neoclassical model of economic growth, assesses the effect of saving, demographic growth and technology on GDP growth. It is based on several

main assumptions, particularly the hypothesis that factor prices are flexible in the long term and respond to excess demand, which allows factor substitution by firms in response to changes in relative factor prices. Aggregating this response by firms across the economy would lead to changes in the factor proportions utilized in order to generate output (Levacic & Rebmann, 1982).

So, in response to the deficiencies observed in the Harrod-Domar subsection, the neoclassical model considers the capital-output ratio $\frac{K}{Y}$ and the capital-labor ratio $\frac{K}{L}$ to be flexible. And all the proportion of output that goes to saving is totally invested. It also considers the assumptions of full price flexibility and monetary neutrality, and GDP is supposed to be persistently at its potential level. Unlike the Harrod-Domar model, the Solow model is based on the existence of technological progress; its rate, as well as the capital stock depreciation's and the population growth are determined exogenously. And in order to simplify, the model takes into account an economy made of one sector and one type of product that can used for both investment and consumption.

According to Mankiw (1995), one of the strengths of Solow's version of the neoclassical growth model is that, despite its simplicity, it has many predictions. In evaluating the usefulness of the model in explaining growth experiences, it is worth stating namely: 1. In the long run, the economy approaches a steady state that is independent of initial conditions. 2. The steady-state level of income depends on the rates of saving and population growth. The higher is the rate of saving, the higher is the steady-state level of income per person; the higher the rate of population growth, the lower the steady-state level of income per person. 3. The steady-state rate of growth of income per person depends only on the rate of technological progress; it does not depend on the rates of saving and population growth. 4. In the steady state, the capital stock grows at the same rate as income, so the capital-output ratio is constant. 5. In the steady state, the marginal product of capital is constant, whereas the marginal product of labor grows at the rate of technological progress. These predictions are broadly consistent with experience (Mankiw, 1995). Moreover, the simplicity of the neoclassical model, together with its ability to yield substantive

and seemingly reasonable predictions, has given it a prominent place in the macroeconomist's toolbox (Mankiw, 1995: 278).

The model tackles the *proximate* sources of growth and is built around three main functions, i.e. the production function, the consumption function and the capital accumulation process. The first one, based on the neoclassical aggregate production function, is written initially as follows:

$$Y = f(K; L)$$

One of the key hypotheses here is that the production function is increasing (positive first derivative) but concave (negative second derivative), and that it perfectly respects the Inada conditions. More elaborately, when capital and/or labor increase, the marginal returns generated by this variation would be positive, but progressively diminishing. Besides, it is assumed that the higher is the capital-labor ratio $\frac{K}{L}$, the smaller becomes the marginal product of capital, and vice-versa. This finds explanation in the fact that, in an economy with a given level of technology, the capital-labor ratio would increase if there were, per se, more machines per worker. Subsequently, the output per worker/capita $\frac{Y}{L}$ (i.e. labor productivity) would reach a higher level. On the other hand, as (marginal) returns tend to diminish, the effect driven by this capital accumulation per worker (per capita) on output would become thinner as $\frac{K}{L}$ keeps going upward. Accordingly, the impact of a certain progression in $\frac{K}{L}$ on $\frac{Y}{L}$ is likely to be more important if capital is not relatively abundant. This observation led the proponents of the Solow model to defend that capital accumulation would have a larger impact on labor productivity in developing countries, as opposed to developed ones. Following this logic, in an open economy framework with no rigidities on capital mobility, capital is supposed to flow from developed countries to developing ones *ceteris paribus*.

Expressed in a more elaborate way, income can be expressed as in:

$$Y = A_t f(K; L)$$

This could be written as follows, in the Cobb-Douglas version:

$$Y = A_t . K^{\propto} . L^{\beta}$$

Where ∝ and b are weigh parameters, reflecting the proportion of capital and labor in income; their sum usually equals 1[19]. This function, best known as the aggregate production function, is assumed to exhibit constant returns to scale, i.e. if capital and labor are raised by a certain rate, output would increase according to the same exact rate. A_t represents total factor productivity, i.e. the way production factors are used in order to generate output. This variable is considered to be exogenous, depending basically on time. As defended by Solow (1956) and Mankiw (1995), among other neoclassical growth theorists, technology follows the same logic as a –free from charges- public good. If we consider the world economy, this would imply that all countries, despite their different levels of development, are allowed access to the same technology, ergo they are likely to follow the same production function. In other words, the neoclassical model of economic growth predicts that, in the long run, output per capita in all countries will grow at the same exogenously determined rate of technological progress.

Several economists disagree with this assumption and insist that there are severe technology gaps between countries. Fagerberg (1994) argues that the only factor left within Solow's framework that can explain differences in per capita growth across countries is the "transitional dynamics". Since initial conditions are generally different, economies may grow at different rates in the process towards long-term equilibrium. By the time said economies will reach this long-run equilibrium, disparities in terms of income would have narrowed down and eventually disappeared. On the other hand, Solow's model seems to have overlooked the interaction between capital accumulation and technological progress: according to several theorists, new technology is usually embodied in new capital goods (Fagerberg, 1994)[20].

[19] In the literature and based on the fact that the sum of both parameters equal unity; β would logically equal 1-α

[20] See also Johansen (1959) and Nelson (1964).

The second key component of Solow's model is the consumption function. As mentioned earlier, it is assumed that output per worker/capita $\frac{Y}{L}$ is positively tributary to capital per worker/capita $\frac{K}{L}$. Based on this hypothesis, it is important to understand how the latter evolves over time, i.e. capital accumulation, which is largely determined by saving. As mentioned earlier in the Harrod-Domar subsection, income –which equals output-, encompasses consumption and investment:

$$Y_t = C_t + I_t$$

And since $I_t = S_t$ and $S_t = \tau . Y_t$, it is possible to write:

$$Y_t = C_t + \tau . Y_t$$
$$\text{Thus } C_t = (1 - \tau) . Y_t$$

Capital accumulation plays an important role in the neoclassical framework of growth analysis. It constitutes the 3rd key component of Solow's model, and is initially based on the hypothesis that capital stock is subject to a persistent depreciation (δ), while investment helps push it upward. As written in the previous subsection and in light of the other elements presented here:

$$K_{t+1} = (1 - \delta)K_t + \boldsymbol{I_t} = (1 - \delta)K_t + \boldsymbol{\tau . Y_t} = K_t - \delta . K_t + \tau . Y_t$$
$$K_{t+1} - K_t = \tau . Y_t - \delta . K_t$$

In order to study capital accumulation in relation with labor, we subdivide both sides of the equation by L:

$$\frac{K_{t+1}}{L} - \frac{K_t}{L} = \frac{\tau . Y_t}{L} - \frac{\delta . K_t}{L}$$

This last equation illustrates the principle according to which capital accumulation evolves through time. According to the literature, the fundamental differential equation of the Solow model in this framework is usually written as follows[21]:

[21] In a more elaborate way, the equation also takes into account the technology growth rate (g) such as $\dot{k} = [sf(k) - (n + g + \delta) . k]$.

$$\dot{k} = \tau f(k) - \delta . k$$

Where $\dot{k} = \frac{K_{t+1}}{L} - \frac{K_t}{L}$ is the variation of capital input per worker, and $\tau f(k) = \frac{\tau . Y_t}{L}$ represents saving (investment) per worker. As for $\delta . k = \frac{\delta . K_t}{L}$, it represents the level of investment required in order for the capital-labor ratio to stay invariable. Solow's model takes into account the assumption that the labor force grows proportionally to the population growth rate n. Since $k = \frac{K_t}{L}$ an increase in the labor (e.g. due to a demographic expansion Δn) would drive a downward influence on k, just like capital depreciation do.Ergo, the equation can simply become:

$$\dot{k} = \tau f(k) - (n + \delta) . k$$

The steady state, which has been discussed above, can then be expressed as:

$$\tau f(k^*) - (n + \delta) . k^* = 0$$
$$\text{Thus:} \quad \tau f(k^*) = (n + \delta) . k^*$$

In a nutshell, the steady state is where saving (investment) can only cover the combined effect of population growth and capital depreciation per worker/capita, in a way that the capital-labor ratio stays unchanged. According to the literature, when $\tau f(k)$ is larger than $(n + \delta) . k$, the capital-labor ratio progresses, and vice versa. It is worth noticing that public finance could play a prominent role in influencing the course of capital accumulation, through the strengthening of $\tau f(k)$ in this particular framework.

If we apply the same logic here to the income function $Y = A_t . K^{\propto} . L^{\beta}$, we can write the equation below. Provided the hypothesis that returns to scale do not change, output per worker

However, all these rates are assumed to be exogenous. In the present thesis, we chose not to further analyze*g*since its underlying philosophy has already been discussed and its implications are not significantly related to the elements developed in the empirical chapter below. See Mankiw (1995: 276, 282 and 309). See also Snowdon & Vane (2005: 607).

$\frac{Y}{L}$ is not likely to be influenced by the scale level of output. In the Solow model, it is also assumed that for a given technology A_0, the output-labor ratio $\frac{Y}{L}$ is positively correlated to capital per worker $\frac{K}{L}$.

$$\frac{Y}{L} = A_0(K^{\propto}.\frac{L^{1-\alpha}}{L}) = A_0(K^{\propto}.L^{\mathbf{1}-\alpha}.L^{-\mathbf{1}}) \qquad \text{As} \quad \beta = 1-\alpha$$

$$\text{Then} \quad \frac{Y}{L} = A_0(\frac{K}{L})^{\propto}$$

If we take $y = \frac{Y}{L}$ and $k = \frac{K}{L}$, the intensive form of the aggregate production function can be written as follows:

$$y = A_0(k^{\propto})$$

According to this function, the higher is the capital per worker the more important is output growth per worker, provided that the economy remains at an exogenously determined level of technology. This finding, among other aspects mentioned above, suggests that capital-increasing fiscal policy is likely to improve GDP growth, on condition that demographic growth stays stable (*ceteris paribus*). Although, this observation does not apply to long-run output growth, as shall be explained below. On the other hand, it is worth noticing that this function exhibits diminishing returns on capital, i.e. the more important is capital accumulation the less marginal returns it generates.

The Solow model gave a tremendous importance to technology as an explanatory variable that allows stronger output growth, by making it possible for a given economy to enhance its efficiency through different input combinations. Nevertheless, the fact that this key component of the neoclassical model of growth (i.e. technological progress) could not actually be explained by the model raised a significant wave of criticism. In an attempt to develop the model's structure, Arrow (1962) incorporated the "learning by doing" concept, which is supposedly at the origin of technological progress and productivity improvement. According to Arrow, experience uplifts labor's productivity; he argues that "technical change in general can be ascribed to experience, that it is the very activity of production which gives rise to problems for

which favorable responses are selected over time" (Arrow, 1962). In a nutshell, experience is tributary to cumulative investment expenditures that have an effect on the work environment.

As a whole, the Solow model has shown several deficiencies. One major shortcoming is the fact that long-run economic growth does not find satisfactory explanation in this model. Asmentioned above, public economic policy can influence the level of output per capita/worker, whereas it has no effect on long-run GDP growth. Moreover, growth rate can only gather (or lose) pace temporarily during the aforementioned "transitional dynamics" toward a new steady state. However, sustained growth is still possible according to Solow's model, but only when there is technological progress. Then again, the only variable that could explain why there has been economic growth in world economies, i.e. technology, is left outside the model as it was shown in this subsection. This also narrows the interest toward this model regarding public long-run economic growth policy, as in the case of the present doctorate thesis.

To sum up, in the Solow neoclassical model of economic growth, capital accumulation is far from accounting for either continuous growth of output per capita in the long-run, or the tremendous gaps that can be noticed empirically between countries and geographical regions (even within the same country) in terms of welfare and living standards.

Starting from the strengths of this model and as a response to its deficiencies, Romer (1986) and Lucas (1988), among other growth theorists, developed an alternative model with a competitive framework where long-run economic growth is tributary to investment decisions rather than exogenously determined technological progress. The next subsection discusses the different findings in this framework.

The Romer-Lucas endogenous growth model

According to the aforementioned work of Arrow (1962), capital accumulation -which is translated into technical changes that touch the work environment, generates positive spillover effects on knowledge and learning among the labor force. The endogenous growth model, as introduced by Paul Romer (1986) and completed

by Lucas (1988), started from this finding and expanded the notion of capital to include research and development spending (R&D) and human capital formation, besides from the obvious physical capital [22]. In this framework, capital accumulation has a significantly more important role in the economic growth process, as opposed to the neoclassical model.

Here, knowledge is considered to have the characteristics of a public good since what the labor force learns in one firm is assumed to have a positive external effect on the production possibilities of other firms, because "knowledge cannot be perfectly patented or kept secret" (Romer, 1986: 3). Therefore, no firm can actually entirely internalize the propitious impact driven by their investment in physical and human capital on the stock of knowledge in the economy as a whole.

Following this logic, technology is included in the production function as an endogenous variable:

$$Y = f(K, L, A)$$

Unlike the neoclassical Solow model, this aggregate production function is assumed to exhibit increasing returns to scale, rather than constant ones. Another noteworthy difference is that Solow (1956) and Swan (1956) argue that returns to capital tend to progressively diminish, while the endogenous growth model does not. Moreover, the Romer-Lucas model supports the hypothesis that technology -or knowledge in general- is tributary to the growth of capital, since positive technological externalities are strengthened when there is an increase in the capital per worker ratio $\frac{K}{L}$ (capital *deepening*). Consequently, when K increases, it drives an upward influence on A, thereby uplifting the productivity of the economy as a whole according to the "learning by doing" logic as presented by the end of the previous subsection. In simpler words, economic growth is driven by investment, and the hypothesis of the nonexistence of diminishing returns to capital makes it possible for economic growth to sustain its pace as capital

[22] The major part of this logic is taken into account in what is defined as productivity-enhancing investment expenditures in the last two chapters of the present research thesis.

deepening takes place. In this case, the economy would fit in the *Promethian* type of growth, and would permanently increase its growth after each raise in the investment per GDP ratio.

However, several economists criticized the model's findings based on the so-called historical inconsistency of its core hypothesis, i.e. technology and knowledge as a free-from-charges public good. Empirical evidence shows that one of the most important problems that underdeveloped countries come up against is nothing but technology gaps. As a response to this wave of criticism, Romer (1990) enhanced his initial model based on three main premises. First, at the image of Solow's (1956) neoclassical model, it is assumed that technological progress (improvement in the production instructions for "mixing together raw materials") lies at the heart of economic growth (Romer, 1990: S72). Technological progress motivates economic agents into continuous capital accumulation which, combined with technological progress itself, account for much of the increase in output per hour worked. The second premise is that technological progress is an endogenous variable since it is assumed to arise in large part as a consequence of intentional actions taken by people (e.g. economic agents, scientific researchers…) who respond to market incentives[23]. The third and most important premise is that once the cost of creating a new technology –and a new set of production instructions with it- has been incurred, the said technology can be put to use over and over again without any additional cost. Romer compares the development of new production instructions to incurring a fixed cost, which makes technology "inherently different" from other economic goods. In this framework, Romer admits that the benefits of knowledge/technology have to be at least partially excludable, in order to encourage the investment that is supposed to trigger such technological progress. Since the second premise states that technological progress arises in principle as a consequence of

[23] Here, Romer (1990) accepts that, per example, an academic scientist who is supported by government grants would not be motivated by market profit in order to seek new technologies. The idea is that profit starts playing a crucial role only once new technologies are translated into goods with market value.

purposeful actions taken by economic agents who are self-interested, the said progress must at least generate benefits that are motivating enough to these agents and which are supposed to be higher than what other people would generate afterward. Unlike public goods, which are non-rival and non-excludable, knowledge is assumed to be only non-rival[24]. In other words, its use by a given firm does not technically stop others from using it, but said firm can prevent them via legislation and patent restrictions.

Following this logic, the endogenous model of growth rejects the neoclassical hypothesis that considers technology to be a pure public good, hence accessible by everyone across the world without restrictions. Differences in incomes at the international level could be explained by differences in productivity, the latter being tributary to technology gaps, which are also known as "idea gaps". This finding was confirmed by several economists, particularly Parente & Prescott (1999), who affirm that productivity gaps are due to the existence of barriers in the form of lobby-based high costs of entry which prevent economic agents in many developing economies from improving their respective technology and production process (Parente, & Prescott, 1999). Subsequently, if the developing world's problem is rather *idea* gaps than *object* gaps (i.e. physical capital gaps), then it would be possible to stem the tide of income disparities and poverty in several countries simply via technological catch-up, which would come at a relatively low cost. This perspective implies that economies that are isolated in terms of foreign economic exchanges are in effect raising barriers to the adoption of new technologies, thereby increasing their probability of having a lethargic GDP growth rate. A clear silver lining of economic openness is foreign direct investment (FDI), which can significantly facilitate the transmission of innovation and know-how, thereby boosting income growth. As a consequence, technological catch-ups can be made possible if developing countries at least encourage inward

[24] Rivalry is a purely technological attribute, in the sense that a purely rival good has the property that its use by one firm or person precludes its use by another, while excludability includes a legal aspect, i.e. a good is excludable if the owner can make use of the legal system in order to prevent others from using it. See Romer (1990: S74).

FDI flows and invest in human capital, in order for the workforce to be able to acquire and assimilate technological progress itself.

In support to the importance of human capital, recent studies came up with the conclusion that investment in physical capital and in education play roughly similar roles in the determination of output, which implies that economic growth depends roughly equally on the amount of physical capital and the amount of human capital in the economy (Blanchard & Johnson, 2013). Blanchard & Johnson (2013) say in this framework that countries that save more and spend more on education are likely to reach significantly higher steady-state rates of output per worker/capita. They explain that both forms of capital can be accumulated, the former through private and public physical investment, and the latter via education and training. According to these authors, there is a consensus among endogenous growth proponents regarding the fact that increasing either the saving rate or the fraction of output spent on education might lead to much higher levels of output per worker/capita in the long run. Nonetheless, seen the rate of technological progress, increasing education expenditures would not lead to a sustainably higher growth rate.

From the elements developed in this section as a whole, it is possible to read the importance of investment and capital accumulation in the improvement of economic growth, whether directly or through the facilitation of technological progress. In this context, it is most valuable to bear in mind that reducing restrictions to international trade is not enough to boost FDI flows and GDP growth; it could even generate reversed effects when the ground for such investments –and the technology that comes along with them- are not satisfactory. Private investment in general, whether at the national scale or through FDI, is usually motivated by a ripple effect as regards to fiscal policy, particularly public investment. The latter provides in principle the required infrastructures regarding logistics, transport infrastructures, education and public health services, which are considered as *sine qua non* preliminary conditions for any investment in human or physical capital, hence for any progress in terms of economic growth and development.

In order to deepen the discussion regarding the relation between growth and its determinants, we take this issue into an empirically founded level with practical cases of developed and developing countries in the section below. But before doing so, we first make a swift emphasis on some further elements that could bring some additional explanatory power over growth.

Further determinants of economic growth

According to the discussion above, three main growth factors can be identified, namely capital accumulation, human capital formation and technology/innovation. All three involve investment, respectively in physical capital, in education and knowledge, and in research and development (R&D).

Stern (1991) goes beyond these elements and adds three other potential determinants of growth, i.e. organizational management, infrastructure and allocation of output across directly productive sectors. According to the author, infrastructure deficits, together with a non-optimal management and economic organization, are likely to account for a significant part of low factor productivity in developing countries. He illustrates with the example of a private factory that works in an environment characterized by weak water and electricity supplies, unreliable transport infrastructures and expensive access to other logistics. It is important to note in this framework that, infrastructure spending constitutes the buckle of public investment. In this perspective, public infrastructure investment plays a crucial role in economic growth and development. Based on several studies laid by the World Bank, it is broadly accepted that infrastructure and GDP growth are linked by a more or less one-to-one correlation in developing countries, i.e. a 1 percent rise in the infrastructure stock would lead to a 1 percent progression in output growth.

As regards to the organizational factor of economic growth, well managed firms are supposedly likely to improve output by working with efficiency, and even in the case of a small capital-labor ratio -and thus allegedly strong incomes[25], capital can

[25] The underlying mechanism of this phenomenon has been explained previously, in the subsection about the neoclassical model of growth.

squarely be unproductive if combined with a weak organization. Moreover, Stern (1991) argues that a system where individuals behave dishonestly, where bureaucracy is obstructive, or where property rights are unclear may lead to a very wasteful allocation of resources in insuring against dishonesty, circumventing bureaucracy or enforcing property rights. The costs involved and the distortion of incentives in this framework might critically clog GDP growth[26].

Empirical studies provided evidence on the importance of the three factors Stern (1991) defends, besides from the ones presented by Solow (1956), Romer (1986) and Lucas (1988). A strong rolein stimulating the growth process was assigned to both competition and government action by offering, for example, education and infrastructure (Stern, 1991). Barro (1997) led a study in order to classify growth determinants in over 100 countries, which backed up and extended the broad lines of Stern's stipulations. Besides from the latter's three additional factors, Barro includes levels of education, fertility, inflation, government consumption, the rule-of-law, life expectancy and the terms of trade as factors that have a noticeable impact on GDP growth over "fairly long intervals" of time[27].

Furthermore, Abramovitz (1996) largely accepts technological progress as an eminent factor of growth, but partially links it to societal determinants, that he calls "social capability". He argues that technological backwardness is not usually a "mere accident". Tenacious societal characteristics normally account for an important portion of a country's past failure in achieving a level of

This mechanism fits into Robert Solow's "convergence" framework, which is determined by the diminishing returns hypothesis, also discussed in said subsection.

[26] Robert Barro takes as a prototype Sierra Leone which is poor and yet generating low economic growth, which is in contradiction with the convergence hypothesis. He justifies this by the fact that said country has "weak enforcement of property rights, low school attainment, high fertility, low life expectancy, no political freedom, high government consumption, moderately high inflation, and virtually no investment". See Barro (1997).

[27] For more details regarding the empirical methodology of this study, see Barro (1997: 13) henceforth.

productivity that is more or less equal to advanced economies', which could explain the persistent disparities in terms of output worldwide. The same deficiencies may also prevent developing countries from succeeding in the technological catch-up that is predicted in the Romer-Lucas framework. In a nutshell, Abramovitz defends that "a country's potential for rapid growth is strong not when it is backward without qualification, but rather when it is technologically backward but socially advanced" (Abramovitz, 1986: 388). Education and economic organization play a crucial role in this context, as a trade-off between specialization and adaptability becomes decisive. The notion of adaptability suggests that there is an interaction between social capability and technological opportunity. The state of education embodied in a nation's population and its existing institutional arrangements has the tendency to hold back the economic agents in their choices of technology. It is, however, technological opportunity that encourages said economic agents to do additional –adaptation- efforts in order to enable the transition toward a new technology. Here, technological opportunity is usually materialized into a stronger income growth, whether as the consequence of a direct impact or via the increase of competitiveness at the international scale.

In effect, Abramovitz (1986) argues that an economy's "potentiality" for productivity advance through catch-up is actually defined by the combination of technological gap and social capability. Economies that are technologically backward have a potentiality for generating faster economic growth rates than more advanced ones, but only provided their social capabilities are sufficiently developed to enable successful exploitation of cutting edge technologies that are already in use in developed countries. The rhythm at which potential for technological catch-up is actually realized in a given period of time is tributary to factors limiting (or promoting) the diffusion of knowledge, the rate or structural change, capital accumulation and the expansion of the demand for new technology-based products. And as discussed in the subsection about the endogenous growth model, investment plays an important role, especially FDI which can significantly facilitate the transmission of innovation and

knowledge, thereby boosting GDP growth. As a consequence, technological catch-up can be made possible if developing economies at least encourage inward FDI flows and invest in human capital, in order for the workforce to be able to acquire and assimilate technological progress itself. In this framework, needless to remind ourselves that FDI is usually driven by public economic policy, mostly through the existence of satisfactory social and physical infrastructures regarding logistics, transport infrastructures, education and public health services etc., besides from fiscal and tax incitements. Institutional infrastructures are also noteworthy (i.e. democracy, human rights and arelatively impartial justice system); they provide the country with political and social stability.

Nevertheless, the free flow of FDI –and technology along with it, from advanced to developing countries can be highly dissuaded by the risk involved in investing in economies that suffer from macroeconomic volatility, trade barriers, insufficient infrastructure, weak level of education, social and political instability, and corruption. This having been said, theorists defend that *proximate* causes of growth are not enough to deepen the analysis and that one should also look into the larger *fundamental* determinants. To explain growth "miracles" and "disasters" requires an understanding of the history of the economies being investigated as well as how policy choices are made within an institutional structure involving political distortions (Snowdon & Vane, 2005).

As a response to this necessity, the next section provides a discussion of several empirical studies regarding the very cases of some advanced and developing countries. The emphasis is laid in general on the empirically founded determinants of output growth; but out of relevance to the present thesis, the choice of giving most attention to the influence of public investment was made. Furthermore, the next chapter gives a macroeconomic background and a historical economic policy analysis of the Moroccan case, in order to come up with the main causes of the country's GDP growth and to assess the significance of public investment in that particular framework.

A review of the empirical studies

This section reviews the main findings of empirical studies that had tackled the question of economic growth, its determinants and the role of public investment as a potential growth-enhancing policy measure. The analysis starts with general cases, mostly in advanced countries, before narrowing down the focus to discuss the case of middle-income countries, which is more consistent with the Moroccan case, thereby preparing the ground for an elaborate study of the Kingdom's macro-financial framework.

As discussed in subsection 1.1.2, investment plays a decisive role in the sense that it enhances the capacity of production factors' inputs, particularly by driving an upward influence on technology and education, among other physical and societal variables. It is placed as a transversal determinant of growth. Even in the *learning by doing* process introduced by Arrow (1962), what is described as *experience* is tributary to *investment* expenditures that have an effect on the work environment. However, it is important to make allowances between private and public investment. Based on empirical studies, several eminent economists argue that the latter should be included in a production function as a separate variable from the overall investment, since private investment is not likely to be a substitute of public capital, particularly when it comes to providing public goods and services. Public investment is even considered to be an input to private production (Barro, 1990). This argument is endorsed by the literature, where it is largely accepted that public investment is predominant when it comes to infrastructure expenditures and projects, as opposed to private capital. Hirschman (1958) and Biehl (1991) define infrastructure itself as the part of the overall investment that provides public services. Furthermore, the government's role in public investment is not limited to its own budgetary spending. The case of public-private partnerships (PPP) is a striking example of infrastructure projects where the biggest part of investment spending is supposed to be made by private companies. Yet the purpose of these expenditures would be to provide goods or services for which there is justified public involvement. And the government's role in relation to the PPP arrangement, e.g. monitoring, regulation and risk bearing, remains quite important. Similarly, in cases

where the private sector invests in the production of goods characterized by natural monopoly conditions, government regulatory involvement is called for. In other spheres of private investment, a government regulatory or planning role may also be fundamental in order to take account of public policy objectives (in the case of spillovers), though such investments would still be recognized as private (UNCTAD, 2009).

Beyond the canonical crowding in/crowing out effects of government spending, the debate regarding the impact of public investment on economic growth was revived by an empirical research led by Aschauer (1989), where the emphasis was laid on the productivity growth generated by non-military public investment in the United States. He came up with the conclusion that investment in infrastructure has a really strong positive influence on private firms' productivity, as the post-1970 productivity decrease was found to be the result of the drop in public investment in the US. This finding was remotely supported by the high growth rates in Asian economies during the 1990s, which were linked to their tremendous public investment rates. Nevertheless, the causality here –and even the correlation sign in some studies- remained subject to controversy, as explored below in this section. Besides from divergences between researchers regarding the econometrical aspects and their outcome, it is possible to say that the persistent debate might also be explained by the fact that a considerable part of public investment is spent on the government's transversal functions, e.g. law and order enforcement, provision of social and public services, administration etc. Therefore, it is difficult to assess its impact on productivity and economic growth, since it would only indirectly affect them. This difficulty exists even when it comes to infrastructure investment expenditures, because the latter's impact on productivity takes a long time to be recognizable and the risk of losing track becomes quite important, which complicates the data assessment even more.

Usually, available data for this purpose consists of both national-level evidence and investment-specific evidence. The former consists in time series data on public investment expenditures while the latter tackles the economic impact of each

specific investment project. Lack of coverage has always been a major difficulty in this framework, besides from the fact that developing countries –and even some developed ones- rarely keep track of the economic performances of their investment expenditures over time. Warner (2014) sums up this particular situation as follows: "Research in this area is bedeviled by the fact that governments that implement major public investment drives frequently leave no hard data behind on the impact of their investments; and governments that collect good data frequently do not attempt major investment drives" (Warner, 2014: 6). Subsequently, researchers are obliged to use estimates and, in most cases, to go along with how the national authorities differentiate public investment expenditure from public consumption spending. And as explained below in the chapter about the Moroccan case, the difference between both types could be hazy, to some extent. For example, education expenditures are usually not considered to be public investment. Yet, even though the definitions are not unanimous across countries, there is a large consensus regarding expenditures that touch logistics, roads and power infrastructure which are treated as capital goods.

In order to discuss these elements, among other significant findings, the first subsection starts by reviewing the empirical debate regarding public investment among the determinants of economic growth in advanced countries. Then, the light is shed on this question, but in the very case of developing countries in order to set a relevant benchmark for the Moroccan framework, which is further explored in the second chapter.

The case of developed economies

As briefly underlined above, one of the most influential research papers regarding the determinants of growth and the macroeconomic impact of public investment is Aschauer's (1989), in a sense that it revived the research in this area, in particular regarding developed countries. At the moment when economists were attempting to explain why productivity dropped in the United States, Aschauer provided based on a Cobb-Douglas econometrical model, a seemingly logical explanation, i.e. the decline of private and public investments (Aschauer, 1989).

Nevertheless, the findings were taken with much caution after acerbic criticisms regarding the modeling methodology. As a matter of fact, the non-stationarity of the data used in Aschauer's work was undoubtedly a significant problem, but also the assumption that production factors are purely exogenous, which implies that there would be no room whatsoever for a potential influence of output itself on private and public capital. However, empirical evidence visibly suggests that there is a back and forth connection between GDP growth and investment.

Sturm & De Haan (1995) revisited the results found by Aschauer (1989) and ended up with a different conclusion using the same data but more modern econometrical techniques. Based on their assessment of the data, it turned out that the variables in the production function were supposed to be estimated in first differences, as opposed to in levels regression used by Aschauer. One of their main conclusions is that the positive relation between public investment and GDP discovered by Aschauer had been overvalued (Sturm, & De Haan, 1995). A research paper made by Barth & Bradley (1987) -and which had not caught as much attention as Aschauer's even though it was prior to it- found, for the case of 16 OECD countries, that the share of investment in GDP had a statistically insignificant effect on growth, although the sign of the correlation was positive.

Also based on a Cobb-Douglas production function, Barro (1990) formally considered government (consumption and investment) expenditures to be endogenous, and provided an insight on the potential relation between the size of the government and the economic growth rate. He concluded that the share of productive government spending (e.g. public investment expenditures) that maximizes GDP growth is smaller if the government is also using the income tax to finance other less productive types of spending. In other words, an increase in resources dedicated to non-productive government services is likely to generate lower per capita growth (Barro, 1990). Therefore, Barro (1990) partially joined the conclusions of the former work of Kormendi & Meguire (1985) who found, based on a sample of 47 countries in the post WW II period, that there is no significant relation between average real GDP growth rates and average

government consumption. This last paper did not, however, tackle government spending from a productivity-enhancing investment perspective. As for Mankiw (1995), he sums up the buckle of empirical studies, stating that the share of output allocated to investment is positively associated with growth, as well as a certain number of measures concerning human capital, such as enrollment rates in primary and secondary schools. Milbourne *et al*. (2003) investigates whether there is a distinct role for public investment as a determinant of GDP growth. In order to neutralize the potential effect of demographic growth, they consider output per capita. The latter does not seem to be influenced in a noticeable way by public investment in the steady state equilibrium. However, the impact is found to be substantial during the periods of transition toward steady state[28].

Whereas, the models based on the production function or the cost function, were proven to have a noteworthy drawback, i.e. they can only analyze the effects of public spending that "transit" through private sector production. However, many government consumption or transfer items can have important macroeconomic effects even if they have no noticeable impact on private sector production or cost functions (Perotti, 2004).

With the aim of addressing such particular issues, the introduction of the VAR approach (vector autoregressive) by Sims (1980) enabled economists to empirically assess the influence of public and private investment on output growth without any pre-established theoretical restrictions. One of the most valuable contributions of Sims is the possibility to examine causality directions between all variables. This contribution largely responds to the abovementioned criticism regarding Aschauer's (1989) one-way-causality econometrical methodology. However, VAR's perks are limited by some deficiencies, particularly the fact that it demands larger data samples in order to apply lag lengths. This often narrows the possibilities for researchers due to the lack of

[28] In the assessment of the impact of public investment on growth during transition toward equilibrium, the authors first use the Ordinary Least Squares method (OLD), then switch to instrumental variables econometrical techniques. More details about the methodology are explained in Milbourne, Otto, & Voss (2003).

long series data, especially regarding variables that only have annual frequency, e.g. public capital stock.

Using VAR methodology, Mittnik & Neumann (2001) analyzed the interactions between GDP, private investment and public (investment and consumption) expenditures in the case of six advanced economies. Their conclusion corroborated some of Aschauer's findings as regards to the significant positive effect of public investment as a determinant of GDP growth in the short run with a smaller influence in the long run, except for Germany where the effect remains significant. Furthermore, Mittnik & Neumann's (2001) results dismissed the existence of public investment crowding out effects. This last conclusion was contested by Voss (2002), who argues that innovations to public investment crowd out private investment, based on a VAR model that encompasses GDP, private investment, public investments, and the real interest rate for the cases of Canada and the United States from 1947 to 1996.

As for Perotti (2004), he led a study based on a quarterly VAR model with a sample that includes the United States, the United Kingdom, Australia, Canada and Germany. In order to improve the accuracy of his model, Perotti subtracted government investment for defense purposes from public investment and added it to government consumption, since defense machinery and equipment do not touch the conventional structures of the economy and are not likely to drive a ripple effect on private sector investment. However, the paper's result is quite difficult to reconcile with the studies mentioned above, among many others. Output and private investment were found to react more significantly to government consumption shocks, than to public investment. Perotti explains this puzzle by the fact that the aforementioned advanced countries might have too much public capital relative to their optimal level, so that public investment could have a very low –or negative- marginal product. There is also a plausible hypothesis, i.e. public investment might be particularly prone to political pressure, and loaded with pork-barrel projects with no economic rationale; if it crowds out more productive private investment, it can show up as having a negative multiplier after the general equilibrium effects are played out

(Perotti, 2004). Besides, Perotti argues that some types of transfers and government consumption also have important, if less obvious, positive externalities in the long run; for instance, some models of growth imply that under some conditions transfers might release credit constraints and therefore promote investment in education and growth. Bottom line is: the paper provided evidence suggesting that the reputation given to public investment as a determinant of GDP growth is "probably undeserved".

The first explanation given by Perotti (2004) was corroborated by Kamps (2004) for the case of Japan, where public investment shocks seem to drive a downward influence on economic growth. Among the 22 OECD countries examined by Kamps, Japan is the country that exhibits by far the most important public capital to output ratio, which makes plausible the assumption that the said ratio in Japan is beyond its optimal level so any further public capital would have an unfavorable effect on GDP, hence the negative marginal productivity of public investment. However, Kamps' model contradicts itself if one follows only this particular logic. Portugal, which shows the lowest public capital to output ratio, also exhibits a negative marginal productivity of public capital, while the other countries in the sample have a larger ratio but still a positive macroeconomic effect of public investment[29]. As a response to this contradiction, the author brings up another possible explanation, i.e. public capital possibly crowds out private capital and employment (Kamps, 2004).

On a remotely different register, Gonand (2007) links the extent of public investment's impact on the economy to the existence of qualified labor force. Gonand focuses mainly on public investment in human capital, and underlines the substantial long-term impact on GDP of efficiency gains in public spending in education. According to his study, a 10% increase on educational output might raise GDP by an estimated 3 to 6% in the long run in most

[29] Kamps (2004) uses 1960-2001 annual data (private and public net capital stocks, employed population and real GDP). He considers the following countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and the United States.

OECD countries. Following this logic, the public budget spent on education in the 25 EU members jumped from 4.7 per cent to 5.2 per cent in the 2000-2003 period, according to Eurostat data.

When analyzing the efficiency of public investment spending as regards to both its required financial resources and its economic impact, Afonso *et al.*, (2005) built a public sector efficiency composite indicator for 23 advanced OECD economies, which includes information on administration, education, health (life expectancy, infant mortality), income distribution, economic stability and economic performance outcomes. The latter is assessed through the variations among a 10 year average unemployment rate. Their main conclusion is that higher public investment expenditures are associated with diminishing marginal returns, which is in line with the elements discussed above in the subsection about the Solow-Swan Neoclassical model of growth. Furthermore, the authors here argue that countries with "small" public sectors (i.e. with public spending that is below 40 percent of GDP) *on average* have a more efficient provision of public services and therefore a stronger macroeconomic impact[30].

In this subsection, it is possible to presume that an important part of the empirical literature tends to corroborate the existence of an upward effect of public investment when it comes to economic growth, in developed countries in this case. Nonetheless, research papers such as Perotti's (2004), Kamps' (2004) or Barro's (1990) question the effectiveness of public capital as a potential determinant of GDP growth. They generally support -based on empirical evidence- that an insignificant or negative multiplier of government investment goes alongside the existence of a large public capital per capita. Subsequently, some of the findings could probably not be extended to developing countries, which are characterized by low GDP and allegedly low public capital per capita.

The next subsection reviews some of the empirical studies that tackled the very question of public investment as a determinant of

[30] The countries studied in Afonso *et al.*, (2005) are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and the US.

GDP growth in developing countries. The objective is to come up with a benchmark that is closer to the Moroccan framework.

The case of developing countries

In the case of developing countries, where the infrastructure level is usually suboptimal and –in some sectors- nonexistent, the necessity for substantial public investment expenditures in order to promote both economic growth and development would merely be common sense. However, even among this category of countries, the significance of the impact of public capital on the economic activity is subject to a large empirical debate, since it remains tributary to several factors (e.g. governance, political stability, the relative dynamism of private investment…), as some concepts such as efficiency and optimality start to play a decisive role in the process.

One of the research papers that examined the largest samples of developing countries is Khan's (1996), which explored the relative importance of public and private investment in promoting economic growth for 95 developing countries using two stage least squares (TSLS) and panel data methods. The author found out that private and public investments have a differential impact on economic growth, with private investment having a much more significant macroeconomic influence than public investment. Nevertheless, Khan argues that the government can play a critical part in the process by identifying much more rigorously the types of investment that have positive net returns and that are likely to be complementary to the private sector. In other words, this research subtly calls for the implementation of concepts such as efficiency and selectivity based on the size of investment and its expected returns. Public investments that do not meet these criteria would most likely appear to have a downward influence on GDP growth and factor productivity, and thus should be cut or not undertaken (Kahn, 1996). Khan's main finding was roughly corroborated by Ghani & Din (2006) who concluded, based on an analysis of the Pakistani framework, that growth is largely driven by private investment and that no strong inference can be made about the effects of public investment and public consumption on economic growth. However, they found that public investment has

a negative -though insignificant- impact on output, which "raises some concern about the efficiency of public investment" in Pakistan (Ghani, & Din, 2006). Based on these two different research papers, it is possible to connect the dots and think of a plausible explanation for the relatively weak macroeconomic effect of public investment, i.e. when further public spending do not follow efficiency and profitability-based selectivity, its marginal productivity is likely to shrink as the crowding-out effect stays at a certain level. By the end of the process, the allegedly positive effect of public investment on output would have been partially or totally neutralized by the negative macroeconomic impact of crowding-out.

The assumption of the existence of crowding out effect in developing countries was challenged by a book published the same year as Khan's (1996), i.e. Agénor & Montiel (1996). The latter authors argue that in the case of small and middle income countries, government budget deficits tend to have a negligible influence on interest rates; hence the crowding out effect would be of an insignificant magnitude. Moreover, public investment is supposed to provide developing countries with the lacking infrastructures regarding logistics, transportation, education and public health services, which are considered as *sine qua non* preliminary conditions for any private investment in human or physical capital, hence it is supposed to be non-substitutable and to uplift economic growth and development. In other words, public investment is likely to have a larger macroeconomic effect in the developing world compared to advanced economies, since there is a more important margin of improvement at the infrastructure level, among other development and economic variables. In this context, the public investment multiplier effect is found to go up to 1.4 in middle income countries while it is weak – and even negative in some cases- in advanced economies, according to an empirical survey made by Hemming *et al.*, (2002). They explain this finding by the fact that crowding out is strong when government expenditures substitutes for private spending or when the interest rate and the exchange rate rise in response to fiscal expansion. This generally does not apply to developing countries, since most of them have fixed exchange rate and public

spending, particularly public investment, tackles essentially the existing infrastructure issues, hence its non-substitutability as regards to private investment. The paper also links crowding out to the predominance of Ricardian households in the economy, in which case a permanent fiscal expansion would reduce the demand, particularly consumption[31].

Based on these elements, among others, Hemming *et al.*, (2002) conclude that crowding out is more likely to take place in developed economies, not in developing ones. In a more recent study, Swaby (2007) contested this finding in a research paper that discusses the interaction of public investment and GDP growth in Jamaica using a VECM method, based on 1994-2006 data. The paper's results show that public investment considerably crowds out net private investment, while only a weak relationship between output and public investment has been detected. Furthermore, the Granger causality result suggests that public investment does not cause GDP growth; however, reverse causality could not be convincingly rejected. Swaby's VECM results join Khan's (1996) when it comes to the importance of private investment as a determinant of economic growth: it was found that domestic private sector investment and FDI have a positive direct impact on the level of GDP in the long-run (Swaby, 2007).

China, during its development phases, also constitutes an interesting case to investigate. An empirical research led by Chow (1993) tackled the role of capital stock variations in determining the Chinese GDP growth. Besides from the fact that it enables to discover China's investment policy by the time it upgraded to the status of emergent economy, the particularity of this study lies in the disaggregated analysis regarding agriculture, industry, services and construction. The sectors where public and private investment had been the most productive were construction (a 26 percent rate of return to capital), agriculture (20 percent) and industry (17 percent). Moreover, Chow (1993) discovered that in the period from 1952 to 1985, the Chinese average income growth

[31] For further explanations this aspect, see Hemming, Kell, & Mahfouz, (2002).

rate went alongside the capital growth rate, respectively 6 percent and 7.6 percent.

The concept of public investment optimality, in a definition that is partially different than the one developed in this PhD thesis, was motivated by Fosu *et al.,* (2011), who used a panel data from 33 Sub-Saharan African countries during the period from 1967 to 2008 in order to assess the relationship between public investment, private investment and economic growth. The results indicated that not only does public investment play a crucial role in determining economic growth, but also that its current level in Sub-Saharan economies is, on average, sub-optimal (Fosu, *et al.,* 2011). The paper went further and tried to identify the growth-maximizing level of public investment. The latter level was found to fluctuate between 8.4 percent and 11 percent of GDP depending on the country, but also on the econometric technique used. This finding does not diverge quite much from a study made before by Miller & Tsoukis (2001) and in which the results exhibit a public investment "optimal" level of 18 percent of GDP, for a different set of low and middle income economies[32].

A certain number of research papers investigated the relationship between public –and private- investment and economic performances, but for specific Sub-Saharan African countries using different econometrical methods. Their findings, however, do converge considerably. For example, Aka (2007) examined the case of Ivory Coast during the period from 1969 to 2001, using an error correction model and an autoregressive-distributed lag methodology. The paper shows that in the short run, a 100 percent increase in public investment leads to a 7 percent rise in real GDP. The impact is even larger in the long run, going up to a 37 percent increase in real output. This finding diverges from Khan's (1996) and Ghani & Din's (2006) in their respective samples, especially that public investment is found to

[32] Both Miller & Tsoukis (2001), and Fosu *et al.,* (2011) use the same definition of public investment optimality, where the issue is to drive a maximal macroeconomic upward influence under the constraint of keeping down crowding out effects. In this PhD thesis, debt sustainability is considered to be the main optimality constraint, besides from the potentiality of crowding out.

have a larger effect on economic growth compared to private capital shocks. On the other hand, Aka (2007) raises the question of public investment inefficiency in Ivory Coast in the short run; however, one should bear in mind that public investment usually generates returns only after a relatively long period of time, since it generally handles long term structural issues, as opposed to private investment.

In Northern Africa and closer to Morocco on the geographical and macroeconomic dimensions, the Tunisian case regarding the particular contribution of (private and public) investment to economic growth has been subject to several studies. Casero & Varoudakis (2004) examined the significance of each factor's contribution to average GDP growth in Tunisia from 1970 to 1999, in comparison to five fast growing countries, i.e. Chile, Korea, Malaysia, Mauritius and Thailand. The study takes into consideration public investment, private investment, the macroeconomic stability, the structural reform in trade and finance, the human capital, and the convergence effect[33]. The results indicate that as opposed to the five aforementioned fast growing economies, Tunisia's GDP growth relied more on public investment, and less on private investment and human capital. The authors defend that it would be unrealistic to assume that public investment will continue to be a main driver of growth in Tunisia in the near future. They explain this predictive hypothesis by the fact that the margin for maneuver to raise public investment is narrowing down, as the size of non-discretionary public expenditures is growing bigger and given the need to consolidate and rationalize Tunisian fiscal policy (Casero, & Varoudakis, 2004).

These arguments are endorsed by Achy (2011), who laid emphasis on the fact that Tunisia's excessive level of public debt is

[33] As implicitly explained previously in the subsection about the Neoclassical Solow-Swan model, the convergence effect is driven by the initial conditions regarding the level of income and implies, based on the hypothesis of diminishing returns to capital, that countries with high capital per GDP ratio tend to have a low marginal productivity of public and private investment, and vice versa. The concept was first introduced by Solow (1956), and emphasized later by Fagerberg (1994) under the name of "transitional dynamics".

likely to only weaken investors' confidence and trim down growth prospects. Subsequently, it would be capital to promote the private sector development, particularly by removing inefficient regulations and fighting corruption (Achy, 2011). Nevertheless, a study made by Boughzala *et al.*, (2007) regarding regional economic growth and development in Tunisia had reached the conclusion that public capital is an essential determinant of economic growth and that it plays a crucial role in the reduction of poverty, therefore it should not be cut down. Based on a dynamic and regionalized computable general equilibrium model (CEGM), the authors discovered that the Tunisian regions and areas where there is the least public investment spending have substantial development deficiencies and show a distorted income distribution and high rates of poverty, as opposed to regions where the state invests more. One should bear in mind that based on the literature we have been discussing so far, public investment (among other instruments of fiscal policy) is hypothetically supposed to help drain private investment to a given region or country by providing infrastructures etc., provided that the public-private investment complementariness is ascertained. In this framework, IMF (2014a) recommends for Tunisia a gradual replacement of generalized subsidies with a better-targeted compensation system, and the control of the wage bill, which would free up budget resources for higher social expenditures and growth-supporting public investments over the medium term (IMF, 2014). For the record, these recommendations are quite similar to the reforms suggested by the IMF to the Moroccan Kingdom.

Following IMF's doctrine and based on several other reports regarding middle and low revenue counties, public investment and social programs are in principle seen to be important to promote growth. The issue is in defining which sectors are the most economically reactive to public investment, and the extent to which certain types of public project management are best in order to improve efficiency regarding some specific public investment expenditures, but also the public projects that are likely to encourage and drive further private capital. On the other hand,

fiscal policy makers would usually face a tradeoff between investing and maintaining debt in a sustainable level.

Several studies concerning the Turkish economy discuss this very issue. As opposed to the predictions and recommendations made by Casero & Varoudakis (2004) regarding the Tunisian public investment trends, the case of Turkey exhibits a squarely detrimental impact of the retrenchment of public capital. Ismihan *et al.*, (2002) argue that when the government cuts down public investment –especially infrastructural expenditures- instead of current and "populist" spending, capital accumulation, economic growth and development suffer from a severe regression in Turkey. Hence, in order to satisfy the public finance stability constraint, fiscal decision makers have to choose carefully which components of public expenditures should bear the burden of fiscal adjustments such as the ones motivated above by the IMF (Ismihan, Metin-Özcan, & Tansel, 2002). Their study indicates that capital accumulation is the main factor behind Turkey's growth performance, and that private investment's response to public investment shocks is quite large, which gives even further importance to public capital from a macroeconomic point of view. And as the post-1980 macroeconomic instability in Turkey resulted in the reduction of public investment, particularly in infrastructure projects, the relative proportion dedicated to current public spending increased which reversed the complementariness between public investment and private investment. The existence of a relatively significant of long-run crowding out effect of the overall public investment on private investment is most probably tributary to the waning of this very complementariness, as even post-2002 data exhibits no long-run correlation between the two.

Arslan & Saglam (2011) went further in their analysis of the Turkish framework by introducing corruption. They basically argue that corruption affects investment, and particularly public investment, which is reflected on the economic performances. The authors explain this chain of causality based on the fact that corruption supposedly distorts the decision making process regarding public investment projects and is likely to influence both the size and the composition of the overall public investment. In other words, corruption would increase the number of projects

carried out by the government and to alter the design of said projects, mostly by extending their sizes and their complexity. Subsequently, the part of public investment in GDP would increase as its marginal productivity would drop, which would trim down the output growth (Arslan, & Saglam, 2011). Despite the fact that their empirical results do not fully support their thesis, as they turned out to be insignificant, the study led by Arslan & Saglam (2011) can fit in the line of several research papers regarding this very issue in different countries, such as Bardhan (1997) and Mauro (1996, 2004). And the analysis carried by these authors motivates the notion of efficiency through the reduction of corruption.

Based on the different empirical research papers reviewed in this subsection, efficiency stands out as a transversal concept, whether through the reduction of corruption or investment projects selectivity –based on costs and macroeconomic reactivity, among other forms efficiency incarnates. Several of the papers discussed above present it as a decisive determinant of the significance of the influence of public investment on the economic activity. The overwhelming finding is that relationships between investment (both private and public) and GDP growth are stronger in countries where public investment is more efficient. Gupta *et al.*, (2014) support this conclusion in the case of 52 developing economies and provide evidence that when public capital is adjusted for efficiency, i.e. the adequacy of projects selection and implementation, its impact as a contributor to growth increases in a statistically significant way, especially in low-income countries (Gupta, *et al.*, 2014). On the other hand, other economists, at the image of Berg *et al.*, (2015), take this question from a "transitional dynamics" perspective and argue that economies with sub-efficient public capital usually also have a rather small quantity of capital; therefore, it can still benefit from substantial returns to public and private investment compared to more efficient countries, which often happen to also have an abundant capital stock.

Conclusion

In this chapter, the light was shed on economic growth as a core variable of the economic activity, its determinants and the role of investment, and particularly public investment, as a potential contributor. Growth theorists agree in principle that public and private investment plays a decisive role in the sense that it enhances the economy's productivity, particularly by driving an upward influence on technology and education, among other physical and societal variables. Public investment's particularity lays in the fact that it is sought to provide key infrastructural components, which theoretically constitute the fundamental basis for any economic activity. Regardless of the specific magnitude of its impact on GDP and productivity according to different empirical studies, a large part of the theoretical and empirical literature recognizes public investment to be a superior determinant of economic growth. As an example, in the seminal work of Baxter & King (1993), public capital is typically modeled as an unpaid factor with a significant marginal product in the private sector production function. This implies that, besides from its "ordinary" effects like any economic agent's consumption, government can also provide a positive externality on the private inputs' productivity through public investment.

However, the approach that one should adopt in order to produce a precise assessment of this externality remains blurry, as public investment offers goods and services that cannot be directly connected to private sector output. In other words, it is difficult to assess public capital's impact on productivity and output growth, since it would only indirectly affect them. This difficulty exists even when it comes to infrastructure investment expenditures, because the latter's impact on productivity takes a long time to be recognizable and the risk of losing track becomes quite important, which complicates the data assessment even more.

Therefore, the debate remains unfasten, starting from the Keynesian-Classical controversies, down to the divergent empirical findings regarding the very impact of public spending, particularly government investment, on GDP growth. Based on the different works reviewed in this chapter, it would be difficult to definitely ascertain the extent of relationship between fiscal policy/public

investment expenditures and the economic activity. A large number of empirical studies confirmed the existence of a significant upward influence of public investment on economic growth and, in some cases, on private investment. However, several authors found public capital to be of no avail when it comes to promoting output growth, and some even came up with the conclusion that public spending has a detrimental macroeconomic effect. Authors like Easterly & Rebelo (1993) and Warner (2014) defend that the differences in estimates of the extent of public investment's influence on output growth are most likely due to uncertainties around fiscal multipliers on the demand side and inefficiencies on the supply side[34]. Another strand of research papers sort-of combines the different visions by linking the significance of public investment's impact on GDP growth, to various notions of efficiency.

As discussed above, this could be explained by the crowding out hypothesis, and the possibly low or negative marginal productivity of public investment. Other than these elements, there is another plausible explanation, i.e. the potentially high level of taxation that often results from further public investment -once it exceeds a certain level-, which could trim down GDP growth and disturb private investment and saving. In this framework, the introduction of the notion of optimality becomes crucial, in the sense that it enables the analysis to go from a monotonic relationship between economic growth and public investment, toward defining the level of public investment that allows for a productivity enhancing macroeconomic effect without jeopardizing either the public finance sustainability or the tax pressure.

In light of the elements developed above, the next chapter tackles the Moroccan macro-financial framework in order to assess public investment policy in the Kingdom and the extent to which it influences GDP dynamics. By the end of said chapter, the effectiveness level of public investment in Morocco level is put into test and an initial series of productivity-enhancing institutional

[34] Regarding the uncertainties on the demand side of the economy, see Easterly & Rebelo (1993). As for the supply side deficiencies, they are explained further in Warner (2014: 62).

and budgetary recommendations are formulated. It is only afterwards, in chapter III, that we introduce the concept of public investment optimality that encompasses both macroeconomic effectiveness and budget sustainability.

2. Analysis of the Moroccan macro-financial framework

Introduction

After having established a number of hypotheses and rules-of-thumb in light of the different theories and asynthesis of empirical evidence from previous research work, the emphasis should most understandably shift toward ascertaining their degree of applicability in the Moroccan framework for both economic growth and public investment.

In this regard, one of the first variables to be taken into account here is the incremental capital output ratio (ICOR), which indicates the amount of investment needed to macroeconomic productivity level of an additional unit of capital. This ratio shows a significantly inefficient level in Morocco, at around 8.96 (8.85 when only considered non-agricultural GDP), as opposed to several other comparable countries such as Tunisia (around 6.54), Egypt (4.34) and Malaysia (4.12), which reflects a relatively low capital effectiveness in Morocco. This index is calculated based on GFCF as a variable representing overall investment; and government investment spending would be merely one of its components, of which the macroeconomic productivity is yet to be examined. The relation of the latter with GDP growth is most likely to be affected by several economic and institutional factors, e.g. the important amount of budget carry-overs, the relatively long procurement procedure, the loosely defined investment budget sections and the

alleged existence of non-productive current expenses within said budget.

In this chapter, we start by shedding light on the evolution of public investment and its relationship with GDP dynamics in order to get insights on their long term idiosyncrasies, and so that the structural factors that had contributed to the current situation could be comprehensively explored.

When discussing public investment, we tackle the three main "public investors" in the Morocco, i.e. public establishments and corporations, local councils and the government. By the end of this descriptive analysis, the scope of the research should be narrowed down to the part of public investment led by the government, as it shows to have significant shortfalls on both the budgetary and the institutional levels, which is most relevant to our thesis. Said relevance is also linked to the fact that the Moroccan economy has a history of fiscal interventionism that aimed to support GDP growth and to steer the economic activity through legislation, fiscal incentives and direct government investments.

Before drawing a first estimation regarding the Moroccan context in terms of public investment's macroeconomic effectiveness, we first estimate a panel data model in which we get to test the validity of the hypotheses developed by the end of the chapter I above. Thus, in section 2.2, we consider Morocco as part of a group of developing countries, in order to compare the latter's characteristics with a certain number of advanced economies. This model's results are meant to help us gather consistent benchmarking information that can be used afterwards when analyzing government investment optimality in Morocco.

In section 2.3, we estimate government investment expenditures' impact on GDP in the Kingdom, along with other variables, such as the GFCF and government consumption. In this particular estimation, we use a GLS time series econometric model. Despite being positive and significant, the correlation between government capital spending and GDP evolution remains suboptimal in light of the hypotheses developed in chapter I and the multiplier effect rules-of-thumb found in middle income countries. Therefore, by the end of this section –and the chapter as a whole, we motivate an initial series of recommendations out to

improve the effectiveness of government capital spending, the latter being the first condition of public investment optimality.

Characteristics of the Moroccan economy

In this section, we lay emphasis on the main characteristics of the Moroccan GDP and public investment. The light is shed on the chronological evolution of both variables in order to familiarize with their long term idiosyncrasies, and so that the structural factors that had contributed to the current situation could be thoroughly understandable.

On the GDP front, a retrospective analysis is in order, as well as a discussion of the components of GDP and the reasons explaining the year-to-year volatility of economic growth in Morocco. When it comes to public investment, the stress should be put on the three main entities that contribute to public investment in the Kingdom, i.e. public establishments and corporations (PECs), local councils and the government. The aim is to narrow down the scope of interest in order to further focus on the most significant component of overall public investment. In the discussion below, the part of public investment led by the government proves to be quite important when compared to overall public investment; hence, it is supposed to have visible influence on GDP growth following the elements of analysis discussed in Chapter I. It also shows to have large margins of improvement that are worth being examined in depth, on both the budgetary and the institutional levels.

A retrospective analysis of GDP's dynamics

This subsection discusses the main characteristics of the Moroccan GDP and the evolution of each of its components from the year 1952 to 2016. For this purpose, we use data from two different sources, i.e. government archives (Division of plan and statistics), the International Monetary Fund database and the World Bank statistics. The elements analyzed here are illustrated in the graphs and details shown in figures 2.1 and 2.2.

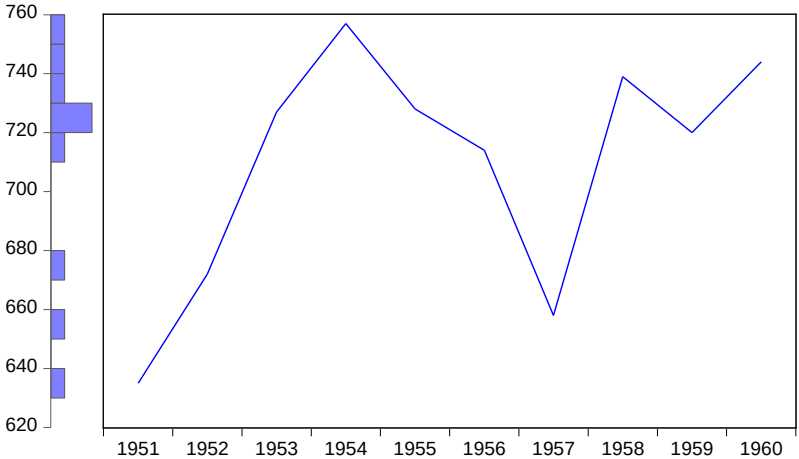


Figure 2.1. *The Moroccan GDP from 1951 to 1960 (billion Moroccan francs)*
Source: The Division of plan and statistics, Moroccan Government

Economic growth in Morocco has been quite unstable, fluctuating based on agricultural performances, which have always depended on random climatic conditions. But other variables also participated in this volatility during certain periods of time. For a start, the significant decrease that marked GDP in 1955 and 1956 was mostly due to the political turmoil that characterized the last phases of the independence process. This led directly to a drastic fall in European private investment and consumption, as over half of the European residents left the Kingdom. In 1957, output largely worsened as the political factors were combined with a severe drought that made the agriculture drop by more than 15.61 percent. It is important to bear in mind that the Moroccan economy relied tightly on the agricultural activity. Even now, it is still significantly influenced by the latter, however in a milder proportion. Trade, which constitutes the second biggest sector in terms of contribution to GDP during this period, would follow the agricultural dynamics, as a large part of goods came from agriculture. As an illustration of this correlation, as the agricultural output fell drastically in 1957, the sector of trade decreased by more than 11.44 percent; in 1958, in which the level of rainfall was favorable and the agricultural output increased by 30.68 percent, trade also grew by over 12.92 percent.

The other sectors of the Moroccan economy fluctuated in different paces during the 1950s, but following a less unstable course. The mining production was growing steadily at a 5 percent average annual growth rate, while the construction sector declined by nearly half from 1952 to 1960. As regards to industry, it kept growing at a mild rhythm (less than 2 percent annually) as public economic policy had not considered the sector to be of priority. This lack of dynamism contributed to the lay-off of around 20 percent of the workforce in the industrial and artisanal sector during that decade, by the end of which the proportion of the unemployed in the industry was three times more important than the one in the tertiary sector[35]. Following the basics of economic logic, this decrease in employment had probably produced a negative effect on households' income, and thus on the demand side of the economy, combined with the economic effect of the European emigration. All these elements hold an allegedly significant explanatory power over the slow GDP growth rate during the early 1960s. Besides, the apparently sluggish economic growth in the 1960s was combined with a significantly higher demographic growth, which led to a drop in the average output per capita during that decade, except for the years 1962, 1967 and 1968 where GDP benefited from substantial increases in the agricultural activity simply due to high levels of rainfall. GDP growth has been negative twice during the 1960s, recording the largest decline (i.e. -2.4 percent) in 1961, which was followed by the fastest growth rate in 1962, i.e. 12.34 percent. This high volatility was strongly motivated during by the random aspects of the agricultural sector. Nonetheless, the latter has experienced over this period an average economic growth of 7.9 percent, whilenon-agricultural sectors grew on an average rhythm of 4.8 percent.

Again, the important growth rates in GDP per capita witnessed in 1962, 1967 and 1968 were essentially tributary to the substantial increases in the agricultural activity due to high levels of rainfall. As mentioned above, these agricultural breakthroughs remained quite random; hence they could not alter the Moroccan economy's

[35] Service Central des Statistiques (1958), "Résultats de l'enquête sur l'emploi urbain à Casablanca", March.

structural trends as can be shown through the other variables examined in this chapter.

The analysis of GDP during the 1960s shows that domestic final consumption represented around 70 percent of GDP in said period, with a contribution to economic growth by 4.6 points, followed by investment (computed based on fixed gross capital formation), with a 2.8 points contribution. The efforts in terms of investment during this period were marked by the implementation of a basic industry and the intervention of the government in the industrial sector with the aim of developing national resources.

As shown in Figure 2.2, the Moroccan economy kept growing during the two decades following the country's independence, and the growth rates picked up pace during the 1970s with an annual average of 5.4 percent. That acceleration is, to a certain extent, explained by the implementation of economic and social development plans, which aimed to strengthen the economy and to prepare the ground for several social transformations.

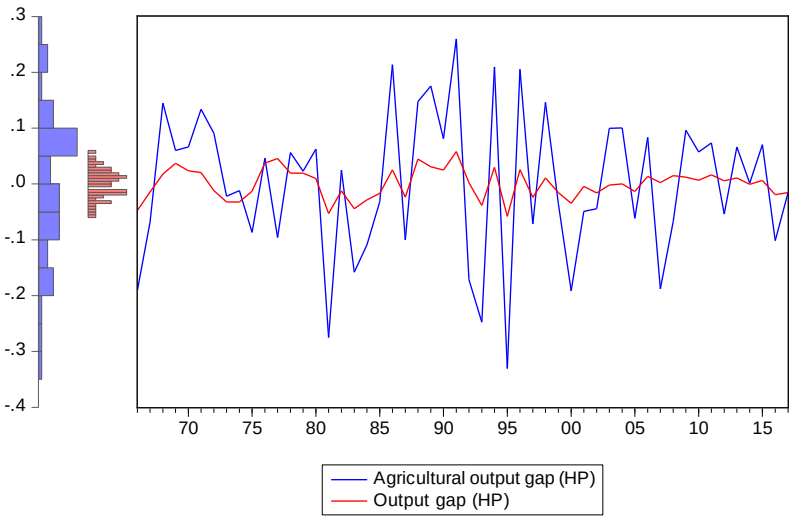


Figure 2.2. *Cyclical dynamics of overall and agricultural output from 1965 to 2017*

Source: Author's calculations based on the World Bank data

The first public plan in sovereign Morocco (1960-1964) was built with the objective of developing agriculture and establishing the ground for basic industry, mainly through large government

interventionism in the shaping of the economy's features. However, some aspects of this plan were canceled or delayed, mostly because of public financial constraints. As a response to this situation, the second plan (1965-1967), whilst focused on promoting economic growth, laid further emphasis on the role of the private sector in the development of investment, and by extension, the global demand.

The 1970s also entrenched this interventionism, as the government introduced a five-year plan in 1973 in order to promote export, and issued substantial public investments in its imports substitution policy. The aim was to protect and help develop national industries, particularly through foreign commercial exchange, especially that the Moroccan exports' contribution to economic growth had been negative (an average of -0.8 points) during the 1960s. However, the government did not succeed in enhancing GDP growth through external demand, as the proportional contribution of exports to GDP remained unchanged since the 1960s (Vergne, 2014).

The 1970s were characterized by an import substitution policy as well, mainly based on stern import regulations and strict control measures over customs tariffs, especially regarding imported goods that could compete with domestic products. In other words, protectionist measures were taken with the aim of protecting newly created economic sectors during the process of their development. The government's interventionism was also palpable through direct public investment in some of these sectors, e.g. the banking sector and several industrial firms.

Compared to the previous decade, economic growth registered in the 1970s and early 1980s was slightly lower with an average annual growth rate of 4.9 percent. As the overall population increased by 2.3 percent between 1972 and 1982, real GDP per capita grew by 2.6 percent[36]. Most importantly, the agricultural share of GDP declined consistently to 19.4 percent during the 1970s, as opposed to an average of 26.5 percent back in the 1960s. On the other hand, the services sector's contribution gained momentum, reaching on average a 48.6 percent share of the

[36] Haut Commissariat au Plan –HCP- (2005), "Les sources de la croissance économique au Maroc", September, p.14.

Moroccan output. Thus, the non-agricultural GDP grew at a 6.2 percent rate, i.e. a faster rhythm than actual GDP. According to HCP (2005), these performances were due to the public investment programs launched by the government during this period.

However, the contribution of overall investments (public and private) to GDP growth stayed beneath the aspired level, thereby dropping from 2.8 points in the 1960s to only 2 points from 1972 to 1980. Instead, it is final consumption that maintained its hegemonic position as the biggest contributor to the Moroccan economic growth, at around 5 points. The regression in the contribution of investment took place despite the fact that investment rate nearly doubled, moving up from 12.4 percent of GDP in the 1960s to 22.9 percent. This evolution was mostly due to the development of public investment as the significant rise in phosphate prices, during the late 1960s and early 1970s, offered a larger budgetary margin of maneuver to the government. From these contradictory evolutions it is possible to draw a plausible hypothesis, i.e. overall investments (and public investment most particularly) lacked effectiveness during the 1970s, at least compared to the preceding decade. This could explain why there was a negative effect on economic growth even though investments rate nearly doubled.

The 1980s were a particularly difficult decade for the Moroccan public finance and the economy; several economic indicators witnessed a serious deterioration. The average annual GDP growth rate dropped to 3.1 percent compared to 4.9 percent in the previous decade. The growth of real GDP per capita was even worse, i.e. 1 percent, as the average annual evolution of the overall population reached a 2.1 percent rate. Thus, real GDP per capita lost 1.6 points of its rhythm compared to 1970s. Following the same trend, the investment rate marked a slight decrease at 22.4 percent, as opposed to 22.9 percent in the 1970s, due to the decline in the contribution of the public sector in the national capital formation. On the other hand, the dependence of economic growth vis-à-vis agricultural performance has become quite recurrent, as the overall output evolution continued to follow to some extent the agricultural sector in its ups and downs, as shown in Figure 2.2, with 1987, 1992 and 1996 being the worst agricultural years and

1986 and 1988 the most productive. The non-agricultural GDP, meanwhile, was characterized by a better variation compared to the overall GDP, at around 3.5 percent. Yet, this rate incarnated in fact a large fall, since the average non-agricultural growth rate had been 6.2 percent during the 1970s. This was mostly due to two contrasted elements. Firstly, the Moroccan non-agricultural growth was partially affected by the deceleration of the industrial/ manufacturing sector, which had begun to face problems of competitiveness. As for the second factor -which was positive, it was driven by the services sector, which was showing a relatively stable growth rate as a direct consequence of the performances of the sectors of trade, communications and transport.

The other economic indicators did not show much of a silver lining. As a result of the large expansionary public investment and spending policy combined with drastic rises in the interest rates at the international level, the Kingdom's external debt rose by more than six times between 1975 and 1982 alone, reaching over 83 percent of GDP. The budget deficit and the current balance of payments deficit have reached record levels in 1982, at 12 percent and 12.3 percent respectively.

The economic and financial deterioration in the 1980s is also significantly tributary to a few circumstantial factors that blocked Morocco from achieving better performances at the economic and the public finance levels. It is worth noticing that the Kingdom relies on import in order to provide for its needs in terms of energy resources. Therefore, it is valid to explain a large part of the regression in the current balance of payments, by the significant increase in the oil prices amidst the second oil shock, which came on the aftermath of the Iranian revolution in 1979. The rise of the US Dollar's exchange value definitely worsened the situation, making in it even more expensive in terms of national currency. One needs to observe, however, that this evolution in the exchange rate helped boost the Moroccan exports. The latter achieved their highest growth rates during this particular decade, and the contribution of net exports to GDP growth was positive, at 0.6 points, which constitutes an *exception* during all the 1952-2015 period. On the other hand, the severe drought that marked the early 1980s had a substantial negative direct impact on output.

Confronted to this severe situation, the government implemented a Structural Adjustment Program (SAP), with the support of the World Bank and the IMF. The latter consists of a series of measures that were carried by the government. The downstream aim of the latter was to manage the domestic demand, mobilize domestic savings, optimize the allocation of resources and work on exchange rates in order to protect the competitiveness of the national economy. In this context, various structural reforms were launched since 1983. They have affected all aspects of the economy, including foreign trade, public spending, taxation, foreign investment, privatization, etc.

These measures allegedly helped improve the budgetary deficits and external public debt. However, their impact on GDP growth cannot be ascertained. During the 1990s, the average annual growth rate was about 3.6 percent, i.e. merely slightly higher than the one registered in the 1980s. It had dropped to an average of 2.8 percent between 1996 and 2000. The same goes for the growth of GDP per capita, which stagnated at an average of 1 percent.

The idiosyncrasies of the agricultural output were –again- corroborated, reflecting the very different climatic conditions from one year to another, thereby resulting in a relatively volatile overall GDP year-to-year evolution during the period from 1990 to 2000. It is worth observing that the non-agricultural GDP, which is more reliable when assessing public policy's impact, suffered a relative decrease, at 3.4 percent, as opposed to 3.5 percent in the 1980s and 6.2 percent in the 1970s. This reflects, to a certain extent, the residual negative impact of restrictive fiscal policies in 1983 henceforth, combined with the upward influence of the significant expansion of the sectors of transport and communications over this period, which contribution rose to 16.9 percent of the tertiary sector's added value. It is quite important to bear in mind that from the year 1998 on, the telecommunications sector has grown remarkably, triggered by the privatization process.

The investment rate marked remained stable at 22.4 percent, particularly due to delays in the implementation of reforms in the business legislative framework, the administrative procedures and the financial sector, but also as a consequence of issues related to

infrastructure and human capital development *status quo*. Households' consumption continued to significantly support GDP growth during the 1990s, as a direct consequence of the low inflation rate, i.e. an average of 2.7 percent during that decade, and the increase in public and private sector wages on the aftermath of the social dialogue.

By the end of the 1990s, economic policy marked significant changes on both the fiscal and the monetary levels, which resulted into a less inflationary GDP growth regime; the latter was characterized by significant private and public investments and the improvement of external balances.

The evolution of the Moroccan growth model, as a consequence of several public plans and private initiatives, has enabled the economy to shift toward a higher growth paradigm in the early 2000s, after two decades of relatively slow growth. As a matter of fact, GDP growth has strengthened its pace and stabilized at an average of 5 percent during the 2000s and early 2010s. The sectors that contributed the most to this growth acceleration period, which went from 1997 to 2007, were agriculture, trade and real estate property as they generated the highest value added (AfDB *et al.*, 2014).

This situation was also tributary to favorable international conditions, i.e. the dynamism of the world economy during that period, which resulted in a significant growth in FDI and in Moroccan migrants' ingoing transfers of funds in foreign currencies. The FDI were mostly made in the sectors of real estate and tourism, and did help strengthen growth momentum, thereby gradually replacing the investment expenditures that were dedicated to the textile sector in the first half of the 1990s. As for the Moroccan migrants' ingoing transfers of funds, they promoted the domestic demand, through private investment and consumption. The impact of the latter was reinforced by a significant rise in bank credits addressed to the private sector starting from the year 2005.

The improvement of the growth rate can also find explanation in the evolution of economic policy during the early 2000s, which has resulted in a domestic demand oriented growth regime. The government has undertaken a policy of active support to both

consumption and investment. In this framework, the commodity subsidies system (basic food products, combustibles…) revived by the socialist government mandate (led by PM Abderrahmane El Yousfi), helped support the purchasing power of households. Moreover, the amount of public investments addressing infrastructure and development issues increased, especially during the liberal-technocratic government mandate (led by PM Driss Jettou), which supposedly helped crowd in further foreign investments in several subsectors of industry and offshore services. Parallel to the budgetary aspect, Bank Al Maghrib's monetary policy, which has been exclusively focused on reducing inflation, helped the country maintain a steady increase in the purchasing power of a major part of Moroccan households. These trends could be linked, to a certain extent, to the fact that the part of population in poverty in the Kingdom decreased from 15.3 percent in 2000 to 9 percent since 2007 henceforth, according to the World Bank data.

However, the Moroccan growth, although relatively strong compared to other oil-importing countries in the region, started to slow down since 2010 to stabilize at an average of 4.3 percent, as opposed to over 5 percent during the 2000s. Despite the fact that oil prices have fallen substantially since late 2014, GDP growth prospects have remained at an average of 3.5 percent. This could find explanation in the fact that the economic performances achieved in the early 2000s were mainly driven by progressions in domestic demand; the latter were encouraged by inexpensive financing. Nevertheless, this domestic demand-driven growth model has shown several limits, as it contributed in amplifying the public budget deficit due to the increasing weight of certain fixed expenditures, such as subsidies and public sector salaries. Moreover, the promotion of domestic demand was not completely at the benefit of the Moroccan economy; a significant part of household consumption spending went for imports, thereby driving an upward influence on the trade deficit, as exports did not evolve in the same proportion. This contributed in limiting the opportunities for domestic firms to engage in large scale production at competitive costs (AfDB *et al.*, 2014).

Overview and current state of output in Morocco

Over the past 26 years, the Moroccan economy has known a limited structural transformation compared to that observed in some other emerging countries. When studying the GDP's composition by sectors, one can notice that the distribution of the value added by sector has not changed significantly since the early 1980s. The primary sector continues to represent about 15 percent of GDP, a share that fluctuates according to the meteorological conditions. It is worth noticing however that, as a consequence of public investment plans, particularly "Plan Maroc Vert" (the Green Morocco Plan), the agricultural value added gradually became less volatile as the government helped widen irrigation infrastructures and diversify the agricultural output. As for the services sector, its contribution to GDP went from 43 percent in 1980 to around 56 percent by 2015. Conversely, the share of the industrial sector in GDP did not progress much. It even declined from 26 percent in 1980 to 22 percent in 2012 (Vergne, 2014). This trend took place despite the relatively good performances of the sector, and public authorities' willingness to promote the industry, particularly through the National Pact on Industrial Emergence 2009-2015 and the new industrial strategy. It is worth noticing however that the industrial part of GDP is supposed to gain pace in the upcoming years as a consequence of expected rise in manufacturing exports.

In a nutshell, the elements discussed in this subsection could be summarized as follows: 1) The Moroccan GDP growth has been driven by domestic demand, i.e. consumption and investment, despite the different export promotion policies. 2) The investment rate remains below the level that constitutes a *sine qua non* condition for a durable and steady output growth in the Moroccan economy. 3) The economy has gradually become sector-oriented starting from the 1990s. 4) Public investment lacked effectiveness in terms of macroeconomic impact, during several periods. 5) The share of industry in the GDP has been suboptimal and improving the industrial output is most likely to reduce the year-to-year volatility of the economy as a whole. 6) Investment allegedly played an important role during the transformation process the Moroccan economy has been through, and most particularly public investment, despite its relative inefficiencies. 7) The Moroccan

economy witnessed substantial interventionism that aimed to support GDP growth and to steer the economic activity through legislation, fiscal incentives and direct public investments.

The next section further assesses the public investment policies and their impact on the key macroeconomic aggregates. The light is also shed on the challenges and constraints that these policies came up against, e.g. public debt sustainability. The aim is to cover the various aspects of public investment and its interactions with GDP growth in Morocco, in order to come up with credible and founded set of optimality-oriented recommendations by the end of the third chapter of this thesis.

Public investment in Morocco: Overview and state of affairs

As briefly explained in the previous subsection, public investment has played a crucial role in the Moroccan government's multiple endeavors to steer the economy and to support GDP growth since the country's independence.

It is worth noticing that from 1956 to 1972, public investment expenditures followed a relatively stable rhythm of progression, following the evolution of the economy as explained in the previous subsection. However, the massive investment spending that marked the 1973-1977 five-year plan drastically changed this evolution. Said plan focused on infrastructure projects such as dams and national roads, besides from attempting to support the industry -and its exports- through imports substitution policies, which required substantial funds.

The tremendous amounts spent within this plan led to a structural public deficit, despite the government's efforts to stabilize its budgetary situation during the period from 1978 to 1982. In this frame, it is important to bear in mind that for the very first and only time in the Kingdom's modern history, public investment expenditures exceeded government consumption spending on an annual basis in 1976 and 1977 as one of this five-year plan's consequences, according to the central bank's data (Bank Al Maghrib). Public investment grew at a 131 percent rate between 1975 and 1977, while government consumption progressed by only 44 percent. The latter's evolution, which was

also critical, was mostly tributary to a 26 percent increase in public employee salaries and basic goods subsidies (Sagou, 2005: 25). Nevertheless, these financial efforts were for naught in most cases, considering the initial objectives of the 1973-1977's plan. Furthermore, as public revenues were by far surpassed by expenditures –particularly the ones allocated to public investment, the government subscribed massively for foreign debts during the whole period of said plan, thereby jeopardizing the very stability of the Moroccan public finance.

The government's attempts of budget stabilization were not effective during the period from 1978 to 1980, and the Kingdom started facing multiple difficulties at the macroeconomic level, e.g. alarmingly negative GDP growth rates during the early eighties (1980-1984). The phosphate prices did not follow the upward trajectory that previous studies had forecasted, and based on which Morocco adopted the 1973-1977's plan; this was far from arranging the situation. As a consequence, the government was forced to adopt the SAP in 1983, as mentioned in the previous subsection. This Program had obviously a damaging impact on investment spending; from 1983 to 1985, (nominal) public investment dropped by around 10 percent. The overall productivity-enhancing public expenditures addressing the economic sectors (i.e. agriculture, industry, transports and commerce) decreased by nearly half, and their part in the government's budget went down from 21.8 percent in 1983 to 13.7 percent in 1988 (Sagou, 2005).

By the end of said fiscal discipline measures, the government stumbled on the incompressibility of public consumption and operating expenditures. In 1992, the latter consumed nearly 40 billion MAD of the budget, as opposed to 15 billion in 1980 and 17 billion in 1987. Debt management also proved to have an infinitesimal room for maneuver. Subsequently, public investment was the variable that most suffered from important cuts; its share in the overall budget went down from 45 percent in 1982, i.e. right before the SAP, to 15 percent in 1992.

Despite the fact that the country started to recover from SAP's fiscal repercussions since 1992, public investment remained stagnant. While debt repayment and operating expenditures

continued to gain pace, public investment stayed below 22 billion MAD from 1993 to the first half of the 2000s, according to the data provided by the Kingdom's Treasury (i.e. *Trésorerie Générale du Royaume*). By that time, debt management and public operating expenditures had reached over 42 and 77 billion MAD, respectively. In the year 2008, the overall public investment jumped by over 30 percent, and its pace kept accelerating in 2009 and 2010, which allegedly helped the Moroccan economy resist the macroeconomic repercussions of the Sub-prime crisis. However, the overall public investment was mostly driven by public companies, which held around (61 percent in 2010), followed by the central government budget (33 percent). Local councils remained far behind at 4 percent, followed by the Autonomously Managed Government Services -SEGMA- and the Special Treasury Accounts -CST- (around 2 percent).

It is only in 2011 that public investment reached the bar of 50 billion MAD; it remained relatively stable at that level in 2012. Besides from structural trends, this significant evolution partially finds explanation in a particular sociopolitical context that was marked by intense social and political protests. As a reaction, the government was bound to engage larger expenditures than expected, hence the substantial fiscal deficit rates in both 2011 and 2012; the latter reached respectively at 6.2 percent and 7.1 percent of current GDP, and the restrictive fiscal policy led by the government brought down the deficit to 5.4 percent in 2013 and 4.9 percent in 2014.

However, the reduction of fiscal deficits was at the expense of government spending, particularly investment expenditures. The latter dropped by 18.7 percent from 2011 to 2013. Starting from 2014, government investment expenditures have recovered some of its upward trend, reaching 5.6 percent of GDP compared to 5.02 percent in 2013. Nevertheless, public spending in terms of debt service has increased at a higher pace and actually surpassed government investment in 2014 and 2015, at around 58 billion MAD compared to slightly more than 50 billion MAD.

It is worth mentioning that several public investment programs are taking place based on the joint policies of the government and public establishments and companies. The Green Morocco Plan

(*Plan Maroc Vert*) is one of the most important projects in this framework. This Plan aims to reduce the influence of random climatic conditions (levels of rainfall, heat waves…) on the agricultural output and to increase its growth. Consequently, agricultural GDP has grown at a yearly rate of 7.6 percent, multiplying the effect of public investments by 1.7[37].

In order to shift toward an in-depth analysis of the ins and outs of public investment in Morocco, it is important to differentiate between the three main stakeholders in this framework, i.e. public companies, local councils and the government. They have different characteristics and degrees of effectiveness; as a consequence, the respective definitions of optimality are most likely to be different.

Public companies' investment

In Morocco, there are 212 public establishments and 44 public companies with a direct participation of the Kingdom's Treasury. The main sectors covered by these entities are agriculture, health, education, urbanism, infrastructures, energy and finance.

Structure and evolution of investments

This public portfolio invests mainly in infrastructure projects, i.e. transportation, water and energy production and distribution, as well as mining and environmental logistics, with a total of 57.8 percent of its overall investment expenditures in 2016. About 15.1 percent goes to urbanism and territorial development, while 12 percent goes to the sector of finance and only 5.8 percent to social projects (health and education).

[37] Data source: Ministry of Economy and Finance, "Rapport sur les établissements et entreprises publics", loi des finances pour l'année budgétaire 2016, p.**37.**

Table 2.1. *Sectorial distribution of public investments led by PECs (2016)*

Sector of activity	Part in overall PEC investment (%)
Energy, mining, water and environment	35.3
Infrastructure and transportation	22.5
Urbanism and territorial development	15.1
Finance	12
Agriculture and fisheries	6.5
Health and education	5.8
Others	2.7

Source: Ministry of Finance, Direction of Public Companies and Privatization (DEPP)

The medium term evolution of public establishments and companies' (PEC) investment shows a substantial increase from 2005 to 2015. In ten years, the Moroccan PEC managed to go from 32.2 billion MAD to around 80 billion MAD, i.e. a 147.6 percent increase. As the government voluntarily reduced its public investment expenditures by over 11.8 billion MAD during the year 2013, the investments of the PEC remained at a steady pace, which partially helped compensate the macroeconomic implications of the government investment cuts. However, in 2014, the PEC investment dropped by 8.2 percent, as public companies and establishments contracted fewer loans in financing their investments. Subsequently, the part of their investments driven by self-financing capacity reached 50 percent in 2014, as opposed to 47 percent the year before.

On the geographical level, the distribution of PEC investment shows to substantial disparities between regions. Nonetheless, significant efforts of rebalancing are made, particularly in the new regionalization framework. The part of PEC investment dedicated to the initially rich Casablanca-Settat region, went from 40.5 percent in 2014 to 36.8 percent in 2016. Other regions benefited from this shift, e.g. Rabat-Salé-Kénitra, Fès-Meknès, Guelmim-Oued Noun, Dakhla-Oued Eddahab and Daraa-Tafilalet, where PEC investment increased respectively by 4.8, 0.25, 0.13, 0.12 and 0.1 points in two years.

Table 2.2. *Regional distribution of public investments led by PECs*

Regions	Part of overall PEC investment (%)
Casablanca-Settat	36.8
Rabat-Salé-Kenitra	26.4
Tangier-Tetouan-Al Hoceima	10.4
Marrakech-Safi	6.1
Fez-Meknès	4.8
The Oriental region	3.4
Souss-Massa	3.1
Beni Mellal-Khenifra	2.8
Laayoune-Sakia El Hamra	2.3
Daraa-Tafilalet	2
Guelmim-Oued Noun	1.3
Dakhla-Oued Eddahab	0.6

Data source: Ministry of Finance, DEPP, 2016 preliminary data

In most cases, public investment in this framework is led by PECs that tackle different projects nationwide that fit into one type of infrastructure or public service, e.g. the Moroccan National Company of Highways. However, starting from the mid-2000s, several PECs were created to develop and manage a well defined project in one very specific region.

Highways and rail transport

The highways network in Morocco went from 866 KM to 1800 KM between 2008 and 2015, as a direct result of over 33 billion MAD cumulative investments deployed by the National Company of Highways (*La Société Nationale des Autoroutes du Maroc,* ADM) based on a contract-program with the government. ADM mainly financed these investments by international loans and by the issuance of bonds guaranteed by the government. The public establishment also benefited from financial contributions, in the form of capital allocations, from both the government budget and the Hassan II Fund of Economic and Social Development. In the year 2016, ADM was set to invest 4 billion MAD in order to complete the highway sections that are still under construction, particularly El Jadida-Safi (500 million MAD), the Rabat bypassing highway (862 million) and Tit Mellil-Berrechid (783 million).

As for the sector of rail infrastructure, the Railways National Office (*Office National des Chemins de Fer*, ONCF) invested around 32.8 billion MAD between 2010 and 2015 pursuant to a contract program signed with the government. The aim was to increase the share of rail in the national market for both passenger and freight transport, and to ensure the development of logistics platforms, thereby participatingto the improvement of the national economy's competitiveness. A particular attention is allocated to the development of the high-speed line (LGV) between Casablanca and Tangier in the extreme north of the country.

Ports and airports infrastructure

Other PECs also lead important investments in order to improve mobility, namely the air flight company Royal Air Maroc (RAM) and the Airports National Office (*Office National des Aéroports*, ONDA). The former is expected to invest over 36 billion MAD, based on a 2016-2025 development plan, in order to increase its aircraft fleet from 47 aircrafts to 105 by 2025. Through this program, RAM aims to increase its share of the African market by creating new airlines in said continent. This investment program is expected to yield a 7 percent average annual increase of the public company's sales from 2016 to 2025.

As for ONDA, it tackles the development of the different aspects of airport infrastructures. An 8 billion MAD investment plan was launched in 2015 in order to develop air navigation infrastructure and equipment. Around 67.1 percent of this investment is directed toward airport capacity development projects, such as the construction of new terminals and the redevelopment of existing ones, while 25.72 percent goes to air navigation and airports exploitation. Through these investments, ONDA aims to the increase airports' capacities and to reduce the risk of disturbances due to unforeseeable incidents or natural disasters. The downstream objective is to support the development of the tourism sector, thereby allegedly driving an upward influence on the economic activity.

The economic activity is also strongly linked to port infrastructures, which are also seen as a priority in terms of PEC investment, particularly via the National Agency of Ports (*Agence*

National des Ports, ANP). Investment expenditures made by the latter directly aim to promote competitiveness in the national ports whether through the reduction of transit costs, the improvement of the quality of the services and logistics. In this framework, ANP is set to invest around 5.9 billion MAD in the period between 2015 and 2019, based on the National Port Strategy; 48 percent of this investment envelop comes from ANP's own resources, while the rest comes mainly from external debt. These investments are accompanied by those of the public company SODEP-Marsa Maroc in terms of the improvement of the services provided by the main ports (Casablanca, Tangier, Agadir, Nador…) when it comes to passengers, containers traffic and several international trade related services. In this perspective, SODEP-Marsa Maroc invested 454.3 million MAD in 2015 out to improve the equipments and the infrastructures, while 331 million MAD was to be spent for the same purpose in 2016.

Urban transport infrastructure

PECs also invest in the sector of urban transport, e.g. tramway infrastructure. Here, the two tramway companies, Casablanca Transport and the Rabat-Salé Tramway Company, operate respectively on networks of 31 KM and 20 KM. The companies serve a respective yearly number of passengers of around 30 million and 33 million. The implementation of the tramway infrastructure in Casablanca had required a 5.92 billion MAD investment, mainly financed through Casablanca Transport's self-financing (67.5 percent) and concessional loans (27.8 percent). As for the implementation of the tramway infrastructure in Rabat-Salé, the total cumulative amount of investments deployed by the Rabat-Salé Tramway Company was 3.6 billion MAD by the end of 2014. It is worth noticing that, besides from their alleged economic impact, these investments allowed for the reduction of accidents by 17 percent in 1 year of implementation.

The construction of five additional lines was launched in the Casablanca region, totaling 80 KM for an overall investment of 16 billion MAD. The construction phases of these extensions generate more than 4,000 direct jobs and 6,000 indirect jobs, while the operating activity currently generates 600 permanent jobs.

Overview of the main characteristics

From the elements presented in this subsection, it is possible to say that in terms of public investment, the PECs show more visibility and resilience compared to the government, e.g. they kept their upward trend and continued financing their programs notwithstanding the budgetary strait starting from 2012, which led the government to significantly cut its investment in 2013.

Also, public investment led by PECs is directly linked to specific projects with thoroughly defined objectives in most cases. Therefore, the impact of said investment is assessable; it supposedly meets a fair degree of effectiveness. On the other hand, the government investment is only partially based on defined projects and objectives. To a certain extent, the Finance Bills of the year (*les lois de finances de l'année*) have loosely defined budget sections, especially in the Investment Budget, where hardly any budget section or line is linked to a specific investment program[38]. As a result, in a significant number of cases it is only after the Finance Bill of the year is voted by the parliament that various expenditures, which do not qualify as investment, are taken from investment budget lines.

However, it is evident that the regional distribution of PEC investment is far from being symmetrical, which prevents the national economy from availing itself of potential opportunities. In this context, it is important to shed the light on the contribution of local councils in terms of public investment since they are supposed to offer effective answers to specific investment-related needs at the local level, seen their proximity and knowledge of the idiosyncrasies of their respective regions.

Thus, before examining the part of public investment that is driven by the government, the next subsection turns into local councils' investment, since it is supposed to respond to specific

[38] It is worth observing that to some extent, government's Trust Accounts could be considered as an exception in this very framework. Originally *Comptes d'Affectation Spéciale*, public Trust Accounts are a type of Special Treasury Accounts (CST) where expenditures are exclusively allocated to a specific project/mission. However, these projects are usually not investment-oriented.

local economic issues, thereby promoting GDP from a local perspective.

Local Councils' investment

In this subsection, we use "Local councils" as a generic term that includes regions, provinces, and urban and rural communities.

The evolution of local councils' public investment has been quite significant starting from the early 2000s. It went from 3.5 billion MAD in 2002 to around 11 billion in 2015, according to yearly reports issued by the Kingdom's Treasury. However, it is worth mentioning that as their budget is significantly embedded on the government's finance because of transfers, local councils decreased their investment expenditures in 2013 by 8.17 percent.

As a matter of fact, public investment led by local councils remains limited to a handful of basic public services. It mainly covers the development of local roads and tracks, the construction of substations for the transformation and distribution of electricity at the community level, the digging of wells, the acquisition or construction of real estate assets, the development of green spaces and the construction of wholesale markets. Also, local public investment includes a significant part representing the local communities' contribution to national (government) programs that tackle rural electrification, drinking water supply and rural roads.

Therefore, it is hardly arguable that most public investment expenditures in the sectors of local infrastructure, housing, health and education is made by the government and public establishments and companies. The role of local councils remains relatively marginal in this framework[39]. This reality could be partially tributary to the lack of management skills and political determination in said councils, especially that the end of fiscal years is often marked by significant surpluses, essentially accumulated through carried over funds (*reports de crédits*). In fact, the surpluses went from 8.6 billion MAD to 21.7 billion from 2002 to 2013 (Bensouda, 2014). When put into perspective, these

[39] Commission Consultative de la Régionalisation (2011), "Rapport sur la régionalisation avancée, Livre III: La régionalisation avancée au service du développement économique et social", p.6.

surpluses are unused resources that could have been used to reduce the gaps in terms of public investment and development among different local communities.

As regards to the distribution of expenditures, salaries come first with around 40 percent of local councils' budget. Their incompressible aspect prevents local public investment from reaching higher levels than what is observed above. This constitutes a common problem between local councils and the government budget, which also suffers from incompressible operating/salaries spending.

Also, the distribution of public investment made by local councils remains very asymmetrical at the horizontal level, depending on the categories of the local public actors. Most of public investment engaged in this framework is made in urban areas, as over 36.94 percent of the overall local public investment expenditures are directly made by urban communities, as opposed to 23.31 percent by rural ones. Furthermore, the majority of public investment made by provincial and regional authorities –which respectively constitute 28.88 percent and 10.86 percent of the overall local public investment, targets the urban areas that fall under their authority, at the expense of the rural sectors (Trésorerie Générale du Royaume, 2014).

In order to actively participate in the development at the regional level and promote local GDP on a more balanced basis, a few mechanisms of horizontal solidarity should be implemented. One way could be through the levy on the revenues of rich territorial communities, to be distributed among the ones with the least resources and where needs for investments are more urgent.

In this framework, public authorities are gradually working on the creation of the Social Upgrade Fund (*Fonds de mise à niveau sociale*) and the Interregional Solidarity Fund (*Fonds de solidarité interrégionale*). The former is intended to address local deficits in terms of human development, infrastructure and equipment, whilst the latter is supposed to focus on the equitable distribution of resources, in order to reduce disparities between regions.

Despite that both of these funds are enunciated in the constitution since 2011, they remain nonoperational. Their organic law (*loi n° 111-14*) was not adopted by the parliament until July

2015; furthermore, said organic law only provides the framework of their respective activities. Most operational details, including the resources, the programs and the distribution criteria, are still to be defined by other laws (Finance bills mostly) and decrees.

As for the present moment, local disparities persist significantly on a regional and local level as demonstrated above. Moreover, vital investment programs such as rural electrification, drinking water supply and rural roads are still managed directly through governmental programs. The paradigm of priority has not yet shifted toward a more inclusive approach of local public investment, as local councils are supposed to offer effective answers to specific investment-related needs at the local level, seen their proximity and knowledge of the idiosyncrasies of their respective regions, provinces and urban or rural communities.

However, improving public investment deployed by local councils is strictly tributary to the enhancement of their financial autonomy. Currently, around 60 percent of their resources are driven from government transfers, e.g. VAT transfers destined to communities and provinces, and company/income taxes transfers addressed to regions. Only 21 percent come from locally managed resources. The proportions did not substantially evolve since the year 2002 to 2015.

On the other hand, it is worth observing that, in light of the current situation, the part of public investment engaged by local councils remains quite small when compared to investment expenditures made by the government and the PECs. When doing the computation, local councils' investment in 2015 did not exceed 10 percent (9.73 percent) of the overall public investment engaged by government, PECs and local councils.

Subsequently, the impact of local councils' investments on national GDP growth is not likely to be important, nor does the expected marginal profitability of the implementation of efficiency-oriented measures. Thus, despite the fact that we consider the importance of further studies exploring the margins of improvement when it comes to local budget effectiveness, we deem that the emphasis of the present thesis should be put on a public investor with a larger potential influence on GDP, so as enhancing its efficiency would likely lead to significant increases in

economic growth. As a consequence, we do not consider the part of public investment made by local councils henceforth, in order to mainly focus on the optimality of government investment expenditures.

The next subsection discusses some elements regarding the part of public investment made by the government, which constitutes the focus of the following sections and chapter III.

Government budget investment

Since the early 2000s, (central) government investment has represented between 20 and 30 percent of overall public investment.

The main sectors where the government invests, following the logic of ministerial distribution are detailed in Table 2.3[40]. The ministry of equipment and transportation comes first, with around 27 percent of the total government investment budget, followed by the ministry of agriculture and fisheries and the ministry of energy and mining, at 17.88 and 16.21 percent respectively. Investment budget appropriations addressing productivity-enhancing sectors such as health (6.87 percent) and education (6.86 percent) are less important than the ones directed to the defense department (10.18 percent).

It is worth bearing in mind that the health and education sectors are highly linked to human capital, knowledge and innovation, which positively impacts GDP dynamics as discussed in chapter I above. On the other hand, there is overwhelming evidence demonstrating the negative impact of military expenditures (investment or consumption) on GDP growth and employment (Korkmaz, 2015; Dunne & Tian, 2013; Chang *et al.*, 2011 among others).

[40] In this frame, we take into account both types of budget appropriations, i.e. commitments and payments. The proportions were calculated based on the average appropriations contained in budget morasses pursuant to yearly finance bills from 2013 to 2016. In fact, we focus on the information contained in said finance bills just to show the initial distribution of investment budget among the different government departments.

Table 2.3. *The distribution of government investment expenditures among ministries (based on the budget settlement law for the year 2013)*

Ministries	Appropriations (billion MAD)	Part in government investment (%)
Equipment and transportation	19.64	26.99
Agriculture and fisheries	13.00	17.88
Energy and mining	11.79	16.21
Defense	7.40	10.18
Health	5.00	6.87
Education (university included)	4.99	6.86
Interior (national security)	3.51	4.83
Industry and trade	2.39	3.28
Youth and sports	1.5	2.06
Others	3.49	4.8

Source: Author's calculations, based on data from the Ministry of Finance

One of the specificities of government spending in general is the fact that it is not linked to particular projects. Instead, each department's budget sections, as defined in each yearly finance bill, are classified according to a few selected types of expenditures. And funds are distributed according to said budget sections (*rubriques budgétaires*).

This distribution logic, based on means instead of clearly defined objectives as in the case of PECs, has been encouraging a certain number of non-productive spending behaviors, particularly when it comes to the part of government budget dedicated to public investment. As an example, departments and ministries tend to spend a maximum of their allowances by the end of each fiscal year, in order not to see their respective budgets reduced in the next year's finance bill[41]. And these impromptu expenditures, although taken from public investment budget sections, usually do not qualify as actual investment, hence their allegedly non-productive aspect. This non-productive spending behavior has been enabled by the fact that to a certain extent, yearly finance bills

[41] A new organic law of finance (No.130-13) is progressively replacing the previous legislative framework in terms of public finance management. The provisions of said organic law are meant to enable the government to shift toward an objectives-oriented paradigm in the evaluation of public spending by the year 2020.

have loosely defined budget sections, especially in the Investment Budget, where hardly any budget section or line is linked to a specific investment program[42]. As a result, in a significant number of cases it is only after said finance bills are voted by the parliament that various expenditures, which qualify more as operating expenses, are taken from investment budget sections.

Paradoxically, the loosely defined government investment budget sections also contribute to the low rates of execution of public investment itself. In the period from 2004 to 2015, the rate of implementation of government investment has remained below 70 percent, while the part that is dedicated to direct investment has hardly reached an execution rate of 55 percent[43]. These evidently structural difficulties when it comes to respecting the objectives in terms of investment spending are likely tributary to the lack of visibility regarding investment projects. A significant part of public investment projects led by the government suffer from consistent delays (construction, infrastructure…). And there is usually a small, yet not insignificant, percentage of investment related procurement contracts that are prematurely terminated as their underlying purchases or projects are unfinished.

Government investment and procurement regulation

The difficulties in terms of the execution of the government's investment budget can also be linked to the institutional framework. Most of said investments are made through procurement, which is mainly regulated by the provisions of the decree No 2-12-349 on the conditions of public procurement, legally in force since 2013, which is a reformed version of the decrees No 2-06-388 (2007-2012 period) and No 2-98-482 (1998-2006 period).

This regulatory text was shaped so as to promote transparency and fight corruption in the process of choosing the most advantageous proposal for a given procurement contract. In doing

[42] As mentioned above, there are certain exceptions to this rule-of-thumb, e.g. government's Trust Accounts.

[43] Trésorerie Générale du Royaume (2004-2015), 'Bulletins Mensuels des Statistiques des Finances Publiques', Volumes from January 2004 to December 2015.

so, the decree's provisions introduce a large number of strict measures, which makes it difficult to fluidly engage and pay for expenditures, particularly the ones supposedly related to public investment. This assumption fits in the line of previous studies that excessive business regulation can be a significant barrier to investment in a country (Korutaro & Biekpe, 2013).

So, out of transparency, the procurement regulation obliges the government to wait for a minimum period of 40 days between the announcement of the call for tenders and the first session of the procurement granting committee, in the cases of construction projects estimated at 65 million MAD or more (i.e. around 6.5 million USD) or equipment/services expenditures estimated at 1.6 million MAD or more (160,000 USD)[44]. Evidently, investment projects usually fall under these two categories. In addition to the forty days publicity period, the period of validity of tenders/bids goes up to 105 days starting from the first session of the procurement granting committee, i.e. 75 days plus a maximum additional period of 30 days. To sum up, the selection phase of procurement can take up to 145 days by itself, which is most likely to slow down the actual implementation of public investment projects or equipment. This time-consuming process highly reduces the government's margin of maneuver during the fiscal year, thereby contributing to the low public investment implementation rate as detailed above.

Also as a consequence of the strict regulatory framework, a significant number of calls for tenders are declared unsuccessful because of simple procedure-related details. Therefore, some government investment projects get further delayed, especially when considering the long period of the procurement procedure as explained above. Furthermore, procurement regulation focuses substantially on the control/inspection approach and the fight against corruption, which promotes bureaucracy and mistrust

[44] This is an updated provision introduced by the Ministry of Finance's Ministerial Order No. 914-14 (March 2014), in compliance with article 20 of the aforementioned Decree No 2-12-349 related to procurement. However, the amounts did not change much compared to the initial ones mentioned in the Decree, i.e. 63 million MAD (construction) and 1.6 million MAD (equipment and services).

among the members of the procurement granting committees. The distribution of roles within said committees hypothetically puts the external members representing the ministry of finance –who are focused on controlling the compliance of the bids selection procedure to the legislative and regulatory texts, in confrontation with the other members, who should focus on the feasibility and quality of the potential contractors' offers (technical aspects, services, project proposals, specific costs…). It also gives the former category of members a higher influence, as all government expenditures and procurement will need the approval of the ministry of finance (the Kingdom's treasury specifically) in the phase following the decision of the committees. Ultimately, one can safely observe that the current legal framework exceedingly focuses on the logic of control and regularity, at the expenses of effectiveness and flexibility when it comes to the calls for tenders.

It is worth mentioning that several public investment projects can be launched by directly negotiating with a limited number of specialized firms, which takes significantly less time than the open calls for tenders (*Appels d'offres ouverts*). However, the latter represent more than 97 percent of the total number of procurement contracts, while the procurement contracts granted through direct negotiations represents only around 2 percent[45]. Therefore, it is possible to consider as a general rule the abovementioned issues linked to the calls for tenders, as direct negotiations and restricted calls for bids remain extremely limited, mostly used by the Defense department.

On a different note, some of the causes of prematurely terminated contracts and unfinished public investment projects led by the government can be traced back to the conditions in which the procurement was granted to the contractor. Based on article 18 of the Decree No 2-12-349, the ultimate variable that underlies the selection of the tenders for the majority of procurement is the proposed price. The only exception in this frame is the studies and research contracts, where the tenders are given scores based on both the technical and the financial aspects of their respective offers, thereby including the technical quality as a direct

[45] Source: Trésorerie Générale du Royaume, 2013 data.

determinant of the final choice of the potential supplier. However, procurement addressing sophisticated equipment installations and infrastructure construction –among others- is not included in that category; hence, the government is bound to select the least expensive tender, notwithstanding the eventual negative impact on the quality, effectiveness and economic returns of the procurement in question. As a matter of fact, the risks are higher when the tender's offer is "abnormally low", i.e. 25 percent lower than the estimation for construction work and 35 percent lower for services and equipment goods (Article 41 of the Decree No 2-12-349). In the case of abnormally low offers, the potential supplier is only asked to send a letter of explanation in order to get the procurement contract. The institutional laxity in this regard could likely be at the origin of low durability equipments and relatively unreliable construction projects. This either leads to failure in achieving the objectives of these public investment expenditures (low effectiveness), or to launching addendums or new procurement contracts, thereby spending largely more government funds than initially planned for the completion of the same project (inefficiency).

It is worth mentioning that PECs do use some provisions from the government's regulation (Decrees, Ministerial Orders…). However, on the overall, they abide by customized versions that are meant to fit into their respective management idiosyncrasies and the nature of their activities. Moreover, when comparing a sample of these customized texts with the actual regulation used by the government, they show to be substantially more flexible regarding the members of procurement granting committees, the expenditure commitment authorization procedure (*Visa d'engagement*), the competent authority's approval (*L'approbation de l'autorité compétente*), and the overall time allocated to the selection of tenders. This enables the PECs to implement investment projects and replace the step-by-step control bureaucracy with a strong *a posteriori* auditing. This difference could be considered as a secondary factor that contributes in the relative effectiveness of the part of public investment engaged by PECs, compared to government investment expenditures.

Investment budget carry-over

The difficulty in terms of the execution of government investment budget, in its current configuration, can also be linked to the yearly carry-overs of budget appropriations (*reports annuels des crédits budgétaires*). This option allows government departments/ministries to postpone the use of unspent appropriations beyond the fiscal year for which it was originally granted through the finance bill.

The organic law of finance No 7-98 has put no clear restrictions on this subject, thereby contributing to a year-to-year accumulation of carried-over appropriations, particularly when it comes to investment budget sections. In some departments, the total carried-over appropriations have reached over 100 percent of their actual yearly investment budget.

Evidently, the existence of this unrestricted option, combined with the long and rigid procurement procedures, is directly linked to the low execution rates of government investment mentioned above. Also, the possibility to continuously postpone investment expenditures is in principle more likely to promote lax management instead of strict discipline when monitoring the implementation of investment expenditures.

As a matter of fact, it is possible to argue in favor of investment budget carry-overs. By reducing the distortions created when transitioning between budget years, carry-over regimes can enhance inter-temporal efficiency in the use of budget funds within budget entities (Lienert, & Ljungman, 2009). Also, they enable the government to avoid random non-productive end-year spending sprees, which are usually decided by public budget managers in order not to send a signal that their respective budgets had been over-allocated, with the risk of receiving lower allocations in the next year's finance bill.

However, it is clear that beyond a certain limit, carry-overs could become highly counterproductive and jeopardize the very effectiveness of fiscal policy. For instance, the excess in using appropriations carry-over could lead the government to miss the optimal timing of certain investment expenditures in the case of a punctual fiscal stimulus. In this case, the creation of a *use-it-or-lose-it* restriction could be a valid solution to make sure that said

investment budget allocations are spent at the right point in the economic cycle (Lienert, & Ljungman, 2009). Conversely, when the carried forward appropriations are important, they would most likely prevent the government from effectively leading restrictive fiscal policy when it is required, thereby putting at risk the sustainability of public finance.

Nonetheless, it is worth mentioning that in light of the new organic law of finance (No. 130-13) and starting from the year 2017, the carry-overs are expected to be subject to general restrictions, i.e. a limitation of 30 percent of the yearly investment budget. This limitation has been set so that it would, on the one hand, enable the government to carry multi-year investment undertakings without having to make repeated revisions to the budget and, on the other hand, push budget managers to stick to the timing decided for the other investment expenditures, thereby increasing the likelihood of an effective fiscal policy.

On the definition of public investment expenditures

When discussing public investment in Morocco, and particularly the part led by the government, it is important to tackle the issues related to the very definition of investment expenditures. The government budget is, in fact, shaped based on said definition. The conception of what can or cannot be considered as public investment reveals to be quite important in assessing the effectiveness of the government's investment policy, and could lead to a few premises on how to converge toward public finance sustainability.

As a matter of fact, the government budget sections have been shaped so that certain types of expenditures fit into each one of them. Following this logic, the investment budget is rarely linked to specific projects; it is rather distributed according to what the government defines as types of investment outlays that could be launched by each department/ministry. By skimming through the government budget morass, it is possible to observe that many public investment budget sections are destined to infrastructural expenditures, e.g. government buildings, roads and other types of constructions whose productivity is meant to last for several decades. Equipment expenditures also take a fair proportion of

investment budget appropriations, e.g. machinery, laboratory equipment, electronic hardware and so on. The latter expenditures usually have a lower productive lifespan compared to the former.

However, the spending on the maintenance of the aforementioned infrastructures and equipments is hardly considered as public investment, notwithstanding the fact that in most cases the absence of periodic maintenance can lead to a premature deterioration of public assets, thereby seriously decreasing their productive lifespan and the effectiveness of public investment along with it.

Other expenditures that can contribute to capital formation are also included in the operating expenditure budget. For instance, over 91 percent of budget appropriations related to government spending on education (professors' salaries, supplies, staff trainings…) are considered as current spending[46]. Nevertheless, government spending on education aims to promote human capital, which has a significantly positive impact on GDP growth as discussed above in chapter I, among other studies (Pelinescu, 2015). The same logic can be partially applied to government spending on health, as it has a direct impact on human capital. Here, only 30 percent of the health budget is considered as investment, including large purchases of vaccines and medical equipments, while around 70 percent are considered as current expenditures (salaries, trainings, medical supplies…). Thus, like in many other countries, the Moroccan government classifies most of its spending on education and health as current expenditure. In this framework, it is worth mentioning that the policy implications of this treatment are often contentious, particularly when the government seeks to justify borrowing merely for public investment (UNCTAD, 2009).

On the other hand, a significant number of current expenditures are *de facto* taken from investment budget as the definition of public investment remains partially loose in light of how the budget sections are distributed. For instance, the uniforms used for the police, the army forces and the customs officers are mostly purchased from investment budget appropriations in

[46] Data source: Ministère de l'Economie et des Finances, Morasse budgétaire 2016.

Morocco, while they are strictly linked to the current activity of the government and have very limited lifespan. And this is merely one example among many that contribute in the draining of a significant part of the government investment budget for economically non-productive expenditures.

Section conclusion

In this section, we discussed the main characteristics of the variables of interest, i.e. the Moroccan GDP and public investment. The light was shed on the chronological evolution of both variables in order to familiarize with their long term idiosyncrasies, and so that the structural factors that had contributed to the current situation could be thoroughly understandable.

Several conclusions can be drawn from the discussion in this section. Firstly, the Moroccan GDP growth suffers, to a certain extent, from year-to-year volatility due to the relatively unpredictable agricultural output that is highly tributary to weather conditions. Also, the share of industry in the GDP has been suboptimal and improving the industrial output is most likely to reduce the year-to-year volatility of the economy as a whole. Another observation is that the Moroccan GDP growth has been driven by domestic demand, i.e. consumption and investment, despite the different export promotion policies launched by the government throughout the years. It is important to emphasize in this framework that the Moroccan economy has a history of substantial interventionism that aimed to support GDP growth and to steer the economic activity through legislation, fiscal incentives and direct public investments.

In this regard, the light was shed on the three main entities that contribute to public investment in the Kingdom, i.e. public establishments and corporations (PECs), local councils and the government. And as discussed above, the part of public investment led by PECs is found to be directly linked to specific projects with thoroughly defined objectives in most cases. Therefore, the impact of said investment is assessable and supposedly meets a significant degree of macroeconomic effectiveness, which is a major part of optimality as defined in chapter III below. Following this conclusion, we deemed that it

would be more important to explore optimality-oriented measures in the other parts of public investment, namely local councils and government, rather than PECs'.

When discussing local councils' role in overall public investment, we find that it remains quite small when compared to investment expenditures made by the government and the PECs. Furthermore, vital investment programs such as rural electrification, drinking water supply and rural roads, which are supposed to be under local councils' responsibility, are still managed directly through governmental programs. Subsequently, the impact of local councils' investments on national GDP growth is not likely to be important, nor does the expected marginal profitability of the implementation of efficiency-oriented measures.

Nevertheless, the part of public investment led by the government proves to be quite important when compared to overall public investment; hence, it is supposed to have visible influence on GDP growth following the elements of analysis discussed in chapter I. It also shows to have large margins of improvement that are worth being examined in depth, on both the budgetary and the institutional levels. This examination starts in the following two sections, which estimate the impact on GDP of public investment expenditures' led by the Moroccan government, along with other variables, such as the GFCF and public consumption. In section 2.2, we consider Morocco as part of a group of developing countries, in order to gather initial benchmarking information. In section 2.3, emphasis is shifted toward the Moroccan context in terms of the macroeconomic effectiveness of these variables. The results are then compared with the ones of section 2.2.

A comparative econometrical analysis

Before specifically examining the Moroccan context in terms of public investment's macroeconomic effectiveness, it is very important to build a benchmarking analysis, in which we can first test the validity of the hypotheses developed by the end of the 1st chapter. In this frame, we initially consider Morocco as part of a group of developing countries, in order to compare the latter's characteristics with a certain number of advanced economies. This

should enable us to gather consistent benchmarking information that can be useful afterwards when analyzing the public investment optimality in Morocco.

It is only after doing so that we get to estimate public investment expenditures' impact on GDP in the Kingdom, along with other variables, such as the GFCF and public consumption. In this particular estimation, we use a time series econometric model. The results are then compared with the panel data's and other empirical papers'.

The empirical literature analysis in the 1st chapter of the present thesis, along with Oukhallou (2016), enabled us to draw the following hypotheses on what could be the determinants of public investment's impact on the economic activity:

Hypothesis 1: Efficiency stands out as a transversal concept, whether through the fight against corruption or the enforcement of macroeconomic profitability-based selectivity of investment projects and government expenses in general. In this context, when further public investment spending does not follow efficiency and profitability-based selectivity, its marginal productivity is most likely to shrink as the negative macroeconomic impact of the crowding-out effect partially –or even totally- neutralizes the supposedly positive effect of said public investment on GDP growth. This can also be applied to government current expenditures.

Hypothesis 2: From a "transitional dynamics" perspective, public investment is likely to have a larger effect in small and middle income countries where the capital stock to GDP ratio is usually the lowest. In this category of countries, the margin of improvement in terms of infrastructure is important, among other development and economic variables. Returns generated by further private or public investment are assumed to be positive but progressively diminishing, *ceteris paribus*.

Hypothesis 3: The higher is the public-private investment substitutability, the more important is the crowding out effect, which drives a downward influence on public investment's effectiveness. The substitutability is more present in advanced economies than in developing ones, which could explain why the public investment multiplier effect is found to go up to 1.4 in

middle income countries while it is weak –and even negative in some cases- in advanced economies (Hemming *et al.*, 2002).

The validity of these hypotheses is assessed according to a panel data model tackling the case of two different groups of countries. The first group encompasses five advanced countries, while the second gathers five developing economies, including Morocco. The next subsection provides further explanations on the data, the model's variables and other econometrical aspects.

Building the panel data model

In this model, we evaluate the correlation between output and public investment expenditures in two panels of countries based on 15-year period data (2000-2015). The first panel consists of five advanced economies, i.e. Denmark, Germany, Spain, Sweden and the United Kingdom. As for the second one, it includes Chile, Colombia, Jordan, Morocco and Slovenia. The total number of observations is therefore 80 for each panel.

Besides from public investment spending and GDP, we added other exogenous variables, such as gross fixed capital formation (GFCF) and public (non-productive) consumption expenditures. The model also encompasses the demographic evolution, which supposedly adds more explanatory power to its results. The latter is, to a certain extent, based on the works of Reynolds (1985, 1994), which is discussed above in chapter 1.

In this frame, allowances are made between productivity-enhancing public spending and other purchases, based on the definition provided by a significant part of the empirical literature.

The panel data model is as follows:

$$Y_{it} = \propto_1 . GI_{it} + \propto_2 . GC_{it} + \propto_3 . GFCF_{it} + \propto_4 . \Delta Pop_{it} + \varepsilon_{it}$$

Where Y_{it} is the gross domestic product at purchaser's prices for a given country in a given time. Data are in U.S. dollars, as they were converted from each country's domestic currencies using 2000-2015 average exchange rates. By doing so, the aim was to reduce possible distortions due to fluctuations in exchange rates, which could be interpreted by the model as a significant fall or decrease in GDP. Compared to previous computations, this

technique helped improve the quality of the model's outputs. In both panels, GDP's data source is the World Bank's national accounts database.

GI_{it} represents government investment expenditures, i.e. the part of public budget that is dedicated to investment spending. For this particular variable and in the absence of reliable data series, we created the latter using data mining based on the information contained in government reports (ministries of finance and central banks mostly) for the cases of Chile, Colombia, Germany, Jordan, Morocco, Slovenia, Spain and Sweden. As regards to public investment spending in Denmark and in the United Kingdom, we collected consistent data from their respective statistics offices.

As for GC_{it}, it represents public consumption expenditures' evolution in the panel countries and in different time periods. This variable was included in the model since its analysis would enable us to make allowances between productivity-enhancing public spending and non-productive government purchases. This is also supposed to give hints on the degree of crowding out, if public consumption's impact on GDP growth is found to be equal or larger than public capital expenditures'. Unlike government investment expenditures, public consumption is usually not financed by debt. In both panels, the government consumption expenditures' data source is the World Bank's national accounts database.

$GFCF_{it}$ is the gross fixed capital formation per country and per year, which includes both public and private investments. This variable is often considered as a proxy to public investment (see IMF (2015) and Allain-Dupré *et al.*, (2012), among others). However, this research focuses on the degree of effectiveness of the actual public *spending* in term of investments. In this context, GFCF was merely chosen in order to enable us to compare between the real impact of variations in the actual capital stock (GFCF) and the one driven by variations in government investment expenditures. It is also an intuitive mean to assess the public investment expenditures' degree of effectiveness. At this point, we consider GFCF's impact on GDP as a relatively optimal benchmark. It is worth mentioning that this approach's shortcoming is that it could yield risks of collinearity for the reasons mentioned above. And for

this variable, data series were taken from the World Bank database.

ΔPop_{it} represents the annual variation of the resident population per country. By introducing this variable in the model, we intend to assess the impact of the demographical influence on GDP growth especially that we do not consider per capita variables in this very estimation. The choice of this variable is also based on theoretical elements discussed above (see Reynolds, 1985, 1994 among others).

Table 2.4 displays the average shares in GDP of public investment, public consumption and GFCF in our panel of advanced countries, while Table 2.2 shows these figures in the case of developing economies.

GFCF in the developing countries takes larger shares of GDP (an average of 24.13 percent) compared to the advanced ones (21.15 percent). The same goes for public investment (4.09 and 2.97 respectively). On the other hand, public current expenditures take more important proportions in the developed countries, mostly driven by different transfers, including social support to households.

Table 2.4. *GFCF, public investment and consumption in the 1st panel (% of GDP)*

	Denmark	Germany	Spain	Sweden	UK	Panel
Pub. Investment	2.38	2.07	4.08	4.32	2.01	2.97
Pub. Consumption	25.68	18.74	18.59	25.35	20.13	21.70
GFCF	20.47	20.07	25.09	22.74	17.40	21.15

Table 2.5. *GFCF, public investment and consumption in the 2nd panel (% of GDP)*

	Morocco	Chile	Colombia	Jordan	Slovenia	Panel
Pub. Investment	5.14	3.07	3.50	5.73	3.00	4.09
Pub. Consumption	16.73	11.40	16.77	21.04	19.08	17
GFCF	27.29	22.00	22.52	25.03	23.81	24.13

Among the advanced countries, Spain is last in terms of public consumption, in a clear contrast with the two Scandinavian countries and the UK. This finds explanation in the differences in terms of social protection-related expenses and transfers, as an

important part of these expenditures is statistically considered as public consumption. As a matter of fact, the social security systems in Denmark, Sweden and the UK are very advanced in this framework compared to Spain's[47].

As regards to public investment, Jordan and Morocco seem to have the largest ratios, at 5.73 percent and 5.14 percent respectively. And in terms of GFCF, Morocco is by far predominant, which could be explained by the substantial investment strategies that characterized the 2000s and helped promote domestic private investments and attract significant FDI.

Estimation method and statistical tests

The compound error model used in the present estimation follows this logic:

$$y_{it} = \beta_0 + \beta x_{it} + u_{it} \quad ; i = 1, \ldots\ldots, n \quad \text{et } t = 1, \ldots, T$$
$$u_{it} = \alpha_i + \epsilon_{it}$$

Where x_{it} is the explanatory variable and y_{it} is the continuous variable with constant β_0. The component α_i represents the characteristic of the individual i, while β is the parameter of interest and ϵ_{it} is the error term that follows a distribution N $(0,\sigma^2)$. The term u_{it} denotes the compound error of the model, hence the name "One-Way Error Component Regression Model". On the other hand, if the parameter $\alpha_i$is fixed then the panel model is with individual fixed effects, and if α_i is random then we would be dealing with an individual random effects model.

The estimators used in this framework are: the within estimator for the fixed effect model and the generalized least squares (GLS) estimator for the random effect model. The Hausman (1978) test consists of comparing the GLS and Within estimates to choose the appropriate model, i.e. a fixed effect model (FEM) or an error components model (ECM). The test statistic is written as follows:

$$H = \left(\hat{\beta}_{FEM} - \hat{\beta}_{ECM}\right)' \left[\hat{V}(\hat{\beta}_{FEM}) - \hat{V}(\hat{\beta}_{ECM})\right]^{-1} \left(\hat{\beta}_{FEM} - \hat{\beta}_{ECM}\right) \rightarrow X^2(k)$$

[47] Eurostat (2016), Social Protection Statistics, June

Under the null hypothesis of correct specification, this statistic is asymptotically distributed according to a Chi-square with K degrees of freedom, i.e. the number of time-varying factors introduced into the model. If the test is significant (P-value strictly below 5 percent), the choice falls on the fixed-effect model estimators, since they would be unbiased.

Based on this methodology and as explained below, the estimators proposed in this research are the fixed effect model estimators. This model, also called the covariance model, assumes that α_i are constant and non-random effects. Also, it has a residual structure that verifies the standard assumptions of OLS.

Before turning into the model's econometrical results for both country panels, it is necessary to carry out a number of tests to examine the robustness and the choice of the model. We particularly use the Hausman test of the absence of individual specific effects, the Modified Wald test for the choice of the model and the Breusch Pagan test for heteroskedasticity.

In our specific case, the Hausman test reports an x^2 statistic with a probability of less than 5 percent, thereby allowing the rejection of the null hypothesis of absence of individual specific effects for our case; hence the model should be a fixed-effect one. Moreover, only the Between (inter-country) and Within (intra-country) estimators would be effective in this case.

We chose the Within estimator rather than the Between, since it generates more consistent results. Although the Between estimator makes it possible to take account of the impact of structural factors in the panel, this relative advantage comes at the expense of cyclical influences, which are highly important for our analysis. In other words, the Between estimator does not take into account the persistence of the fixed individual effects. Furthermore, the Between estimator reduces the number of observations since each $X_{(k;it)}$ is replaced by its individual mean $\bar{X}_{(k;t)}$ which often leads the estimator to lose some of its effectiveness.

The Breusch Pagan test provides a Chi-2 with a p-value of less than 5 percent, which leads us to accept the hypothesis of residual heteroskedasticity. However, the coefficients of the variables of interest are globally robust and the errors related to the econometric techniques are substantially reduced.

Empirical results

The estimates of the model are shown in Table 2.6below. In both panels, all coefficients are found to be significant at least at the 5 percent threshold, except for the ones related to population's evolution, which are not found to have any noticeable effect on GDP growth in our pattern.

Table 2.6. *The results of the panel data estimations. Dependent variable: GDP in US dollars (in logarithm)*

Explanatory variables	Coefficient for Developing countries	Coefficient for Developed countries
GI	0.016763**	-0.0023062**
	(0.0231834)	(0.0005874)
GFCF	0.2485102***	0.2613728***
	(0.00392708)	(0.0425781)
GC	0.0095641***	0.0228578***
	(0.0448677)	(0.0139976)
ΔPop	0.0133183	-0.007947
	(0.0131295)	(0.0053584)
R-sq	0.9869	0.9809
Number of id	5	5
Number of observation	80	80
Sigma_u	0.3504	0.2202
Sigma_e	0.04726	0.0225

Source: Author's calculation

Note: * Significant at 10%, ** significant at 5%, and *** significant at 1%, respectively

The parameters Sigma_u and Sigma_e represent respectively the intra-country variance (Within) and the inter-country variance (Between)

The most striking result is the difference between the two groups of countries in terms of the macroeconomic impact of public investment expenditures. In the developed economies' panel, the coefficient that is associated with public investment spending is slightly negative, as opposed to the group of developing countries. The sign of this correlation corroborates evidence provided by Hemming *et al.,* (2002). It finds a plausible explanation in the substantial level of public-private investment substitutability –in the advanced countries, which generates higher crowding out effects; hence the downward influence on public

investment expenditures' effectiveness in said countries. This finding is directly linked to the 3rd hypothesis mentioned above, which states that the higher is substitutability the lower is the public investment multiplier effect. This does not apply to the five developing countries in our panel, since their public investment spending tackles essentially the existing infrastructure shortages, hence its alleged non-substitutability as regards to private investment. Besides, historical evidence shows that government deficits tend to have very little influence on interest rates in low and middle income countries, thereby generating insignificant levels of crowding out.

Also, GDP growth seems to react more significantly to government consumption than to public investment expenditures in the advanced economies. This result confirms the existence of significant levels of crowding out, since public current expenses are not financed by public debt in these countries, unlike public investment expenditures. This corroborates the very conclusion of a previous study led by Perotti (2004) on five industrialized countries, including Germany and the UK. In the panel of developing countries however, the coefficient of public investment expenditures is larger than the public consumption's, and it is significant and positive.

The differences between the two panels of countries in terms of GDP's reaction to public investment expenditures can also be discussed from a "transitional dynamics" point of view. The model's estimates confirm that public investment in the countries with the lower capital to GDP ratio has a larger explanatory power over the economic activity and returns generated by (private and public) investment are shown to be indeed progressively diminishing, *ceteris paribus*. This analysis tends to confirm the 2nd hypothesis because when compared individually, Denmark, Germany, Spain, Sweden and the UK do have larger capital stocks than Chile, Colombia, Jordan, Morocco and Slovenia.

Nevertheless, this hypothesis is challenged by the model's outputs regarding GFCF, since the latter seems to have a relatively better impact on GDP in the panel of advanced countries (a coefficient at 0.2613 compared to 0.2485), despite their high capital stock to GDP ratio and their position in terms of transitional

dynamics. This could be explained by efficiency and profitability-based selectivity (Oukhallou, 2016). The countries of the first panel have lower levels of corruption, which usually helps keep both types of investment at a relatively effective level[48]. Furthermore, the macroeconomic profitability of GFCF is also tributary to the economic agents' behavior vis-à-vis risk. In developing countries, such as Morocco for instance, an important part of private capital investment is addressed to sectors that generate quick returns and have lower risks (e.g. real estate); the latter are also known to generate lower added value, hence the relatively smaller impact on GDP.

But undoubtedly, GFCF shows a larger impact on GDP than public spending in general. This could be interpreted as the consequence of private investment's effectiveness when it comes to generating economic growth, as it is a predominant component of GFCF in all ten countries. It also suggests, to a certain extent, that government investment expenditures are not effective, seen the tremendous gap between their coefficients and the GFCF's in both set of countries. This result is in fact different than research works made in developing countries particularly, e.g. Tunisia, where GDP was found to rely more on public investment and less on private capital (Casero & Varoudakis, 2004; Boughzala *et al.*, 2007).

As regards to government consumption expenditures, they hold more explanatory power over GDP growth in the advanced countries, a 0.023 coefficient compared to around 0.01 in the developing economies. This can be linked to the high proportion of public consumption in the former group of countries, as well as the presence of household income-enhancing transfers among its major components. Said transfers are known to directly support the purchasing power of households with high consumption propensity, thereby improving the demand side of the economy.

[48] According to the Transparency International's Corruption Perceptions Index 2015, the least corrupt countries amongst our panels are Denmark (ranked 1st), Sweden (3rd), Germany and the UK (both at the 10th position). Spain is the only exception, as it is ranked at the 36th position, behind Chile (23rd) and Slovenia (35th). Jordan is 45th, Colombia is 83rd and Morocco seems to have the highest level of corruption in the two panels (88th).

Moreover, the two groups of countries are put on an equal footing as regards to substitutability and transitional dynamics, since public consumption does not crowd out private investment, unlike public investment expenditures. This shows the superiority of developed countries in terms of government consumption's macroeconomic effectiveness.

On a different note, it is worth bearing in mind that the econometrical idiosyncrasies of panel data models and intra-individual estimators do not usually help generate high coefficients. Time series models might give more important coefficients. Thus, the comparison between the coefficients of this model and those generated by the GLS for the Moroccan case in the next section must take into account this aspect.

In a nutshell, the model confirms that public investment is more effective in developing countries. The impact on GDP's evolution is positive in those countries, and despite being econometrically significant, its coefficient remains far below that of GFCF and, by extension, private investment. Our results also suggest that public investment spending is relatively counterproductive in advanced economies, most likely because of high levels of crowding out; the latter is driven by public-private capital substitutability and the respective positions of these countries in terms of transitional dynamics.

Basically, this empirical examination enables us to confirm Hypothesis 3. It also provides evidence that is consistent with Hypothesis 2, but only for the case of public investment. Moreover, the model's results suggest that Hypothesis 1 can be confirmed in the case of government consumption. The five advanced economies are the least corrupt among the overall sample (with the exception of Spain); at the same time, their government consumption expenditures have a better impact on GDP than in the five developing countries, which happen to have higher rates of corruption. Hypothesis 1 cannot however be ascertained when it comes to public investment. The potential effect of such a hardly assessable variable is occulted by the strongly evident impact of crowding out on GDP.

The next section is meant to explore some of the aforementioned hypotheses in the Moroccan context. Based on a

time series analysis, the emphasis is laid on the macroeconomic effectiveness of government investment expenditures in determining GDP growth in the Kingdom. The results are then compared with the ones of the benchmarking panels examined in this section.

The macroeconomic impact of public investment in Morocco

After reviewing the history and main characteristics of GDP and public investment spending in the Kingdom, and drawing a twofold panel data benchmarking analysis, we turn starting from this section to econometrically examining the Moroccan framework and its underlying macroeconomic problems related to public investment expenditures.

Thus, we get to estimate public investment expenditures' impact on GDP in the Kingdom, along with other variables, such as the GFCF and public consumption. In this particular estimation, we use a time series econometric model. The results are then compared with the ones generated by the panel data model and other empirical papers. The downstream aim is to establish whether or not Morocco falls behind in terms of public investment's macroeconomic effectiveness; in case it does, further explanations are developed, which will be tested in chapter III.

Data and econometrical approach

With the purpose of having relatively comparable outputs, the data we use in this section is, to a significant extent, similar to the one based on which we computed the panel data models for advanced and developing countries in section 2.2 above. However, in order to respect, among others, the law of large numbers as represented by a minimal sample size of 30 observations, some adjustments are in order without jeopardizing the results comparability.

In this context, we make use of annual data from the year 1980 to 2015, thereby expending the time set. Furthermore, we mainly focus on the part of public investment that is led by the government (general budget) as it has shown to have larger

margins of improvement than PECs and to be more important compared to local councils, according to our detailed assessment in section 2.1.

And besides from government investment expenditures and GDP in Morocco, we also added gross fixed capital formation and public current expenditures, so as to encompass a larger explanatory power to the model as a whole. However, we do not include the demographical variable (evolution of the population) as it appears to have no significant influence on the variable of interest, based on our first attempts regarding the time series estimation below and the panel data model in the previous section.

Using a time series regression methodology (GLS), we estimate the following equation:

$$Y_t = a.GI_t + b.GC_t + c.GFCF_t + c$$

The variables remain mostly the same as in section 2.2, and they are all in logarithms. Y_t is the non-agricultural gross domestic product in Morocco from 1980 to 2015. Since we are specifically tackling the Moroccan case during longer periods than in the panel data model above, it is important to neutralize the quasi-random volatility of the agricultural output, as it fluctuates according to yearly weather conditions, thereby significantly influencing the GDP growth. Thus, the agricultural component is likely to bias the model's results, while the other components are relatively stable and are more likely to represent the behavior of GDP as conventionally defined. The non agricultural GDP series is in local currency (MAD). In this case, we compute the series based on data from the World Bank database.

GI_t represents government investment expenditures, i.e. the part of government budget that is dedicated to investment spending. We do not consider PECs or local councils, pursuant to the discussion in section 2.1 above. For this particular variable and in the absence of reliable data series, we created the latter using data mining based on the information contained in the Kingdom's Treasury reports. Thus, we followed the same methodology as in the panel data model in section 2.2.

As for GC_t, it represents public consumption expenditures' evolution during the different time periods. This variable was

included in the model since its analysis would enable us to make allowances between productivity-enhancing public spending and non-productive government purchases. This variable should also be a ground for comparison as regards to the degree of macroeconomic productivity of government investment expenditures. Moreover, and at the image of the panel data models above, the inclusion of this variable in the model could also give hints on the degree of crowding out especially that unlike government investment expenditures, public consumption is usually not financed by debt in Morocco. However, this aspect can only be discussed if public consumption's impact on GDP growth is found to be remotely equal or larger than public investment expenditures' in the Kingdom. We use World Bank's national accounts database as a data source forGC_t.

$GFCF_t$ is the gross fixed capital formation in Morocco, which includes both public and private investments. We choose not to consider this variable as a proxy to public investment. Instead, we rely on it so as to compare, in terms of impact on GDP dynamics, between variations in the actual capital stock (GFCF) and variations in government investment expenditures. At the image of the panel data analysis above, the inclusion of this variable in the time series model can also be seen as an initial way to assess the public investment expenditures' degree of effectiveness. At this point and despite the exceedingly high ICOR index in Morocco, we consider GFCF's impact on GDP as a relatively optimal benchmark (as opposed to public investment expenditures)[49]. The GFCF series is taken from the World Bank database.

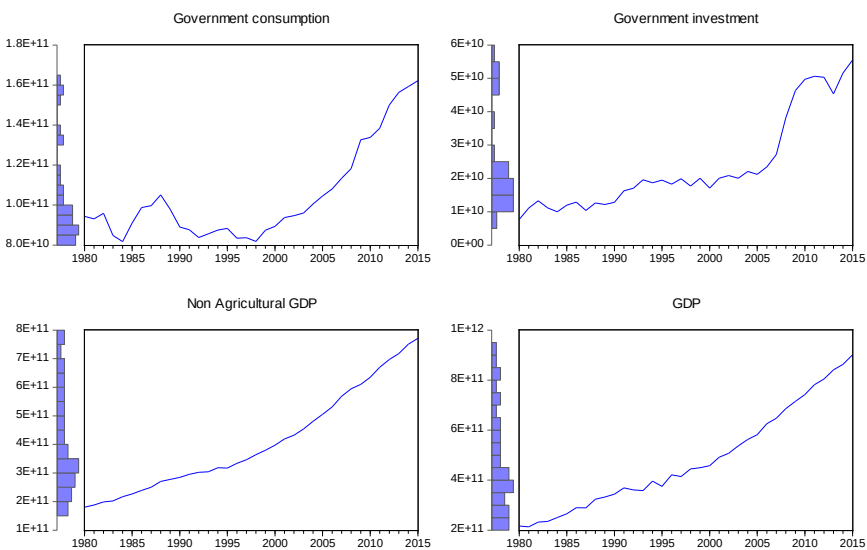
Figure 2.3 displays these four variables (in logarithms). For the GDP variable, it is possible to observe the difference in terms of dynamics between overall GDP and the non agricultural output. The latter's evolution is seemingly more stable, which is in line with the elements discussed earlier in this subsection, and based on which the choice of this variable was made. Other than that, it is

[49] Based on the author's calculation (data from the World Bank database), from 1998 to 2015, the ICOR index in Morocco is 8.96 (8.85 when only considering non-agricultural GDP). It is the average of the ratios found by dividing the share of GFCF (constant MAD) in GDP (constant MAD) by the GDP growth rate for each year during the examined period.

quite easy to observe that, in general, all variables have an upward trend. However, public current expenditures seem to have followed an unstable evolution from 1980 to 1998. This is most likely to affect its potential econometrical correlation as regards to output dynamics, thereby reducing its explanatory power at least during the aforementioned period.

Through the public investment statistical series, we can observe a drastic drop in 2013, which comes as a consequence of a mid-year 11.8 billion MAD government cut in the investment budget in order to prevent the fiscal deficit from increasing. This significant increase does not seem to have influenced GDP's evolution, as its potential negative impact was compensated that year by the increase in GFCF and the macroeconomic windfalls generated by the agricultural sector as a consequence of the favorable weather conditions.

Based on this set of data and the equation above, we use a generalized least squares model in order to have an initial estimation of the extent to which each of the variables determines GDP dynamics. Despite the model's simplicity, it enables to generate consistent outputs that are worth being discussed. In the next subsection, we analyze the results of this statistical inference.



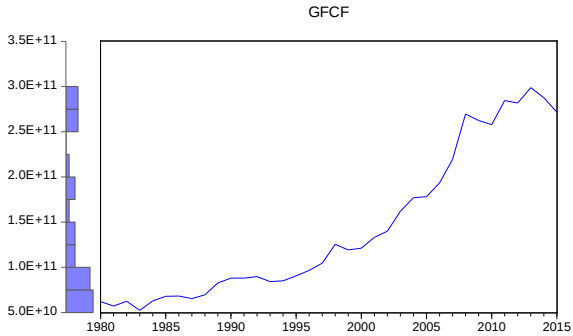


Figure 2.3. *The model's outputs.*

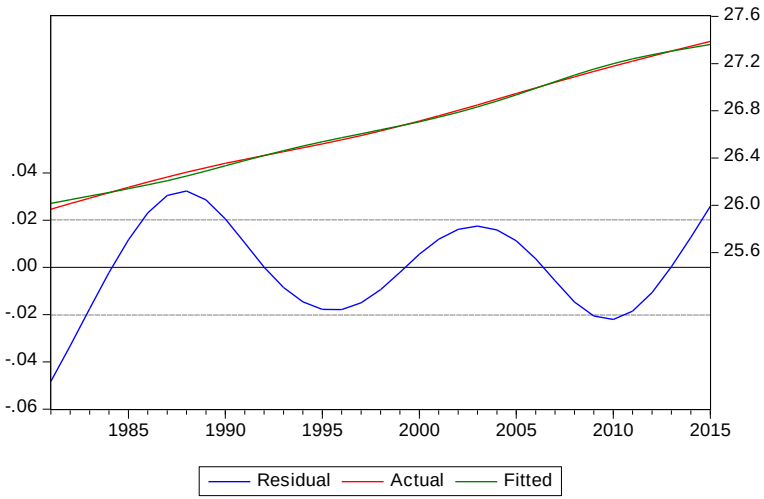
Empirical results

The model's outputs are shown in Table 2.7 below. As explained above, all variables are expressed in logarithms. The exogenous variables are in principle the same as in the panel data model, except that we use the non-agricultural GDP to reduce the potential influence of the climatic bias on the model's reliability.

Econometrically, the coefficients of public investment expenditures and gross fixed capital formation are significant at the 5 percent threshold, while public consumption spending does not have a significant explanatory power over the endogenous variable, according to the model's results. The adjusted R-squared is significant at 0.97, while residuals' distribution slightly converges toward a white noise distribution, except for the three first periods of the time sample. A major caveat is to be emphasized in this regard, i.e. the non-stationarity of the series, which means that part of the coefficients' size could come from spurious relationships that do not imply causality. This risk should be taken into account when discussing the results, since the coefficients are likely to be overstated due to the potential existence of confounding factors.

Table 2.7. *Generalized least squares regression results*

Dependent Variable		LNON_ARG_GDP		
Method		Least Squares		
Date		05/25/17		
Sample		1980-2015		
Included observation		36		
Variable	Coefficient	Std. Error	t-Statistics	Prob.
LOG_PUBINVEST	0.166702	0.068592	2.430318	0.0209
LOG_CONCO_CONSTANT	-0.141014	0.101554	-1.388577	0.1746
LOGGFCF_CONSTANT	0646374	0.062462	10.34829	0.0000
C	9.761390	1.883963	5.181307	0.0000
R-squared	0.976369	Mean dependent var		26.64627
Adjusted R-squared	0.974154	S.D. dependent var		0.434254
S.E. of regression	0.069814	Akaike info criterion		-2.381517
Sum squared resid	0.155969	Schwarz criterion		-2.205571
Log likelihood	46.86731	Hannan-Quinn crt.		-2.320107
F-statistic	440.7178	Durb,n-Watson stat		0.0661762
Prob (F-Statistic)	0.000000			



In terms of results, and as expected the model suggests a positive correlation between GDP and government investment expenditures, at around 0.16. In other words, the model suggests that a 100 percent increase in government investment spending would lead to a 16 percent increase in real GDP. This coefficient is in fact higher than in some Sub-Saharan economies, such as the Ivory Coast, where the variation in real GDP is only estimated at 7 percent for each 100 percent increase in public investment

expenditures (Oukhallou, 2016). However, the regression coefficient remains significantly below that of several comparable economies; and in our case in point, it is smaller than GFCF's, which is over 0.64. It is worth mentioning, nonetheless, that public investment's coefficient would have been more important if we had not excluded the supposedly more macro-economically profitable part of the overall public investment, i.e. the investments led by public establishments and companies, as explained in section 2.1.

The statistically non-significant relationship between public consumption expenditures and GDP evolution could find explanation in the fact that this sort of expenditures is usually classified as non-productive. Besides, the trend that was followed by the series of public consumption does not seem to be linked whatsoever with GDP, as shown in the graphs above.

To some extent, the non-significant influence of public consumption in Morocco can be analyzed alongside the coefficient of government consumption in the panel of developing countries in section 2.2, which was found to be extremely small (0.009) and way below the one observed in advanced economies (0.023).

In order to assess what could be considered as a (long-term) structural influence of each of the three exogenous variables on GDP dynamics, we run the same model using trend series. The latter were computed using the Hodrick-Prescott filter, through which we neutralized the (short-term) cyclical components of all variables [50]. Here, the risks of the existence of a spurious relationship between the variables is evidently higher. The model's outputs are shown in Table 2.8.

[50] There are a few alternative detrending approaches that could be used for the examined data in this case, such as the Christiano-Fitzgerald band filter and Hamilton's (2017) approach. However, in this estimation exercise essentially intended for intuitive analysis and approximation, the difference in terms of model's estimates is hardly noticeable.

Table 2.8. *GLS regression results (structural trends)*

Dependent Variable		T_NA_GDP		
Method		Least Squares		
Date		05/26/17		
Sample		1980-2015		
Included observation		36		
Variable	Coefficient	Std. Error	t-Statistics	Prob.
LOG_PUBINVEST	0.328290	0.033752	9.726627	0.0000
LOG_CONCO_CONSTANT	-0.254192	0.034135	-7.446642	0.0000
LOGGFCF_CONSTANT	0.517797	0.023900	21.66513	0.0000
C	12.08788	0.556278	21.72976	0.0000
R-squared	0.998936	Mean dependent var		26.74820
Adjusted R-squared	0.998818	S.D. dependent var		0.375908
S.E. of regression	0.012923	Akaike info criterion		-5.739723
Sum squared resid	0.004509	Schwarz criterion		-5.554693
Log likelihood	92.96571	Hannan-Quinn crt.		-5.679408
F-statistic	8452.490	Durb,n-Watson stat		0.284302
Prob (F-Statistic)	0.000000			

When examining the structural relationship between the endogenous variables and GDP's evolution, the most interesting finding has to do with government current expenditures, which are clearly counterproductive according to the regression's outputs, with a -0.25 coefficient that is statistically significant this time. It is worth bearing in mind that this category of spending takes the lion's share of the Moroccan government budget. And this result partially confirms the conclusions of Oulmakki (2015), where public expenditures were found to be negatively correlated with GDP evolution, at a coefficient of -1.1 using OLS and VECM (Oulmakki, 2015). However, Oulmakki (2015) considers the overall government expenditures as a proxy for public investment instead of making the difference between public current and capital spending, while our study takes into account the fact that current expenditures are predominant in the government budget.

On the other hand, the model detects a larger influence of public investment expenditures, where each 100 percent increase drives a 33 percent growth in GDP. This could find explanation in the fact that public investment expenditures ultimately meet a significant part of their objectives, despite the deficiencies discussed in section 2.1above, e.g. the large rate of carry-overs, the relatively long procurement procedure, the loosely defined investment budget sections and the existence of non-productive

current expenses within said budget. Nevertheless, GFCF, which we consider as a benchmark variable, remains more influent. The model's outputs suggest that in the case of a 100 percent increase in GFCF, GDP is supposed to grow by over 51 percent in the long run.

This result also shows that the Moroccan government could have evolved, to a certain extent, in terms of macroeconomic impact of its investment expenditures. A previous study led by DEPF (1999) had revealed that back in the late 1990s, a yearly 100 percent increase in government investment would drive an upward influence on GDP from 2 to 4 percent[51].

However, Morocco is in fact a developing country, which implies very low public private capital substitutability. Moreover, in the logic of transitional dynamics, Morocco remains way below the threshold beyond which the returns of (public) investment start to diminish or become counterproductive. Therefore, we consider that the macroeconomic impact of public investment expenditures is supposed to be higher, in both model configurations presented in this subsection, as their influence is way below the 1.4 multiplier effect found in middle income countries as discussed in chapter I above and in Hemming *et al.*, (2002).

The next subsection discusses and motivates a number of policy recommendations that are likely to increase the macroeconomic productivity of government investment expenditures, in light of the diagnosis established in this chapter. The aim is to come up with hypotheses that could be tested in the optimality-oriented framework of chapter III below.

Recommendations and hypotheses

The ICOR index for Morocco remains at a significantly inefficient level, at around 8.96 (8.85 when only considering non agricultural GDP), as opposed to several other comparable

[51] Originally, the study led by DEPF (1999) states that a yearly 2 billion MAD (≈10 percent) increase in government investment would lead to a 0.2 percent increase in the Moroccan real GDP by the year 1999 and 0.4 percent by 2003. It is merely in order to facilitate the comparison that we mentioned a 100 percent increase instead of a 10 percent. However, we kept the proportions unchanged, *ceteris paribus*.

countries such as Tunisia (around 6.54), Egypt (4.34) and Malaysia (4.12), which reflects a relatively low capital effectiveness in the Kingdom. This index is calculated based on GFCF as a variable representing overall investment. And since both our time series estimations suggest that GFCF has significantly more explanatory power over GDP variations compared to public investment expenditures, it is only straightforward to assume that the latter are at a further low level of effectiveness.

So far and according to the discussion in the previous sections of this chapter, the premises are that this low level of efficiency is likely tributary to the fact that a significant part of government investment budget is used for non-productive expenditures, as an important number of current expenditures are *de facto* taken from the investment budget where hardly any budget section or line is linked to a thoroughly defined investment program.

Our analysis also suggests that the excess in using budget appropriations carry-over contains high risks of government investment ineffectiveness. As several of its departments/ministries have been continuously postponing public investment expenditures in light of the previous organic law of finance (up until 2017), the Moroccan government could have missed the optimal timing of certain investments, especially in the case of fiscal stimulus. The discussion also stipulates that the procurement legal framework does not help improve efficiency, as its strict and time-consuming provisions tend to further delay a major part of public expenditures, especially the ones related to investment projects and equipments. Subsequently, the low rate of execution of government investment is most likely a determining factor, especially when considering that during the last decade, the part of budget dedicated to direct investment has hardly reached an execution rate of 55 percent[52].

In the present thesis, the concept of efficiency stands out as a transversal factor determining macroeconomic effectiveness, *i.e.* the impact of public investment spending on output growth, whether through the fight against corruption or the enforcement of macroeconomic profitability-based selectivity of investment

[52] See subsection 2.1.2-c above

projects and government expenses in general. According to the IMF (2015), aone-off 1 percent of GDP increase in public investment increases output by just 0.3 percent for countries with lowlevels of efficiency, as opposed to 0.6 percent for the most efficient countries in this framework (IMF, 2015).

Based on the problems discussed in the different sections of this chapter, we stipulate the following general recommendations based on which public investment expenditures are more likely to improve their effectiveness.

Limitations on investment budget carry-overs

A restriction of 30 percent of the yearly investment budget has been stipulated by the organic law of finance (No 130-13) but still has not been effectively implemented. In the absence of data in this regard, we deem important to estimate the potential impact of this policy measure on government investment effectiveness.

This measure should push public budget managers to switch toward more respect of the opportune timing of investment expenditures and stricter discipline when monitoring their implementation, thereby increasing the likelihood of their effectiveness as regards to the economic activity.

Adjusting the procurement regulation

The difficulties in terms of the execution of the government's investment budget can also be solved partially through a reform of public procurement regulation, particularly the provisions of the decree No 2-12-349. The distinction between productivity-enhancing government investment expenditures and current purchases does not exist in the aforementioned decree; hence, both types of spending follow the same procedure with the same restrictions, conditions and deadlines.

In this context, we recommend adding this distinction to the regulation and introducing more procedural flexibility when it comes to procurement related to public investment projects and equipments. Thus, creating a synergy between the logic of the new organic law of finance 130-13 (which further focuses on performance) and public procurement regulation is a *sine qua non* condition for the public finance reform to work in Morocco.

This distinction should also make it possible to introduce a thorough and qualitative treatment of the cases of abnormally low offers when it comes to contracts that are strictly related to public investment, thereby reducing the risk of prematurely terminated contracts and unfinished public investment projects led by the government. The current regulation remains deficient in this framework, as the potential supplier with abnormally low price is only asked to send a letter of explanation in order to get the procurement contract, regardless of the degree of importance of the latter. The institutional laxity in this regard could likely be at the origin of low durability equipments and relatively unreliable construction projects. This either leads to failure in achieving the objectives of these public investment expenditures (low effectiveness), or to launching addendums or new procurement contracts, thereby spending largely more government funds than initially planned for the completion of the same project (inefficiency).

On the other hand, it is worth mentioning that in 2016, the government reformed the conditions and deadlines of supplier payments through the decree No 2-14-394. The latter reduced the time limits for paying suppliers to 60 days instead of 90, which significantly helped pace up this procedure, thereby improving the treasury liquidity of a large number of national companies -that provide the government with goods and services. Also, when passed the 60 days time limit, the government is obliged to pay default interests (*intérêts moratoires*) to said supplier. Before the year 2017, this measure was only applied if suppliers formally demanded the default interests to the administration, which was rarely the case for various reasons. It was made mandatory by the decree No 2-16-344 on payment terms and default interests, which is most likely to push public budget managers toward a faster and more efficient treatment of this aspect of public procurement.

In this framework, we recommend a reduction of the period given to the procurement granting committees in order to select the potential suppliers -which goes up to 105 days[53]- by 30 percent

[53] Here we only consider the selection period, which starts from the date of the bid opening. We do not include the time of publication (which goes from 21 to 40 days as explained in section 2.1 above). We do not exclude

for instance. Following the same logic as above and in light of the current challenges discussed in section 2.1, this measure is likely to improve the actual implementation of public investment projects or equipments that are launched via procurement, as the current time-consuming process highly reduces the government's margin of maneuver during the fiscal year.

Linking government investments to strictly specific plans

As detailed above, despite the recent reform of the organic law of finance, the Moroccan government still operates, in practice, with finance bills that have loosely defined investment budget sections, where hardly any budget section or line is linked to a specific investment program. Subsequently, in a significant number of cases it is only after the finance bill of the year is voted by the parliament that various expenditures, which do not qualify as productivity-enhancing investment, are taken from investment budget lines.

From this perspective, we deem that the impact of public investment on GDP dynamics can also be improved by allocating the appropriations that are encompassed in the investment budget to specifically defined government plans, at the image of PECs. This paradigm shift should enable government investment decisions to be founded on transparent and realistic priorities, cost analysis, and objectives for each department/ministry. In this frame, upstream appraisals should be established in order to estimate the expected returns of each government investment project and examine its potential risks. The selection of investment projects or equipments should be based on the results of the aforementioned appraisals, in the process of the adoption of the finance bill of a given year. The selection of projects to be funded should be based on transparent and objective criteria, and in the case of multi-year government investment projects, the appropriations should be transparently predicted in a multi-year budgeting framework (e.g. triennial budget).

the possibility of reducing the latter as well, at the image of developed countries such as the UK.

This measure should stem the draining of a significant part of the government investment budget by non-productive expenditures that are strictly linked to the current activity of the government and have very limited lifespan.

The logic of strictly project-oriented investment spending should also enable the government to insert the maintenance of infrastructure and equipment projects in the very investment budget related to each project, as it helps prevent premature deterioration of productive public assets, thereby significantly increasing their productive lifespan and the macroeconomic effectiveness of public investment along with it.

However, it is crucial that any solution/measure must take into account the sustainability of public finance as a central constraint. The latter is further developed in the simulations and policy analysis in chapter III.

In our approach from here henceforth, we go beyond this analysis by introducing the concept of public investment optimality. In this context, we combine the different aspects of macroeconomic effectiveness as discussed above, with the constraint of public finance sustainability. The objective is to assess the mechanisms through which government investment expenditures can effectively support the economy without compromising a given sustainable budget equilibrium.

Conclusion

In this chapter, we examined the Moroccan framework in terms of public investment and its relationship with GDP dynamics. Firstly, the light was shed on the evolution of both variables in order to get insights on their long term idiosyncrasies, and so that the structural factors that had contributed to the current situation could be thoroughly explored.

In this frame, GDP growth was found to suffer, to a significant extent, from year-to-year volatility due to the relatively unpredictable agricultural output that is highly tributary to weather conditions. Also, the share of industry in GDP has been suboptimal; improving the industrial output would most likely reduce the year-to-year volatility of the economy as a whole. Another observation is that the Moroccan GDP growth has been

driven by domestic demand, i.e. consumption and investment, despite the different export promotion policies launched by the government throughout the years. It is important to emphasize in this regard that the Moroccan economy has a history of substantial interventionism that aimed to support GDP growth and to steer the economic activity through legislation, fiscal incentives and direct public investments.

As regards to public capital spending, the emphasis was put on the three main institutions that contribute to public investment in the Kingdom, i.e. public establishments and corporations (PECs), local councils and the government. The part of public investment led by PECs was found to be directly linked to specific projects with thoroughly defined objectives in most cases. Therefore, the impact of said investment is assessable and supposedly meets a significant degree of effectiveness. Following this finding, PECs are likely to have a significantly smaller margin of improvement in terms of macroeconomic impact. Subsequently, we deemed that it would be more relevant to explore optimality-oriented measures in less effective public investors, namely local councils and government.

When discussing local councils' role in overall public investment, we found that it remains quite small when compared to investment expenditures made by the government and PECs. Furthermore, vital investment programs such as rural electrification, drinking water supply and rural roads, which are supposed to be under local councils' responsibility, are still managed directly through governmental programs. Subsequently, the impact of local councils' investments on national GDP growth is not likely to be important, nor does the expected marginal profitability of the implementation of efficiency-oriented measures. On the other hand, the part of public investment led by the government proves to be quite important when compared to overall public investment; hence, it is supposed to have a visible influence on GDP growth following the elements of analysis discussed in chapter I. It also showed to have large margins of improvement, on both the budgetary and the institutional levels.

In the process of examining the Moroccan context in terms of public investment's macroeconomic effectiveness, we initially

consider Morocco as part of a group of developing countries, in order to compare the latter's characteristics with a certain number of advanced economies. With this perspective in mind, we estimated a panel data model with a total of ten developed and developing countries. One of the main findings were that government investment has a slightly negative impact coefficient in the sample group of advanced economies, while in the developing countries, the influence is clearly positive. Also, GFCF shows a larger impact on GDP than public spending in both categories of countries.

This first model helped gather consistent benchmarking information that can be useful afterwards when analyzing the public investment optimality in Morocco. Then, we estimated public investment expenditures' impact on GDP in the Kingdom, along with other variables, such as the GFCF and public consumption. In this particular estimation, we used a GLS time series econometric model. The latter shows that public non-productive spending, i.e. government consumption, has no statistically significant correlation with GDP evolution in Morocco. But most importantly, the model suggests that a 100 percent increase in government investment spending would lead to a 16 percent increase in real GDP. This regression coefficient is in fact higher than in some Sub-Saharan economies, but it remains significantly below that of several comparable economies; and in our case in point, it is smaller than GFCF's, where a 100 percent increase would lead to a 64 percent increase in GDP. Nonetheless, in terms of structural trends, the coefficient of government investment improves notably. This could find explanation in the fact that public investment expenditures ultimately meet a significant part of their objectives, despite the deficiencies discussed in the first section of this chapter, e.g. the large rate of carry-overs, the relatively long procurement procedure, the loosely defined investment budget sections and the existence of non-productive current expenses within said budget.

However, Morocco is in fact a developing country, which implies a relatively small capital to GDP ratio and very low public private capital substitutability, hence very limited crowding out. Moreover, in the logic of transitional dynamics, Morocco remains

way below the threshold beyond which the returns of (public) investment start to diminish or become counterproductive. Therefore, we consider that the macroeconomic impact of public investment expenditures is supposed to be higher, in both model configurations presented in this subsection, as their influence is way below the 1.4 multiplier effect found in middle income countries as discussed in chapter I above and in Hemming *et al.*, (2002).

In this perspective, we motivated an initial series of hypotheses and recommendations. Firstly, we recommend the enforcement of restrictions on the carry-over of government investment budget appropriations, particularly through the implementation of the 30 percent threshold, stipulated by the new organic law of finance (130-13) but not yet in force. Also, the accent was put on the adjustment of the procurement regulation by reducing the counterproductively long administrative procedure, and by introducing public investment-specific measures that promote effectiveness and performance, thereby creating a synergy with the spirit of the new organic law of finance No 130-13. Another recommendation is linking government investments to specific projects or equipments that should be defined before the approval of the budget. The investment projects and equipments should be subject to appraisals before being approved and submitted in the project of finance bill.

However, it is important that all recommended measures should take into account the sustainability of public finance as a central constraint. In this framework, the introduction of the notion of government investment optimality becomes crucial, in the sense that it enables the analysis to go from a canonical relationship between economic growth and public investment, toward defining the level of public investment that allows for a productivity enhancing macroeconomic effect without jeopardizing either the public finance sustainability or the tax pressure.

In the next chapter, we tackle public investment optimality in Morocco, through the simulation of different policy recommendations in order to come up with an equilibrium in which government capital spending can maximize GDP growth while ensuring public debt sustainability.

3. Toward an optimal public investment policy: A small scale model analysis

Introduction

After having examined the idiosyncrasies of the Moroccan framework in terms of GDP dynamics and its relationship with public investment, and after having considered investment expenditures' macroeconomic effectiveness in Morocco both individually and as part of a benchmark of countries, it is important to shift the analysis now toward what we deem to be the second condition of public investment optimality, i.e. public debt sustainability.

In order to build a sound model, we start this chapter by discussing the historical evolution and several stylized facts regarding government debt as a newly introduced variable. After getting an empirical sense of the elements to be discussed, we shift emphasis toward defining the concept of public investment optimality, and how government debt's evolution operates as one of its major underlying constraints. It is worth noticing in this framework that, when examining debt sustainability according to the literature, the definitions given by different authors to sustainability vary quite much, covering from the relation between public debt and government's solvency, to the potential impact of public debt on the macroeconomic aggregates. And when tackling the notion of optimality in the literature, we briefly cover most definitions, starting from the growth-maximizing public

investment rate to tax-driven fiscal optimality. By the end of the first section of this chapter, a twofold concept of public investment optimality is introduced, where we combine macroeconomic effectiveness as discussed in chapters I and II, with the constraint of public debt sustainability. This conception of government investment optimality should enable the analysis to go from the monotonic relationship between economic growth and public investment studied in the previous chapter, toward defining the level of public investment that allows for a productivity-enhancing macroeconomic effect without jeopardizing either the public debt sustainability or the tax pressure. The objective is to enable the assessment of the extent to which government investment expenditures can effectively support the economy without compromising a given sustainable budget equilibrium.

Based on this discussion, we motivate in the second part of this chapter a small scale macroeconomic model for public investment policy analysis. It is inspired from the strand of New Keynesian reduced-form models that are directed toward monetary policy analysis. The model is then augmented by a twofold fiscal component, in order to include public debt sustainability as a constraint for government investment spending. The logic of the fiscal reaction function joins to some extent Collignon's (2012).

The model encompasses four main blocks: the aggregate demand, represented by an IS curve that explains output dynamics through a number of expected and lagged variables, including public investment expenditures; a Phillips curve that defines the price level according to expected inflation and GDP dynamics; a monetary policy rule, where we made the assumption that the central bank follows a Taylor-type pattern that links the evolution of the interest rate with inflation and GDP dynamics; and the twofold fiscal system that should help provide insights on the relation between public investment expenditures and government debt. The model is shaped so as to remain parsimonious and coherent, thereby providing a clear understanding of the structural relations between the main variables. It is also perceived in a stochastic environment, for the reason that the shocks are random, meaning that there should be an aggregate uncertainty regarding the future.

We calibrate the model based on an eclectic method combining estimation and stylized facts-based adjustments, because it is important for this type of models to have a minimum of statistical foundation; but in order to be useful for fiscal policy makers, it is important for it to accommodate their view about the economy. The idea in this instance is to parameterize the model based on not only the econometric estimates, but also the stylized facts of the Moroccan economy and the examination of the characteristics of the model's equation system as well.

And in order to follow up to the discussion on public investment optimality in the first section, a debt sustainability threshold is introduced in the model. We set the threshold at a debt-to-GDP ratio that is equal to 60 percent of GDP, based on the buckle of the literature and the as stated in article 104 of the Maastricht Treaty and detailed in article 1 of the Protocol on the Excessive Deficit Procedure. Through this experimental parameterization, the deviation of the debt ratio from the sustainability threshold is thus taken into account in the very behavior of government investment spending, in a simulation-oriented model.

In the third section, we mostly drive a series of shocks based on different scenarios, in order to further discuss several hypotheses developed throughout this thesis and to establish a number of fiscal policy recommendations, particularly regarding government investment. The model should also provide with reliable information on the *optimal combination* so as public investment can drive an upward influence on the economic activity (*effectiveness*), without jeopardizing the budget *sustainability*.

Then, shock simulation and public investment policy discussion are done in light of where the Moroccan economy stands on the hypotheses developed in the first two chapters of this thesis and in Oukhallou (2016). In Hypothesis 1, Morocco could not possibly be well-placed in terms of efficiency and profitability-based selectivity of government investment projects, at least if considered its high corruption rate and the fact that yearly Finance Bills have loosely defined budget sections, especially in the investment budget, where hardly any budget section or line is linked to a specific investment program. A substantial amount of entirely non-

productive expenditures are even inserted in investment budget sections. This implies that in case of further investment spending, the marginal productivity is most likely to diminish as the negative macroeconomic impact of the crowding-out effect would partially neutralize the supposedly positive effect of said public investment on GDP growth. However, in regards to Hypothesis 2, further public investment is assumed to have a larger effect on GDP in Morocco compared to developed and emerging countries when considering *transitional dynamics*, as the margin of improvement in terms of infrastructure is evidently more important. And in light of Hypothesis 3, Morocco could have a relatively low crowding out effect, since there is very little substitutability between public and private capital spending.

Debt sustainability and public investment optimality

In order to build a sound model, it is important to first define the concept of public investment optimality, and how debt dynamics operate as one of its underlying constraints. In this section, we start by shedding light on the main characteristics of government debt in Morocco, through an overview of its historical evolution and current state of affairs.

Secondly, the concept of debt sustainability in the literature is examined. It is worth noticing that the definitions given by different authors to the notion of sustainability vary, covering from the relation between public debt and government's solvency, to the potential impact of public debt on the macroeconomic aggregates.

Finally, we discuss the different definitions of optimality in the literature, starting from the growth-maximizing public investment rate to tax-driven fiscal optimality. By the end of this section, a twofold concept of public investment optimality is introduced, where we combine macroeconomic effectiveness as discussed in chapters I and II, with the constraint of public debt sustainability. This conception of government investment optimality should enable the analysis to go from a monotonic relationship between economic growth and public investment, toward defining the level of public investment that allows for a productivity-enhancing macroeconomic effect without jeopardizing either the public debt

sustainability or the tax pressure. The objective is to enable the assessment of the extent to which government investment expenditures can effectively support the economy without compromising a given sustainable budget equilibrium.

Stylized facts of government debt

As in many developing countries, public debt played quite a determinant role in the shaping of development policies led by Morocco through public investment. From 1956 to 1975, the initial objective of debt management was to raise the funds needed to finance government investment programs. Then, public debt followed –like public investment expenditures, a relatively stable rhythm of progression following the evolution of the economy.

However, the massive investment spending that marked the 1973-1977 five-year government plan drastically changed this evolution. Said five-year plan focused on infrastructure projects such as dams and national roads, besides from attempting to support the industry -and its exports- through imports substitution policies. The Moroccan government was basically spreading its efforts thin, and based most of its investment decisions on the potential macroeconomic returns of said five-year plan combined with a speculative upward forecast over phosphate prices, which should have generated some sort of a windfall.

The tremendous amounts spent within this plan laid to a structural public deficit, which logically led to substantial debt levels, despite the government's efforts to stabilize its budgetary situation during the period from 1978 to 1982. In this context, the central government's debt to GDP more than doubled between 1974 and 1981, rising from 22.4% to 53.38% (Sagou, 2005). And as the government had resorted to international financial markets, this situation brought external indebtedness to unsustainable levels, which forced Morocco to a series of rescheduling between 1983 and 1992 in the framework of the SAP, as explained in chapter II above.

Despite the rescheduling and a series of draconian restrictive fiscal measures, government public debt continued to rise by an average annual rate of 7% during the period from 1980 to 1992. By that time, the government was accumulating large budget deficits,

which were mostly financed by foreign debt, thereby increasing the central government's direct debt ratio. And that situation pushed the authorities to gradually switch toward domestic sources in order to finance budget deficits.

It is worth observing that from the year 1993 henceforth, the public debt stock registered an average annual decline of around 0.3%, while debt management was characterized by a new approach based on a new separation between domestic and foreign resources in order to reduce the burden of foreign debt and bring its costs to a sustainable level (Cour des Comptes, 2012: 17). This approach made it possible to reduce the proportion of government's foreign debt from 80% of overall debt in 1984 to nearly 22.3% in 2016. This debt was gradually replaced by a more concentrated use of local financial sources leading to a rise in the domestic part of public debt, which went from 20% in 1984 to 77.7% by the end of 2016.

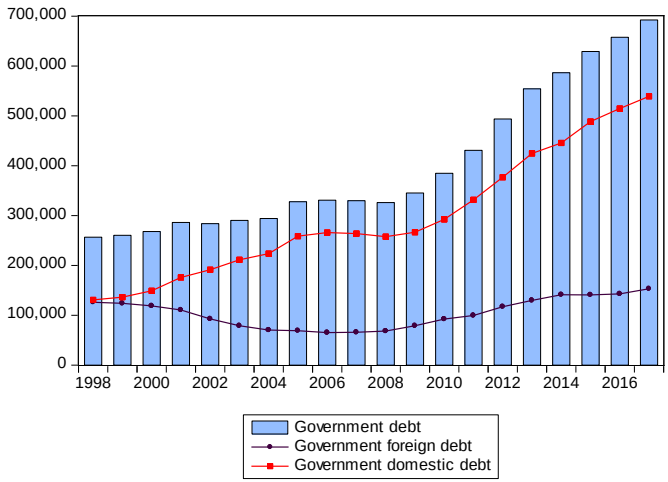
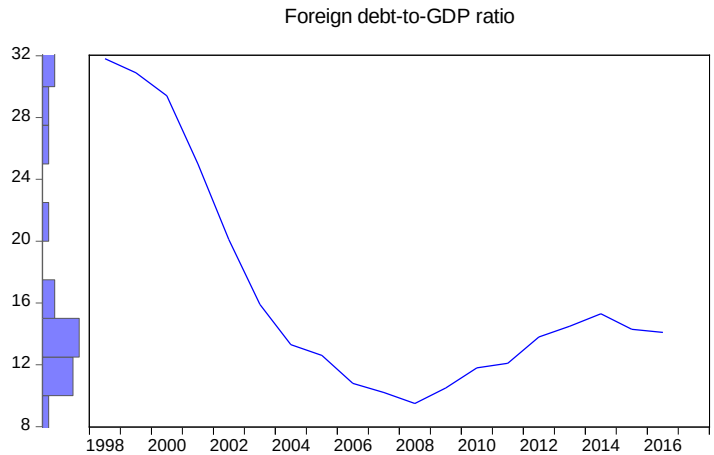


Figure 3.1. *The evolution of government debt in Morocco (million MAD)*
Data source: Ministry of Economy and Finance

As shown in Figure 3.1, the proportions of foreign and domestic debt were inverted starting from 1998. The share of foreign debt reached 22% in 2016 at 142.8 billion MAD, as opposed to 49% in 1998. The proportion was over 80% in early 1980s. This decrease was also observable in the government's foreign debt to GDP ratio,

which dropped from 31.8% in 1998 to 9.5% in 2008 as shown in Figure 3.2. However, starting from 2009, this ratio went back to increasing on the aftermath of the international financial crisis; it reached 15.3% in 2014, as opposed to 9.5% in 2008. Starting from 2015, said ratio regained its downward trajectory, reaching respectively 14.3% and 14.1% in 2015 and 2016.

On the other hand, the government's domestic debt has increased significantly. This progression is essentially tributary to the financing of budget deficits though a massive use of domestic resources. Subsequently, the domestic share of overall government's debt went up to 78% by the end of 2016, at 514.7 billion MAD. Nonetheless, the dynamics of its ratio compared to GDP is quite mitigated. According to Figure 3.2, it had initially followed a dominantly upward trend. However, from 2006 to 2009, the course of its evolution was reversed, mostly as a result of the increase in tax revenues combined with budget surpluses and above-average GDP growth rates. The domestic debt-to-GDP ratio regained its progression starting from 2010, on the aftermath of the international economic recession that was triggered by the Sub-primes crisis.



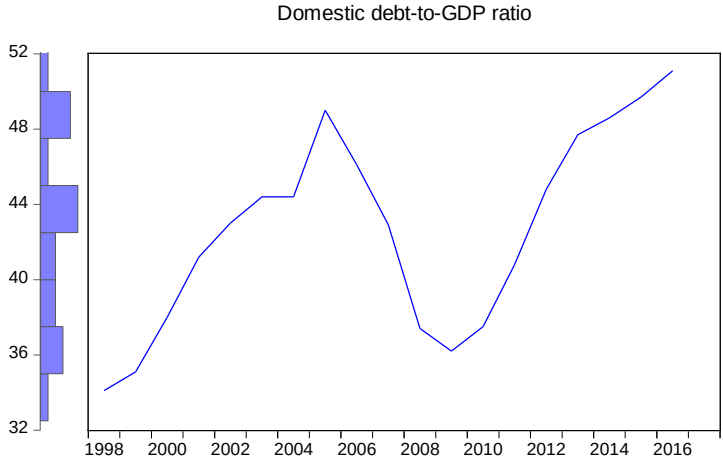


Figure 3.2. *The government's foreign and domestic debt to GDP ratios (in %)*
Data source: Ministry of Economy and Finance (the Department of Treasury and External Finance)

It is worth observing however that, despite the continuous increase in its stock and GDP ratio starting from the year 2009, the domestic debt shows a significant decrease when it comes to its financing costs. As show in Table 3.1, the apparent average cost of government domestic debt went from 5.4% in 2008 to 4.4% in 2016. The same observation can be made regarding the government's foreign debt, where the apparent average cost went reached 2.7% in 2016, as opposed to 4.3% in 2008, i.e. the year in which the foreign debt-to-GDP ratio regained its upward trajectory.

Table 3.1. *Apparent average cost of government debt from 2008 to 2016 (in %)*

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Domestic debt	5.4	5.1	5.2	4.8	4.7	4.7	4.56	4.79	4.4
Foreign debt	4.3	4.2	3.00	3.3	3.4	3.3	2.9	2.8	2.7
Overall debt	5.1	4.9	4.7	4.5	4.5	4.4	4.18	4.33	4.05

Data source: The Ministry of Economy and Finance

In Figure 3.3, we use the Hodrick-Prescott filter in order to examine and compare the cyclical dynamics of government debt and public investment expenditures [54]. Seemingly, the two

[54] As mentioned in chapter II above, there are a few alternative detrending approaches that could be used for the examined data in this case, such as

variables follow a counter-cyclical evolution. This could be interpreted as if when public investment spending rises above the equilibrium level during a given period –in most cases as part of an increase in government spending, debt cumulatively picks up pace after a response time lag of one to two years. This evolution logically drives the fiscal policy beyond debt sustainability levels, which allegedly puts pressure on policy makers to reduce government expenditures. And historically, investment spending has been in most cases the first component to undergo budget cuts, whether within the framework of the annual finance laws or mid-year on a purely discretionary basis, as in the year 2013.

Conversely, when government debt reaches an amount below its equilibrium level as a consequence of a cumulative decrease in public spending or –in some cases- an extraordinary income (privatization of public companies, tax performances…), fiscal policy makers are likely to perceive this variation as a margin of maneuver for further expenditures. History also suggests that a significant part of the discretionary increase in government spending goes to investment expenditures. This is a plausible explanation for the period from 2008 to 2011, where investment spending reached its highest cyclical level after a drop in both components of government debt.

the Christiano-Fitzgerald band filter and Hamilton's (2017) approach. Then again, this exercise is essentially intended for an intuitive preliminary observation of the variables' cycles.

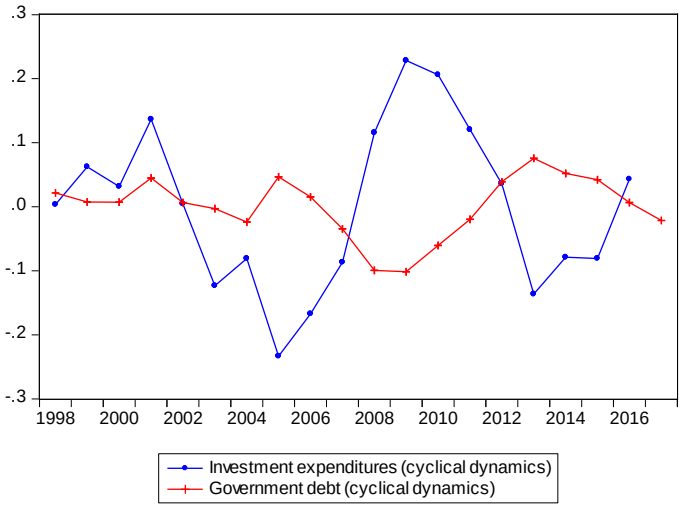


Figure 3.3. *Cyclical evolution of government debt and investment expenditures*
Source: own computations using data from the Ministry of Economy and Finance

The sense of causality between public debt and investment expenditures is still to be discussed in depth, in sections 3.2 and 3.3 below. However, in light of the elements discussed so far, one can only establish the importance of debt management in the process of *optimizing* government investment decision making. Therefore, including the notion of debt sustainability as a constraint for public investment and a component of policy makers' toolkit seems to be of the utmost importance.

The following subsection discusses the concept of debt sustainability, before turning to the extent to which said concept can be included in the shaping of the optimal public investment.

The concept of debt sustainability

When examining public finance literature, it is possible to observe that the definition of sustainability usually involves the relationship between the evolution of public debt and the government's solvency. It is also based on the potential influence of public debt on the main economic aggregates in a given country, such as GDP. The former definition is largely conveyed by the various debt reduction frameworks that were implemented in several developing countries during the 1980s and 1990s, led by

the IMF and the World Bank. As mentioned in Chapter II above, this was the case for the SAP in Morocco in 1983 henceforth. According to the latter definition, the sustainability of public debt is quasi-exclusively linked to the solvency of the government.

Other than these two relatively conventional definitions, there are a few alternatives that could be more adaptable to a context of analysis as opposed to another. Among those, Guzman (2016) suggests an alternative definition that rises from the recent debate in the EU which was triggered by the recent sovereign debt crisis. According to this author, public debt can be considered as sustainable if the macroeconomic policies that are needed to at least stabilize debt under both the baseline and realistic shock scenarios are economically consistent and politically feasible (Guzman, 2016). Here, economic consistency is defined as the satisfaction of a solvency condition for the public sector, such that the macroeconomic policies implied satisfy an inter-temporal budget constraint according to which the present values of revenues and expenses are equal. In other words, if no consistent and politically feasible macroeconomic policies can lead to debt stabilization under non-extreme realistic shock scenarios, public debt would be considered unsustainable (Guzman, 2016).

Despite their initial definition as represented by their plans in the 1980s and 1990s, the main international financial institutions seem to also consider the concept of sustainability based on the impacts of public debt on a country's macroeconomic performances, in the resolution of sovereign debt problems. Pattillo *et al*., (2002) summarize this relationship by arguing that public indebtedness has a positive impact on growth as long as it is kept at a "reasonable" level (Pattillo, Poirson, & Ricci, 2002); beyond a certain threshold, public debt accumulation is likely to slow down the economic growth. In principle, the definition of the reasonable level is related to debt service. In this frame, the IMF and the World Bank emphasize in their institutional guidelines for public debt management that governments should seek to ensure that public debt service does not jeopardize economic growth, and that both the level and rate of growth in their public debt are on a

sustainable path[55]. This definition can be explained by the fact that debt service can replace growth-enhancing public spending, which may trim down GDP growth. Thus, if the debt service is sustainable and does not have a crowding-out effect on public spending, it is possible to consider the public debt that is related to it as economically sustainable.

On the other hand, it is worth mentioning that a significant part of the literature also argues that public debt is only sustainable when a given country is in a path of economic growth that is comfortable enough for the government to draw the necessary financial resources to meet the repayment of said debt. In this context, economic growth can indeed be seen as a financial resource that generates additional government revenue. This is the position advocated by economists such as Monti (2012) and Bernanke (2012), according to which, there cannot be fiscal sustainability without a significant GDP growth rate. Other economists indirectly back-up this position, although by empirically examining the Wagner's law (Lamarita & Zaghini, 2008; Magazzino, 2012… etc.).

Practically, authors such as Trehan & Walsh (1988, 1991) consider the stationarity of the overall budget surplus as a sufficient condition to consider public finance as sustainable. Their perspective is shared to a large extent by Hakkio & Rush (1991) who suggest that fiscal sustainability is satisfied if there is a cointegration relationship between overall government revenues and expenditures. This approach was applied in Morocco by authors like Amrani, Hammes & Oulhaj (2004), who reveal that the domestic part of debt is sustainable while the foreign one is not. Unlike these research papers, Ragbi & Tounsi's (2015) approach seeks to assess the sustainability of the primary fiscal balance, not the debt sustainability, by comparing the fiscal stance with two fiscal response functions in Morocco (Ragbi, & Tounsi, 2015). Through a probabilistic methodology, they emphasize that the likelihood of public finance sustainability when the government prioritizes specific targets in terms of fiscal deficit and public debt. In this perspective, the Moroccan authors argue that the budgetary

[55] See for instance: IMF and the World Bank (2014), 'Revised guidelines for public debt management', Joint Policy Paper, March, p.5.

adjustments necessary to reach those two objectives must focus on public expenditures.

On overall, we hold that debt sustainability is highly related to a country's ability to honor its debt obligations without accumulating significant arrears or being subject to drastic debt-reduction programs. The level of debt, which is also related to the accumulation of public deficits, can be traced back to the evolution of public revenues and expenditures in general. However, unless there is a large tax reform, most ordinary public revenues evolve roughly in the same pace as the economic activity. Therefore, it seems quite important to consider the dynamics of government spending, as public deficits are often driven by expenditures, which are likely to fluctuate depending on different cyclical and sociopolitical factors.

For the purpose of this research work, we focus on debt sustainability as a budget constraint for public investment expenditures, thereby introducing the concept of public investment optimality, i.e. an investment that drives a positive macroeconomic impact on the economic activity without pushing the debt level beyond the sustainability threshold *ceteris paribus*.

Debt sustainability as a condition for optimality

In chapters I and II of this thesis, we mentioned public investment optimality on several occasions, based on a specific definition. However, it is worth bearing in mind that in the literature, the definition of the concept of optimality is far from being subject to a consensus.

A first strand of economists consider the concept of optimality in public finance as mainly linked to tax policy and the role of debt in smoothing tax rates (Barro, 1979b;, Lucas & Stokey, 1983; Werning, 2007). These studies are mostly based on the modern theory of optimal taxation, as developed by Ramsey (1927). Said theory defines fiscal optimality as when a tax system maximizes a social welfare function under a number of constraints. In this frame, when taxes are supposedly distortionary, the individuals' welfare would be maximized if taxes are smoothed over time. It is in this very context that public debt intervenes, as it helps smooth

out the government's financial needs without affecting the requirement of optimal public finance, i.e. a constant ratio of taxes to income at all points in time (Barro, 1979b).

On the other hand, a significant number of research papers focus on the expenditures side when conceptualizing optimality. In a definition that is partially different from the one we develop in this thesis, Fosu *et al.*, (2011) assimilate optimality to a growth-maximizing level of public investment, which is in principle expressed in percentages of GDP. In other words, the emphasis is put on driving a maximal upward macroeconomic influence under the constraint of keeping down crowding out effects. Their results indicate that the current level of public investment in Sub-Saharan economies is, on average, sub-optimal (Fosu *et al.*, 2011). Other authors roughly used this definition to measure public investment optimality. Miller & Tsoukis (2001) used this exact definition when examining a different set of low and middle income countries, and so did Kamps (2005) and Aschauer (2000) respectively for the case of 22 OECD countries and the United States.

Some research papers criticize the constant and time consistent aspect that is given by some of the aforementioned authors to the optimal share of public investment in GDP. Azzimonti *et al.*, (2003) state that the latter depends importantly on the intertemporal elasticity of substitution, capital depreciation rates and the growth rates of productivity and population. Azzimonti *et al.*, (2003) do not consider however sovereign debt, as their model directly links public investment optimality to income taxation. Other papers also lay emphasis on the dynamic aspect of public capital, such as Arezki *et al.*, (2012) who specifically investigate the optimal public investment levels following a resource windfall. They argue that the optimal level differs from a country to another depending on their respective administrative capacity.

However, while the former strand of authors focuses on the public revenue side to define optimality and consider government debt as a tool to reach social welfare through tax smoothing, the latter group relatively discards the budgetary repercussions of public investment, specifically when it comes to public debt evolution. It is merely logical to assume that, as a reaction to the allegedly sub-optimal levels of public investments as defined by

Aschauer (2000), Kamps (2005) or Fosu *et al.,* (2011), governments are not expected to unconditionally increase their investment budgets, even if they become aware of their potential macroeconomic shortfall. Otherwise, they are most likely to raise their debt and gradually jeopardize the very sustainability of the public finance as a whole.

It is based on this particular rationale that we emphasize the importance of including the debt sustainability constraint to government spending in general, and most particularly investment expenditures. We deem it is more pragmatic to find a public investment equilibrium level that actually responds to the government's budget while supporting GDP's evolution, even if said level is supposedly lower than the 9-to-18% range discovered by Miller & Tsoukis (2001) and Fosu *el al.,* (2011) for developing countries such as Morocco.

The notion of public investment optimality that we motivate here is twofold and intuitively inspired from the logic of constrained optimizations. We combine the different aspects of macroeconomic effectiveness as discussed in chapters I and II, and optimize them under the constraint of public finance sustainability. This conception of government investment optimality enables the analysis to go from a monotonic relationship between economic growth and public investment, toward defining the level of public investment that allows for a productivity-enhancing macroeconomic effect without jeopardizing either the public debt sustainability or the tax pressure. The objective is to assess the mechanisms through which government investment expenditures can effectively support the economy without compromising a given sustainable budget equilibrium.

Section Conclusion

In this section, we introduced the concept of debt sustainability as a condition for optimal investment expenditures. Firstly, we shed light on the main characteristics of government debt in Morocco, through an overview of its historical evolution and current state of affairs. When doing a synoptic examination of government investment and debt, we observed a counter-cyclical relation between the two variables. This could be explained by the

fact that when public investment spending rises above the equilibrium level during a given period –in most cases as part of an increase in government spending as a whole, government debt gradually increases, thereby moving far away from sustainability, which would push the Moroccan fiscal authorities to trim down investment expenditures. On the other hand, when government debt drops below its equilibrium level as a consequence of a cumulative decrease in public spending or some sort of a windfall, the government is likely to use this margin of maneuver to engage further expenditures, particularly investment-related ones. This is a plausible explanation for the period from 2008 to 2011, where investment spending reached its highest cyclical level after a drop in both components of government debt.

When examining debt sustainability in the literature, we observe that the latter is not unanimous regarding the exact definition of this concept. In this framework, the spectrum of sustainability covers the relationship between the evolution of public debt and the government's solvency. It is also based on the potential influence of public debt on the main economic aggregates in a given country, such as GDP. Other than these two relatively canonical definitions, we discussed a few alternatives that could fit for merely some specific contexts, e.g. a definition according to which if no consistent and politically feasible macroeconomic policies can lead to debt stabilization under non-extreme realistic shock scenarios, public debt would be considered unsustainable. But on overall, one can conclude that debt sustainability is highly related to a country's ability to honor its debt obligations without accumulating significant arrears or being subject to drastic debt-reduction programs. And since most ordinary public revenues often evolve roughly in the same rhythm as output, it is quite important to consider the dynamics of government spending, particularly investment expenditures.

Finally, we discuss the different definitions of optimality in the literature, starting from the growth-maximizing public investment rate to tax-driven fiscal optimality. For the purpose of this research, we motivate a twofold notion of public investment optimality, where we combine macroeconomic effectiveness as discussed in chapters I and II, with the constraint of public debt

sustainability. This conception of government investment optimality enables the analysis to go from a monotonic relationship between economic growth and public investment, toward defining the level of public investment that allows for a productivity-enhancing macroeconomic effect without jeopardizing either the public debt sustainability or the tax pressure. The objective is to assess the mechanisms through which government investment expenditures can effectively support the economy without compromising a given sustainable budget equilibrium.

In the next section, we build a small scale macroeconomic model, through which we aim to drive scenario simulations in order to assess the aforementioned mechanisms.

The small scale model

In this section, we motivate a small scale macroeconomic model for public investment policy analysis. It is inspired from the strand of New Keynesian reduced-form models developed by Berg, Karam & Laxton (2006a, 2006b), Svensson (2000), Giordani (2004), and Arreaza, Blanco & Dorta (2003), among others. Unlike Oukhallou & Mrabti (2017), we do not exclusively focus on the cyclical dynamics of the variables; hence, we do not apply any de-trending process on the data. Furthermore, the model is augmented by a twofold fiscal component, in order to include public debt sustainability as a constraint for government investment spending. The logic of the fiscal reaction function joins to some extent Collignon's (2012).

The model is perceived in a stochastic context, for the reason that the shocks are random (aggregate uncertainty regarding the future), so agents only know the distribution of the latter but are not able to have insights on whether the future values of the innovations will be zero or one. It is possible to argue that in the case of a linear model, there is no much divergence between the stochastic and the deterministic results. Nevertheless, we prefer not to discard this potentiality, in case the model is basically non-linear and just approximated through our first order log-linearization process.

Model specification and variables choice

Pursuant to the discussion above, the model encompasses four main blocks: the aggregate demand, represented by an IS curve that explains output dynamics through a number of expected and lagged variables, including public investment expenditures; a Phillips curve that defines the price level according to expected inflation and output; a monetary policy rule, where we make the assumption that Bank Al-Maghrib follows a Taylor-type pattern that links the evolution of the interest rate with inflation and GDP dynamics; a twofold fiscal system that should help provide insights on the relation between public investment expenditures and government debt.

The objective of this model is to simulate the combined effect of an investment expenditures shock and to provide with reliable information on the possible *optimal combinations* so as public investment can drive an upward influence on the economic activity (*effectiveness*), without jeopardizing the budget *sustainability*.

The aggregate demand equation

The aggregate demand equation in this model is loosely comparable to the type of equations that are derived from the household optimization program. Here, the equilibrium condition is that consumption should equal output minus both types of public expenditures and exports. Nevertheless, the latter are assumed to be nil, under the hypothesis of a closed economy. And in this context, we consider forward-looking as well as backward-looking expectations, in order to incorporate the persistence.

Equation 1: $GDP_t = \alpha_1 . r_{t-1} + \alpha_2 . GDP_{t+1} + \alpha_3 . GC_t + \alpha_4 . GI_t + \varepsilon_t^{GDP}$

The variations in GDP are explained by a one year lead of itself, the lagged real interest rate (r_{t-1}), public consumption (GC_t) and investment expenditures (GI_t). α_2 is the discount factor, while α_1 reflects the transmission mechanism of monetary policy on the output level. Theoretically, interest rate should have a negative effect on GDP growth. When it is in a high level, investors and borrowers are discouraged and the real activity usually loses pace.

Inversely, an expansionary policy implied by a low level of interest rate stimulates investment and production. And as opposed to papers such as Berg *et al.*, (2006a; 2006b), we assume that the influence of the exchange rate on output is negligible, since the exchange regime is fixed to a large extent in Morocco and that our model is in a closed economy paradigm.

We use the non-agricultural gross domestic product instead of the Moroccan GDP as a whole. As explained in chapter II above, it is important to neutralize the quasi-random volatility of the agricultural output, as it fluctuates according to yearly weather conditions, thereby significantly influencing GDP growth. Thus, the agricultural component is likely to bias the model's results, while the other components are relatively stable and are more likely to represent the actual behavior of GDP. The non-agricultural GDP series is in local currency (MAD). In this case, we compute the series based on the data provided by the World Bank database.

And as defined before, GI_t represents government investment expenditures, i.e. the part of government budget that is dedicated to investment spending. We do not consider PECs or local councils, pursuant to the discussion in section 2.1 of chapter II above. For this particular variable and in the absence of reliable data series, we created the latter using data mining based on the information contained in the yearly Budget reporting laws (*lois de règlement*) provided by the Ministry of Finance and approved by the parliament.

As for GC_t, it represents public consumption expenditures' evolution during the different time periods. The importance of this variable comes from the fact that it enables us to make the difference between productivity-enhancing public spending and non-productive government purchases. This variable should also be a ground for comparison as regards to the degree of macroeconomic productivity of government investment expenditures, especially that its volume is historically larger than the latter. Moreover, GC_t could also provide insights on the degree of crowding out especially that unlike government investment expenditures, public consumption is not directly financed by debt in Morocco in principle. This aspect can only be discussed if public

consumption's impact on GDP growth is found to be remotely equal or larger than public investment expenditures' in the Kingdom. Unlike in the time series estimation in chapter II, we chose not to use World Bank's national accounts database. Instead, we assembled the series based on the information contained in the yearly budget reporting laws (*lois de règlement*) made by the Ministry of Finance and approved through parliamentary vote from 1980 to 2016.

The price-setting equation

We introduce in this model a hybrid version of the Phillips curve that encompasses both forward-looking and backward-looking expectations. Thus, inflation dynamics are supposedly explained by output and economic agents' expectations.

Equation 2: $\pi_t = \beta_1 . \pi_{t-1} + (1 - \beta_1) . \pi_{t+1}^e + \beta_2 . GDP_t + c + \varepsilon_t^\pi$

We only considered a one year difference regarding the expected inflation since the monetary policy/inflation transmission mechanism takes a period from 4 to 6 quarters (Oukhallou & Mrabti, 2017). Since we are in an annual data logic, we use for π_{t+1}^e the *ex post* values of inflation in the period t+1. Unlike previous work on cyclical data by Oukhallou & Mrabti (2017), an intercept c is introduced for better fitted values. The parameter β_1 identifies the nature of the economy. In principle, the weight of the lead term is more important than the lag term (β_1 below 0.5) when the prices are flexible in the economy. In that case, the central bank's stance is likely to be considered by economic agents as *credible*, and a subtle deviation in the interest rate is bound to trigger a substantial variation in inflation.On the other hand, a β_1 that is above 0.5 implies that only accumulated adjustments in the interest rate could move inflation toward the target (Berg, Karam, & Laxton, 2006a).

For π_t we use the inflation rate based on the average consumer index, as provided by the World Bank's national accounts database, while GDP_t represents the non-agricultural gross domestic product as explained in the previous subsection about the aggregate demand equation.

The monetary policy rule

In this equation, the central bank sets the interest rate, with taking into account GDP dynamics and agents' expectations, in order to achieve the equilibrium level of the inflation rate. This part of the model is challenged by the fact that, institutionally, Bank-Al-Maghrib does not have an explicit inflation target, hence the obligation to establish the target either as the trend level, or the mean value. In Oukhallou & Mrabti (2017), the optimal choice was the overall average, which is understandable since the period covered by the paper was relatively homogenous and did not witness the occurrence of any major structural break (1996-2010). However, seen that we cover the period from 1980 to 2016, we use a five-year rolling average as the target rate of inflation in order to go along the evolution of said variable.

On the other hand, the Moroccan central bank does not follow an explicit monetary policy rule; hence, we attempt to capture the reaction function with a Taylor-type rule as follows:

Equation 3: $i_t = \theta_1 i_{t-1} + (1-\theta_1)[\theta_2(\pi^e_{t+1} - \pi^T) + \theta_3 . GDP_t] + \varepsilon^i_t$

Where i_t is the nominal interest rate and π^T is the inflation target. As mentioned above, we define the inflation target as the rolling average rate of inflation for the period from 1980 to 2016. The same logic in equation 2 above applies to π^e_{t+1} . θ_1 is a smoothing parameter, which suggests that the interest rate is set gradually in reaction to inflation. In other words, monetary policy is observed as inertial, and the interest rate does not fully accommodate a shock in the period it occurs.

θ_2 intercepts the degree of the central bank's intervention which goes in line with the nature of the economy, as explained regarding β_1 in the price-setting equation above. In the case in point, only accumulated adjustments in the interest rate can reduce inflationary pressure; hence, that implies a low θ_2 compared to θ_1.

In order to gather the data for the nominal interest rate, we applied the Fisher equation on the real interest rate series as provided by the World Bank's national accounts database. For π_t we use the inflation rate based on the average consumer index, and GDP_t represents the non-agricultural gross domestic product.

The fiscal reaction function and debt constraint

We tackle this component of the model by assuming that the Moroccan fiscal authorities *should* consider the debt ratio as an indicator for public finance sustainability. It is a cumulative variable, which relatively facilitates its monitoring and forecasting by the government, as opposed to the overall public deficit which tends to fluctuate on a year-to-year basis.

The government is supposed to consider a theoretical threshold beyond which it is bound to adjust its primary balance (PB_t). The threshold is considered in the following equation as the target, and the deviation from the latter partially determines the evolution of PB_t. This equation is based on Collignon (2012) with adjustments regarding the fact that the latter considers the overall public deficit as a secondary indicator of sustainability, which is not in line with our abovementioned assumption.

$$PB_t = \alpha.(d_{t-1} - d^{target}) \quad (1)$$

Also based on Collignon (2012), among an overwhelming number of research papers, we write public debt in the following canonical form:

$$d_t = (1 + r_t - y_t).d_{t-1} - PB_t \quad (2)$$

Where y_t is the GDP growth rate, r_t symbolizes the cost of government debt, i.e. the real interest rate. In this framework, it is also possible to use as a proxy the bonds premiums or the apparent average cost of government debt. But we stick to the real interest rate in order to maintain the internal consistency of the model, in compliance with the aggregate demand equation presented above.

On the other hand, since the PB is the difference between government revenues (GR) and government spending (G = GC + GI), we write:

$$PB_t = GR_t - GI_t - GC_t \quad hence \quad GI_t = GR_t - PB_t - GC_t \quad (3)$$

By replacing PB in (3) by its components as in (1):

$$GI_t = GR_t - \alpha.(d_{t-1} - d^{target}) - GC_t \quad (4)$$

By combining (2) and (3):

$$d_t = (1 + r_t - y_t).d_{t-1} - GR_t + GI_t + GC_t$$

The fiscal component of the small scale model can be written as follows:

$$GI_t = GR_t - PB_t - \alpha.(d_{t-1} - d^{target}) - GC_t$$
$$d_t = (1 + r_t - y_t).d_{t-1} - GR_t + GI_t + GC_t$$

The two equations need to be statistically founded, especially that the accounting equations were significantly altered due to the insertion of the components of equation (1) above. In this perspective, we estimate the relationship between the different variables without any prior assumptions regarding their coefficients.

The equations are then expressed like this:

$$GI_t = \gamma_1.GR_t - \gamma_2.PB_t - \gamma_3.(d_{t-1} - d^{target}) - \gamma_4.GC_t + \varepsilon_t^{GI} \quad (5)$$

$$d_t = (1 + r_t - y_t).d_{t-1} - \mu_1.GR_t + \mu_2.GI_t + \mu_3.GC_t + \varepsilon_t^{d} \quad (6)$$

For future research purposes, it is possible to choose different fiscal rules. In the Moroccan case, Abdenour (2017) provides with a broader choice of consistent and detailed fiscal rules that could also be used in this model's framework depending on the downstream objective and analysis elements that are investigated through the yields of the modeling exercise. Nonetheless, we stick with a simpler version in order not to contradict our declared objective in terms of parsimony.

As a matter of fact, these two equations enable us to include, to a significant extent, the debt constraint. We conduct an experimental alternative approach to Hansen's (1999) threshold effects estimation, since we are bound to use a shock-oriented model, which is not possible using the latter approach. Furthermore, Hansen's (1999) approach is more suitable for non-dynamic panels with individual-specific fixed effects, while it is

only a matter of one individual in our case, hence the use of time series analysis.

This component of the model is supposed to help assess the basic hypothesis according to which, public investment shocks have at least two simultaneous effects on the variables of interest, following two different channels; these channels are as follows:

- *On the one hand*, a public investment shock positively influences GDP and government revenues GR_t as a consequence, thereby indirectly improving the primary balance PB_t and by extension the public debt level d_t. The impact on the last two variables is supposedly very limited, nonetheless.
- *On the other hand*, a public investment shock has a directly negative impact on the primary balance PB_t, which is significantly related to public debt d_t and, therefore, to public finance sustainability. The latter is supposed to be kept at check through the debt ratio threshold, which should operate as a watchdog.

Building the model

In principle, there are two possible ways to help calibrate simulation models, i.e. the econometrical approach and the literature-based investigation. The former relies on the parameters value extraction through sequential time series. This approach's main drawback is the fact that the economy can be subject to structural breaks or regime changes, which would be reflected on the data, thereby leading to a biased estimation of the parameters. The second approach is purely based on an intuitive analysis of stylized facts and comparable case studies.

In the present case, we calibrate the model based on an eclectic method combining both approaches, because it is important for this type of models to have a minimum of statistical foundation, but in order to be useful for policy makers, it is important for it to accommodate their view about the economy, which can be founded on their experience, other models for similar countries, and/or discussions with other observers[56]. The idea in this instance is to parameterize the model based on not only the econometric estimation outcomes, but also the stylized facts of the Moroccan

[56] For more details see Berg *et al.*, (2006a), p.18.

economy and the examination of the model's equation system characteristics as well. Thus, we can implement the fiscal policy makers' reasoning through the model's specification and parameterization processes.

The model is reasonably founded on the theory of New Keynesian small scale modeling, in an experimentally augmented version that includes specific public finance constraints. This augmented version is supposed to remain parsimonious and coherent, thereby providing an accurate understanding of the structural relations between the main variables. So, in order to generate artificial series and to simulate scenarios for government investment policy analysis purposes, we start by choosing specific values for the parameters. The specification is based on evidence from growth observation, stylized facts, public finance analysis and economic examination of the Moroccan framework.

Nevertheless, the use of calibration does not mean that conventional estimation exercises are to be abandoned (Berg *et al.*, 2006a). In our first attempts, we estimate all equations one by one using the generalized least squares and we use the results to gather a first impression about the parameters. We also use the Generalized Moments Method (GMM), merely for exploratory purposes, to estimate different parts of the model as simultaneous equations and compare the results with the GLS outputs. However, we avoid relying much on the GMM results since this method requires, in principle, a minimum sample of 300 observations in order to obtain convergent estimates, while the time period 1980-2016 only contains 36 observations. Therefore, we choose to proceed based on an iterative approach, i.e. developing an initial working version of the model and examining the artificial series it yields, then adjusting the parameters' values until the model starts generating series that are comparable to the actual ones which represent the aspects of the Moroccan economy in the examined period. Following this iterative mindset, the adequacy of the model is not to be judged on how the parameters were chosen, but on the extent to which it captures the key features of the economy as represented by the different endogenous variables. Furthermore, calibration and the final version of the model is researcher-specific that should not be misjudged. It is meant to

remain simple and non-exhaustive, since the research program itself is based on "a particular philosophy regarding the nature and the role of economics" (Blaug, 1992: 152).

The aggregate demand equation

For the IS curve, we started from the GLS one-equation estimation result, before turning to intuitive iteration. In the end, we settle for a GDP discount factor (i.e. the output one-period lead term) of 0.54. In the literature, the discount factor is often significantly larger than the one we established through calibration; it usually converges toward 0.99 (See for instance Smets, & Wouters, 2003). The inadequacy with theory regarding this coefficient could be considered as a limit, although it is statistically supported by the model's generated series for the Moroccan case.

The interest rate coefficient, on the other hand, is in line with the theory, with a negative value of -0.02. In this regards, one can possibly argue that we chose a parameter value that is quite lower than the common level in the literature, especially for the cases of USA, Canada and several OECD countries, where it varies between -0.1 and -0.2. During our iterations, we did try a spectrum of values from that interval, but all of them pushed the model to yield fitted series that were highly volatile compared to the actual ones. The difference could be explained by structural economic idiosyncrasies; the real activity in Morocco is seemingly less dependent on the real interest rate. It is worth noticing, nonetheless, that the interest rate parameter is still larger than the one motivated by Oukhallou & Mrabti (2017) using cyclical quarterly data of the weighted average rate of interest (TMP), i.e. -0.002.

Government investment expenditures' parameter α_4 remains approximately at the same level as the one estimated in chapter II above, at 0.12. However, government current spending was given a significantly larger influence on GDP evolution than what was shown in the results of the time series estimation in chapter II, α_3 being set at 0.18. It is worth bearing in mind that the data used in this model is not driven from the World Bank's national accounts database. Instead, we assembled the series based on the

information contained in the yearly budget reporting laws (*lois de règlement*) made by the Ministry of Finance and approved through parliamentary vote from 1980 to 2016. This nuance ostensibly makes the difference.

The aggregate demand equation (*Equation 1*) is, then, written as follows:

$$GDP_t = -0.02 * r_{t-1} + 0.54 * GDP_{t+1} + 0.18 * GC_t + 0.12 * GI_t$$

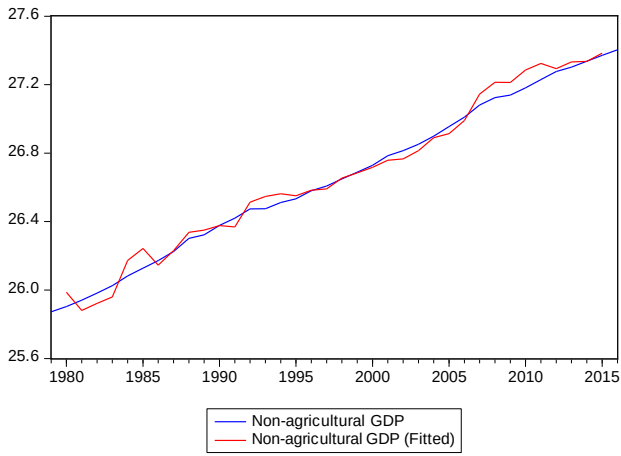


Figure 3.4. The model's generated series for GDP (the aggregate demand equation)

Through Figure 3.4, it is possible to notice that the GDP series generated by the model is comparable to the actual one. Despite a very marginal volatility –which is most probably explained by variables that could not be included in the modeling program, the fitted series fluctuates tightly around the real one during the whole period.

The price-setting equation

The Phillips Curve's coefficients were based mostly on our own investigations. The inflation persistence parameter was set at 0.48, thereby establishing a mildly predominant forward-looking expectations term, at 0.52.

It can be considered as the sacrifice ratio for the central bank, representing the total output loss that is triggered by a variation in

inflation (Ball, 1993). If seen exclusively from this prism, it is supposed to be positive, as the sacrifice ratio theory states that when reducing inflationary pressures, the central bank actually sacrifices a part of output level, especially if considered that GDP growth lays an upward influence on inflation.

However, if we consider the overall relationship between the two variables, we cannot discard its dominantly nonlinear aspect. A number of studies validated the fact that inflation-GDP growth nonlinearity is also sensitive to a country's level of financial development, capital accumulation and government expenditures (Eggoh & Khan, 2014). Moreover, empirical evidence suggests that it is possible to have a positive, negative or neutral correlation between the two variables (Fisher, 1993; Barro, 1995; Mallik & Chowdhury, 2001). In this framework, Ghosh & Phillips (1998) examined the case of 145 countries and concluded that a positive relationship exists between inflation and economic growth when inflation is low, yet this relation turns negative during high inflation episodes.

According to our different estimations, the regression coefficient is negative, at -0.29. This could be explained by the fact that during several periods, low GDP growth coexisted with high inflation rates, especially during a large part of the 1980s and the first half of the 1990s.

In a nutshell, the aggregate supply equation (*Equation 2*) is written in the following form:

$$\pi_t = 0.48 * \pi_{t-1} + (1 - 0.48).\pi_{t+1}^{expected} - 0.29 * GDP_t + 0.13$$

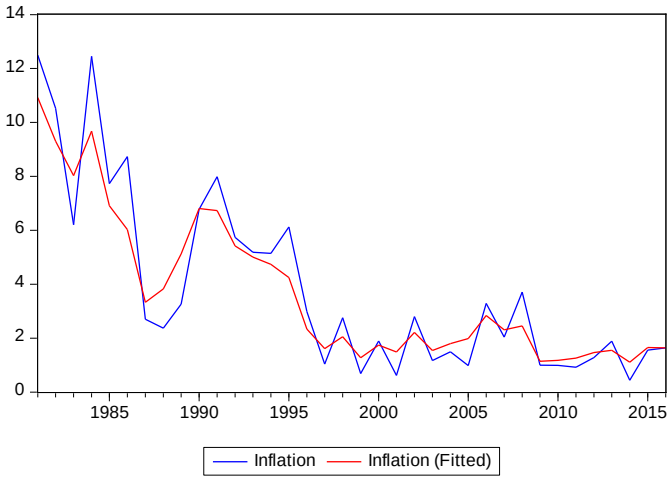


Figure 3.5. *The model's generated series for inflation (the price-setting equation)*

Figure 3.5 shows that the inflation series yielded by the model follows to a large extent, the evolution of the actual data series. We do acknowledge a mild difference in terms of elasticity, which could also be explained by variables that could not be included in the modeling program.

The monetary policy rule

The first attempt of calibration of the Taylor-type rule was to a large extent inspired from Oukhallou & Mrabti (2017). The latterhad started their calibration following the standard Taylor rule version, before realizing that when calibrated in that fashion, the model over-evaluates to some extent the monetary authorities' interest rate reaction. As for our particular case, we started from where the abovementioned paper finished and did iterative coefficient adjustments in order to obtain a version that fits the annual data.

And according to our calibration, the economy remains dominantly backward-looking when it comes to inflation dynamics, with a 0.63 coefficient for i_{t-1}. As discussed above, the inflation target π^{Target} is represented by the rolling average of inflation for the period from 1980 to 2016 in order to follow the major changes in the evolution of said variable. This choice is merely an intuitive approximation based on an assumption that

remains axiomatically criticisable, but seems to have solved the problem for the time being. GDP_t is given a 0.099 parameter, which is mildly higher than in Oukhallou & Mrabti (2017), i.e. 0.08. The influence of output is smaller, however, as its parameter is combined with the overall coefficient of 0.37.

The monetary policy rule (*Equation 3*) is then written as follows:

$$i_t = 0.63 * i_{t-1} + (1 - 0.63)\left[0.4 * \left(\pi_{t+1}^{expected} - \pi^{Target}\right) + 0.099 * GDP_t\right]$$

Therefore, in Figure 3.6 we compare between the historical series with the artificial ones generated based on our calibration. The latter shows to be smoother than the former, but their respective trends remain tightly comparable. Also, both series react in the same fashion during each time period, although the fitted one evolves in a milder elasticity.

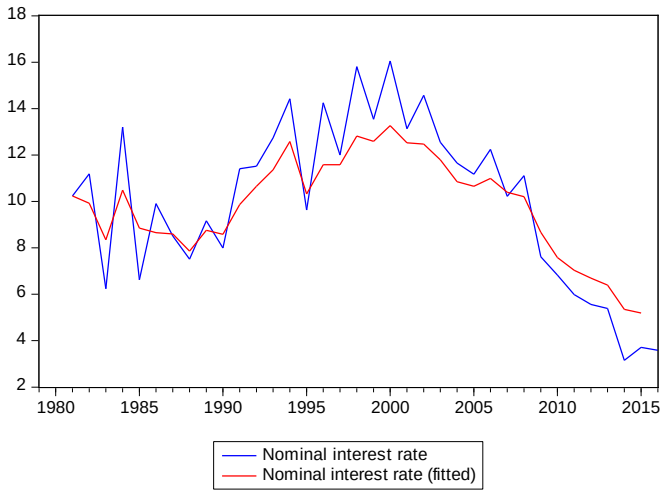


Figure 3.6. *The model's generated series for the interest rate (monetary policy rule)*

The fiscal constraint

The twofold fiscal component of the model was calibrated based on the results of estimates over the 1980-2016 period and some different sub-periods for comparative purposes, followed by iterative adjustments in order to optimize the model's outputs.

As foreseen in the model's description above and according to the estimation results, the introduction of the debt threshold constraint in the first fiscal equation had an impact on the respective coefficients of the other exogenous variables, which are no longer as in the basic accounting equations. It is worth bearing in mind that for the exact values of the series of debt threshold d^{target} , we chose 60% of GDP. This reference level is inspired from the one that is in force in the European Union, as stated in article 104 of the Maastricht Treaty and detailed in article 1 of the Protocol on the Excessive Deficit Procedure.

The calibrated equations are written as follows:

Equation 4:

$$GI_t = 1.12 * GR_t - 0.154 * PB_t - 0.399 * (d_{t-1} - d^{target}) - 0.398 * GC_t$$

Equation 5:

$$d_t = (1 + r_t - y_t) * d_{t-1} - 0.53 * GR_t + 0.273 * GI_t + 0.57 * GC_t$$

As shown in Figure 3.7, the generated series for government investment follows the same trend but in a slightly different elasticity. This could be explained by the inclusion of the deviation from the theoretical debt threshold, which is not explicitly included in the fiscal authorities' behavior. Nonetheless, the two series react in the same fashion during each time period.

As regards to Figure 3.8, a stark difference is observable between the data generated by the model and the historical series. In this context, it is merely logical that the former shows a larger elasticity compared to the latter, if the stylized facts are taken into consideration. Despite leading a discretion-oriented fiscal policy, the Moroccan authorities tend to react quasi-exclusively based on accumulated changes in fiscal variables, when it comes to public debt adjustment. This statement is supported by the fact that the model's series fluctuates around the historical one, and follow its overall trend.

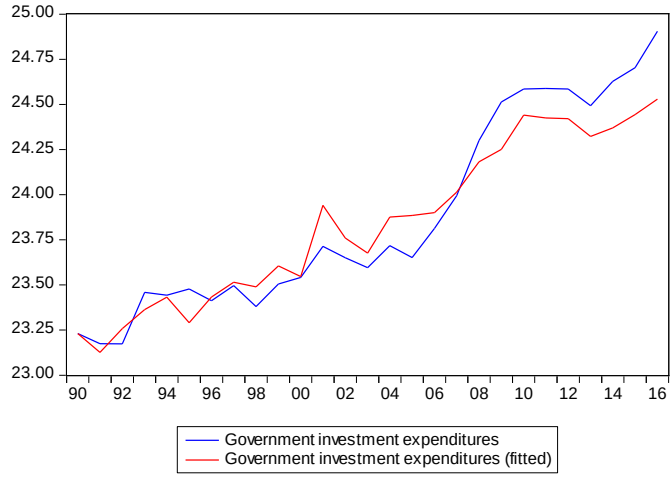


Figure 3.7. *The model's generated series for public investment expenditures*

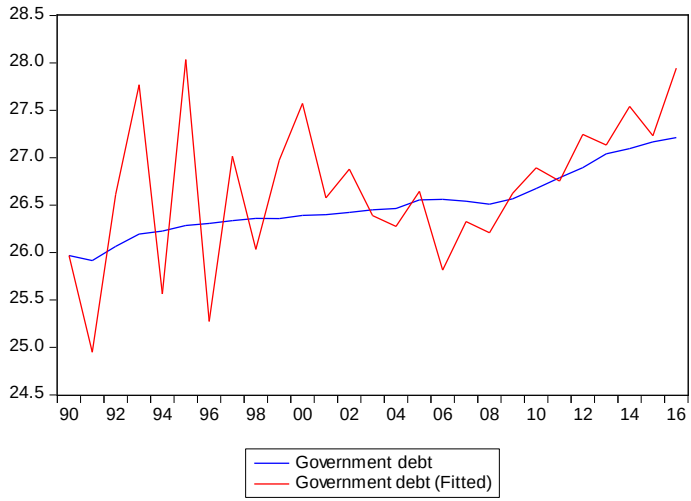


Figure 3.8. *The model's generated series for government debt*

Section conclusion

In this section, we presented a small scale macroeconomic model for public investment policy analysis. It was initially inspired from the strand of New Keynesian reduced-form models that are directed toward monetary policy analysis. The model was then augmented by a twofold fiscal component, in order to include

public debt sustainability as a constraint for government investment spending.

The model encompasses four main blocks: the aggregate demand, represented by an IS curve that explains output dynamics through a number of expected and lagged variables, including public investment expenditures; a Phillips curve that defines the price level according to expected inflation and GDP dynamics; a monetary policy rule, where we made the assumption that the central bank follows a Taylor-type pattern that links the evolution of the interest rate with inflation and GDP dynamics; a twofold fiscal system that should help provide insights on the relation between public investment expenditures and government debt. The model was shaped so as to remain parsimonious and coherent, thereby providing a clear understanding of the structural relations between the main variables.

In order to include the second component of public investment optimality, a debt sustainability threshold was introduced in the model. We set the threshold at a debt-to-GDP ratio that is equal to 60 percent of GDP, based on the buckle of the literature and the as stated in article 104 of the Maastricht Treaty and detailed in article 1 of the Protocol on the Excessive Deficit Procedure. Through this experimental parameterization, the deviation of the debt ratio from the sustainability threshold is thus taken into account in the very behavior of government investment spending, in a simulation-oriented model.

We calibrated the model based on an eclectic method combining estimation and stylized facts-based adjustments, because it is important for this type of models to have a minimum of statistical foundation; but in order to be useful for policy makers, it is important for it to accommodate their view about the economy. The idea in this instance was to parameterize the model based on not only the econometric estimation outcomes, but also the stylized facts of the Moroccan economy and the examination of the model's equation system characteristics as well.

After a number of iterative adjustments on the parameters values, the generated series for most endogenous variables follow the same evolution as the historical ones, with the exception of the debt series. The artificial version of the latter shows a noticeable

difference in terms of elasticity when compared the actual data. This could find explanation in the fact that despite leading a discretionary fiscal policy, the Moroccan authorities tend to react quasi-exclusively based on cumulative changes in fiscal variables, when it comes to adjusting government debt. However, it is worth noticing that the model-generated debt series does fluctuate around the historical one, and follows its overall trend.

And as mentioned earlier, the objective of the model is to enable simulations of the combined effect of an investment expenditures shock and to provide with reliable information on the possible *optimal combinations* so as public investment can drive an upward influence on the economic activity (*effectiveness*), without jeopardizing the budget *sustainability*. In the following section, we discuss those different scenarios and analyze their repercussions on government investment policy.

Scenarios simulation and public investment analysis

In this section, we mostly drive a series of shocks based on different scenarios, in order to validly discuss several hypotheses developed throughout this thesis and to establish a number of fiscal policy recommendations, particularly regarding government investment.

The different steady state specifications are set to be consistent with the literature for the most part. As regards to debt, the steady state values were computed so that there would be no deviation from what could be defined as a sustainability level. Therefore, the variable "$(d_{t-1} - d^{target})$" is equal to zero at the steady state, as debt is equal to the debt threshold as defined above. We also set a zero-inflation-equilibrium; it is a common value in the literature for most New Keynesian models (See for example Gali, 2008). In the same literature-based mindset, the steady state is conditioned by the absence of secular growth, which implies a steady state GDP that is equal to its trend values. We apply the latter approach on government investment expenditures as well, which we deem to be the optimal approximation in light of the evidence discussed so far. When it comes to the interest rate, its steady state level should be neutral, i.e. its trend level as suggested and verified in

Oukhallou & Mrabti (2017) using quarterly data. By the end of this process, the steady state values were effectively verified by the computing software (Dynare) before shifting toward shock simulations.

Before turning into shock simulation and public investment policy discussion, it is worth specifying explicitly where the Moroccan economy stands on the hypotheses developed in the first two chapters of this thesis and in Oukhallou (2016). In Hypothesis 1, Morocco could not possibly be well-placed in terms of efficiency and profitability-based selectivity of government investment projects, at least if considered the fact that yearly Finance Bills have loosely defined budget sections, especially in the investment budget, where hardly any budget section or line is linked to a specific investment program. A substantial amount of entirely non-productive expenditures are even inserted in investment budget sections. This implies that in case of further investment spending, its marginal productivity is most likely to diminish as the negative macroeconomic impact of the crowding-out effect partially neutralizes the supposedly positive effect of said public investment on GDP growth. However, in regards to Hypothesis 2, further public investment is assumed to have a larger effect on GDP in Morocco compared to developed and emerging countries when considering *transitional dynamics*, as the margin of improvement in terms of infrastructure is evidently more important. And in light of Hypothesis 3, Morocco could have a relatively low crowding out effect, since there is very little substitutability between public and private capital spending.

In this framework, we drive four fiscal shocks in order to assess the economy's supposed reaction. Firstly, we simulate a scenario in which the government decides to increase its investment expenditures by 10 percent, as a debt-financed expansionary fiscal measure. Secondly, we examined the alleged reaction to a significant government consumption increase. In the third case-scenario, we assess the implications of a fiscal windfall that is directly reflected on government revenues. Lastly, we simulate the macroeconomic and budgetary implications of a sudden jump in government debt.

We do not simulate an output shock or the implications of a monetary policy decision, because considering public investment as a mere reaction variable is inconsistent with its role in terms of infrastructure development and GDP growth, as established in the discussion in chapters I and II above. It is a motivated choice in order to focus the research on the interactions of the different variables with the fiscal components. This should not undermine the role of monetary policy whatsoever; it is actually one of the downsides of our approach.

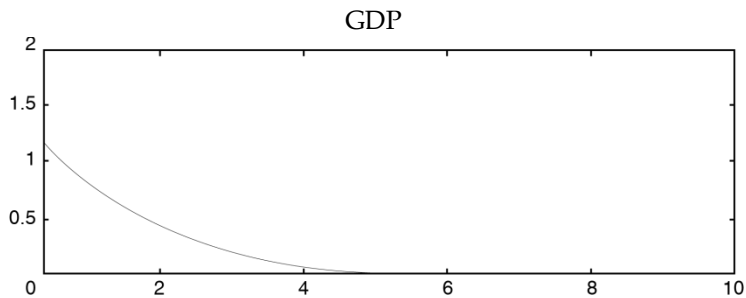
The economy's reaction to a public investment shock

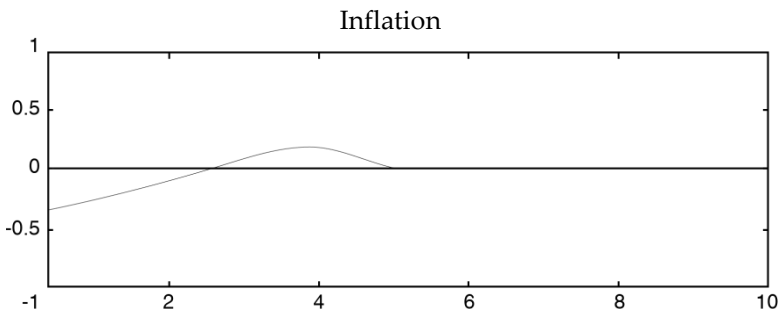
We assume that the government decides to increase its investment expenditures by 10 percent, as an expansionary fiscal policy measure driven by political motives per example. In Figure 3.9, this scenario's outcomes are generated for the variables of interest.

As expected, GDP reacts positively to this increase in public investment, with a growth of over 1.2 percent, i.e. approximately the equivalent of the coefficient that is linked to investment expenditures in the aggregate demand equation. Afterwards, output gradually joins back the initial equilibrium after 5 periods. Inflation supposedly drops as a direct response to the variation in GDP during the first year of the simulation, in light of the negative correlation that had been established between the two variables. This negative correlation could be seen, from the outset, as in contradiction with the intuition of the demand-pull inflation. But it is consistent with the stylized facts in Morocco and with the buckle of the literature. Nonetheless, it is worth observing that by the third period inflation goes beyond its steady state level with a positive difference of +0.15 percent, before making it back to the steady state after two periods from that. This phenomenon could be explained by the fact that the forward-looking economic agents, i.e. 52 percent of the overall population according to this model, notice that the government is spending more, which is probably going to affect the level of prices in the following year (t+1) henceforth, through demand-driven inflationary pressures.

The nominal interest rate follows, to a significant extent, the inflationary dynamics. It evolves in lesser proportions however, mostly as a consequence of interest persistency, since its one-period lagged values were given a coefficient of 0.63. Here, we do not presume any specific voluntary policy mix combination between fiscal and monetary policies. It is merely a reaction to the inflationary deviation following the monetary policy rule, as an increase in aggregate demand usually supposes a rise in loans, hence a mildly higher interest rate than the initial equilibrium.

As for debt, it exceeds its sustainability threshold by around 2.9 percent at the very first period, since no increase in government resources is accompanying the investment expenditures shock. It progressively converges toward the sustainability. However, it only reaches back equilibrium after 7 periods, i.e. longer than the time during which government investment affects GDP growth. Technically, this difference could be explained by the persistence that is materialized in equation 5, along with the overlapping effect of the interest rates.





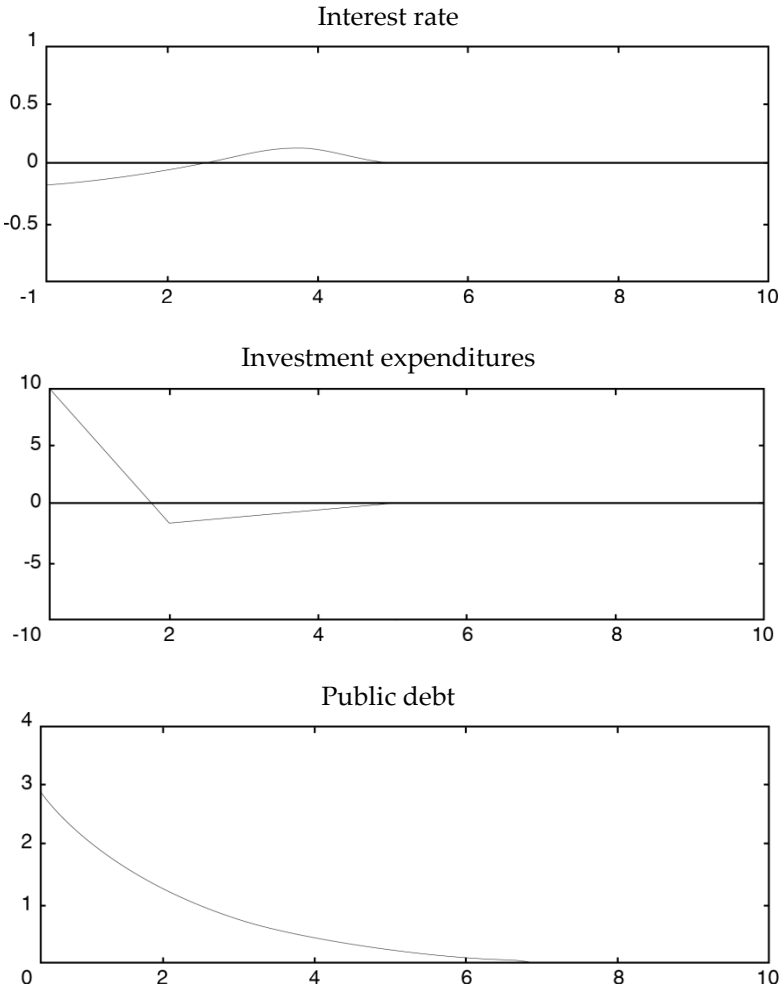


Figure 3.9. *The variables' impulse response to a public investment shock*

From this first shock, we can understand that a raw increase in public investment spending that is not totally or predominantly balanced with a rise in public revenues (taxation or extraordinary resources) has a larger and longer negative impact on public debt than a positive one on economic growth. This interpretation is consistent with the current state of affairs of government investment discussed in Chapter II above, where the macroeconomic productivity remains very low because of the lack of project visibility historically demonstrated by the authorities,

the existence of significant current expenditures in most investment-related budget sections, and the counterproductive legal measures that are supposed to reduce corruption risks in regards to public procurement, among other inefficiencies. It is worth reminding oneself that government investment –already found to be less effective than GFCF in Chapter II, actually fits in a framework that is already marked by the quasi-inefficient overall capital spending (public and private), with an ICOR index of 8.96 based on the World Bank data from 1998 to 2015. According to historical stylized facts, the ICOR index was even higher (i.e. less efficient) in the 1980s and early 1990s.

The economy's reaction to a public consumption shock

In this subsection, we examine the alleged reaction to a significant government consumption increase. Although it does not seem from the outset to be feasible, it is possible to generate a government current spending shock through the model. A positive 10 percent variation in GC_t is driven as the combined effect of a proportional increase in the gross domestic product and debt by 1.8 and 5.7 percent respectively, and a decrease in government investment expenditures 3.98 percent.

It is known that when three shocks are defined, Dynare would merely generate three sets of impulse responses. Therefore, in order to only generate one reaction with the combined influence of the three shocks, it is deemed necessary to define a fourth exogenous shock, which is added to the three equations that encompass government consumption, with a scaling factor for differing variances. Said fourth shock can then be considered as driving the three aforementioned shocks at once.

Through Figure 3.10, the first obvious aspect to be observed is the slightly larger impact on output in the very short term compared to the previous investment expenditures shock. However, the influence of the government consumption variation on public debt is significantly larger: nearly twice the one generated above after a 10 percent increase in government investment spending. A plain and simple explanation would be the fact that current spending is the largest component of the

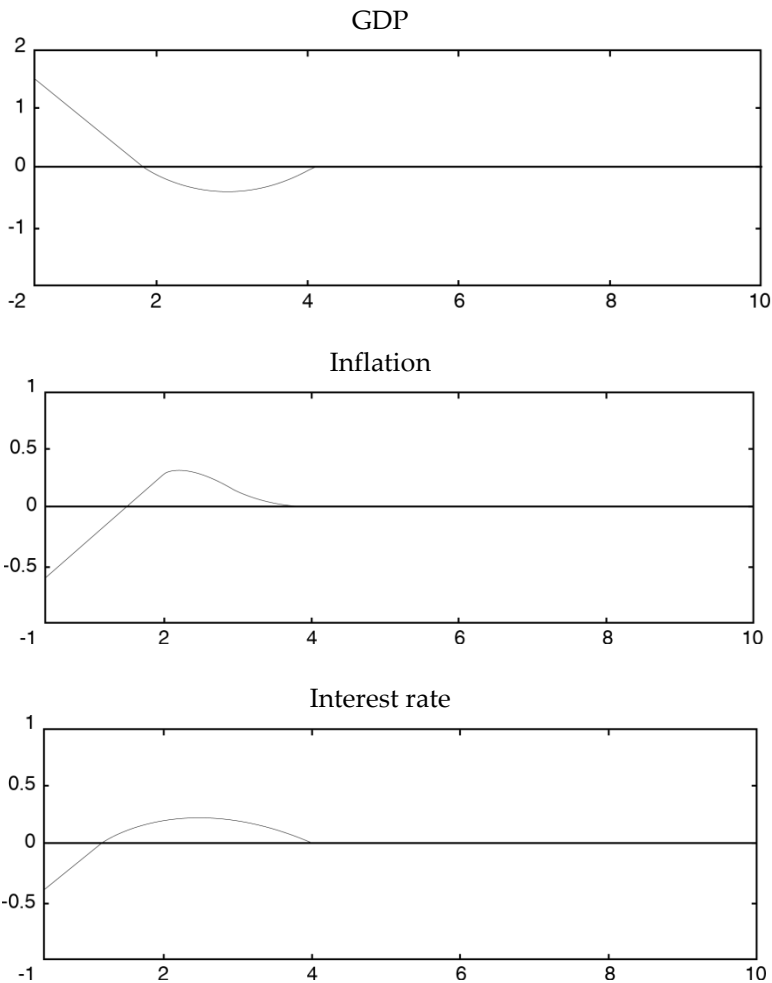
government budget. But there are also some analysis elements indirectly shown by the model, and that support the fact that government consumption, even though it drives an upward influence on GDP growth in the short run through its direct relation within the aggregate demand, is not productivity-enhancing. This statement is corroborated by the fact that this shock does not generate GDP growth by the end of the second year.

On the other hand, one should not discard the negative relation between growth and debt, especially when the debt-to-GDP ratio exceeds 60 percent, which is exactly the steady state threshold in our model (Reinhart & Rogoff, 2010 and Pescatori *et al.*, 2014). This relation is incorporated to some extent in the model via the debt constraint in Equation 4, which is reflected on GDP growth in Equation 1 through variations in public investment expenditures. Modeling the latter as some sort of an adjustment factor is quite consistent with the historical data in Morocco, where government investment is the main target of budget cuts in different circumstances, whether through a direct reduction or carry-overs as explained in chapter II above, or indirectly via a low annual execution rate of the government part of the budget that is dedicated to investment. In this framework, the effect of the government consumption on GDP growth becomes negative beyond the second year following the shock, as its first-round effect is progressively dissipated by the efforts of debt reduction that should follow, and its negative influence on GDP (via government investment adjustment). If, instead, the government was to reduce its current spending in the years following the initial shock, the result regarding GDP is not expected to be significantly different. Of course, we assess the present scenario in a *ceteris paribus* state of mind; hence, we do not suppose any parallel increase in government revenues to counterbalance the evolution of government consumption and debt.

According to the model's results, the government debt increases by more than 5.5 percent as an immediate reaction, before slowly regressing until it joins back the equilibrium in the 5th period following the shock. Public investment, which starts at a -3.98 level, also shows persistence when converging back to the

steady state, taking one period longer than debt. This persistence is mostly explained by debt dynamics, as its lagged deviation values significantly influence investment expenditures.

As regards to inflation, it follows GDP dynamics in inversed proportions, with a steeper trend during the first three periods. Starting at a slightly more negative level than in the public investment shock, inflation crosses the zero level at the second period, reaching a mildly larger positive value before converging back to equilibrium. And the interest rate seems to follow this dynamic, with a steeper reaction as well.



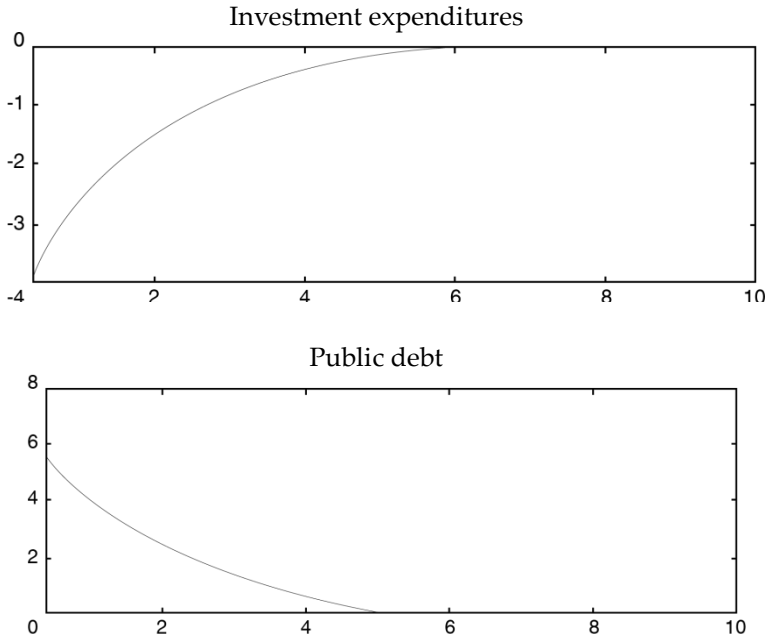


Figure 3.10. *The variables' impulse response to a current expenditures shock*

The economy's reaction to a variation in public revenues

In this scenario, we examine the implications of a windfall in the government budget, at the image of the one that took place during the early 2000s as a consequence of the privatization of public companies and the sale of public parts in the capital of some private entities. For the sake of argument, this windfall is materialized by a 10 percent increase in government revenues GR_t. And following the same technical logic used in order to generate the model's impulse responses in the previous subsection, the positive variation in GR_t is driven through Equations 4 and 5 as the combined effect of a 11.2 percent jump in government investment expenditures and a 5.3 decrease in government debt. And to avoid generating two different sets of impulse responses, the software is reprogrammed again so as to define an exogenous shock that is added to the two equations with a scaling factor for differing variances.

Figure 3.11 shows that government investment spending starts at a +11.2 percent level, and persists above the steady state for the longest period so far, i.e. 8 periods. This persistence finds explanation in the significant margin of maneuver provided by government debt, which evolves below the threshold and takes around 7 years to reach the steady state level. It is worth observing that, in spite of having an exogenous shock that initiates with a variation of -5.3 percent in terms of government debt, the actual impulse response of the latter as generated by the model starts at approximately -2.25 percent. This is most likely due to the fact that as the government would prop up investment expenditures by 11.2%, the latter increase is bound to affect government debt during the very first period through Equation 5 of the model, where GI_t is positively correlated with d_t.

As a matter of fact, GC_t is assumed to remain unchanged or change at a hardly noticeable pace during the first periods of the present scenario. Most procurement contracts, which often come from the current spending budget and are related to the maintenance of equipment or the re-establishment of infrastructures, only enter in force after both the completion time of the initial investment contract and the period of guarantee. This roughly totals three years on average.

As for GDP, it should significantly benefit from the alleged use of the surplus in terms of government revenues, with an immediate reaction variation of +1.34 percent. Output takes a longer time to converge back toward the steady state, i.e. 8 periods, mostly supported by the sustained levels of investment spending. Inflation reacts negatively to the combined effects of this scenario shock, starting at a -0.4 percent level, particularly pursuant to the large output growth generated by the model. This first-round reaction is gradually reversed by the 4th year, as agents' expectations and demand-pull inflationary pressures gather pace while GDP growth slowly loses momentum. However in a marginal proportion, inflation's rate becomes positive from the 5th period henceforth, until it joins back its neutral level after 7 periods from the initial shock. On the other hand, the nominal interest rate slightly decreases by less than 0.15, and then converges in a very persistent fashion. Before it reaches its initial equilibrium, it faintly

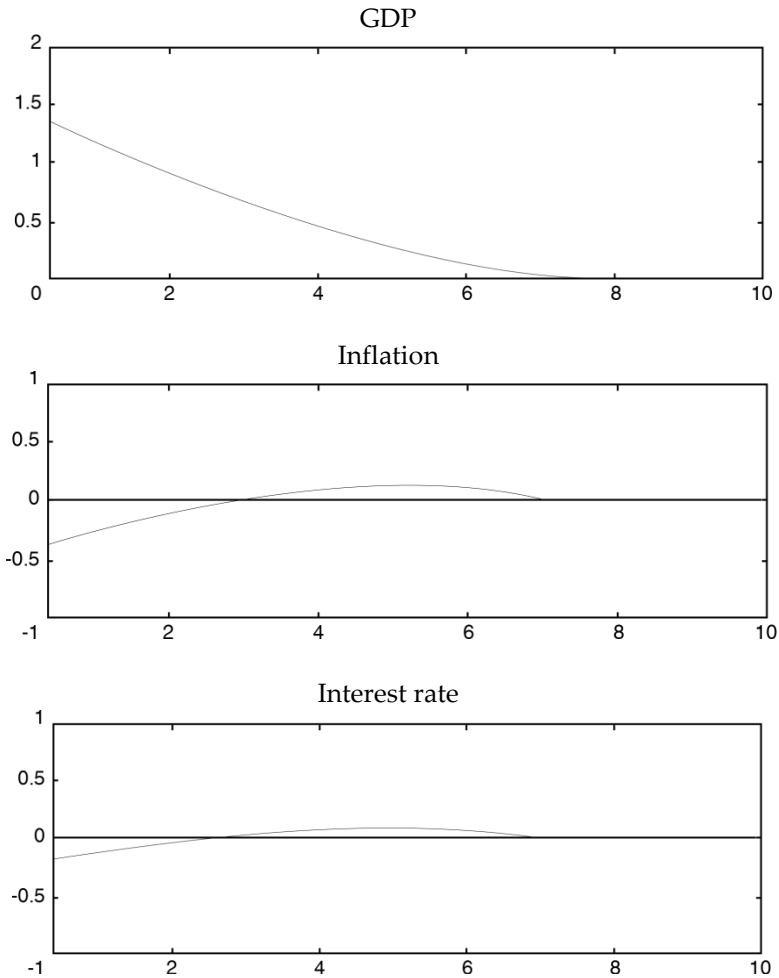
crosses the zero level. In principle, several empirical papers establish the existence of a positive relation between public debt ratios and the long-term costs capital or bonds premiums (approximated in this model via r_t). Following this logic, it is possible to assume that when public debt decreases, it should pull downward the real interest rate, which is linked within our model to the nominal interest rate via the Fisher equation. However, it is worth mentioning that this correlation is not always verified, as the empirical evidence in the literature remains often inconclusive (Alper & Forni, 2011).

This scenario shows that a combined increase in public resources and government investment seems to be the optimal option so far. Firstly, it enables investment projects to thrive, provided that the government demonstrates a minimum of effectiveness and vision of what it can achieve with the revenues surplus. Secondly, the evolution of debt's ratios seems to also benefit from the improvement of public revenues. And according to the model, this would provide government investment projects with a further margin of maneuver below the sustainability threshold for a period of time that is larger than what investment projects take to start generating macroeconomic or budgetary returns.

However, it is worth bearing in mind that the privatization of different public assets cannot be considered as a viable solution to generate positive public revenues shocks and implement the scenario simulated in this subsection. Also, if the latter is aimed for through an increase in taxes, this should remain within the optimal tax rate values, in compliance with how taxes are usually spent by the government. Otherwise, higher taxes would merely trim down long-term real economic growth, mostly via the supply-side of the economy (Lee & Gordon, 2005).

In fact, there are also other rather unorthodox alternatives when tackling a sustained improvement of government resources. The reduction of corruption is one of them. The literature overwhelmingly established a negative relationship between corruption and economic growth, and no conclusive evidence is found regarding the allegedly positive impact of corruption in "greasing the wheels" of highly bureaucratic administrative

procedures such as in Morocco[57]. And when corruption consumes GDP points, it indirectly affects public revenues. Furthermore, corruption usually goes hand in hand with laxity in terms of tax collection as a consequence of briberies and the various forms of conflict of interests. Ergo, fighting corruption would also directly impact public revenues.



[57] For further discussion in this regards, see Ahmad *et al.*, (2012) or Dreher & Gassebner (2013), among others.

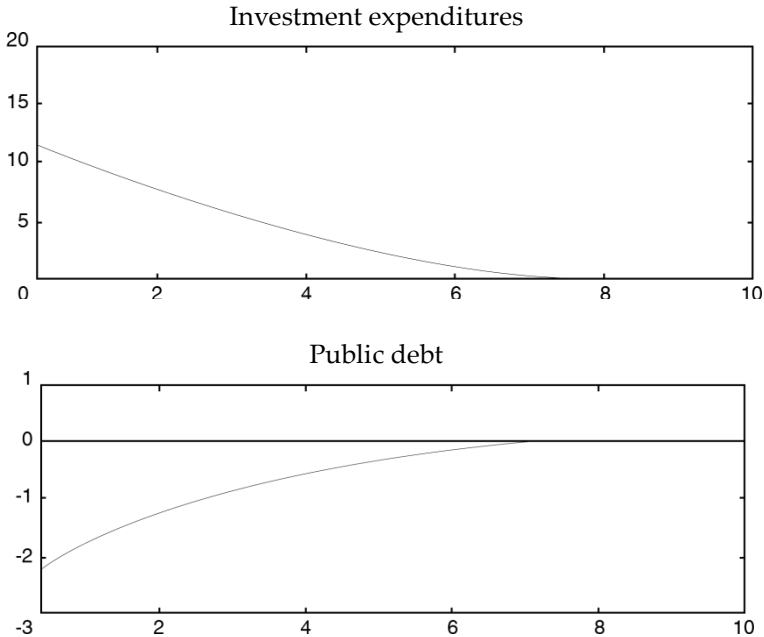


Figure 3.11. *The variables' impulse response to an increase in public revenues*

The economy's reaction to a variation in public debt

In this scenario, we simulate the impact of a sudden 10 percent increase in government debt. It is not a very likely situation if we do not consider foreign debt, where a drastic fall in the exchange rate for example could generate such a variation. However, this scenario can provide reliable evidence on the influence of government debt on the different variables in general, even under a closed economy hypothesis.

The way the model is conceptualized makes government investment expenditures the first fiscal variable to be affected by debt variations. In other words and as mentioned in different discussions above, we assume that the Moroccan government considers, to a significant extent, investment spending as a discretionary adjustment variable. This modeling hypothesis is substantially consistent with the stylized facts in Morocco. As a matter of fact, current spending is highly incompressible, because it is linked to public servants' salaries and a plethora of goods and

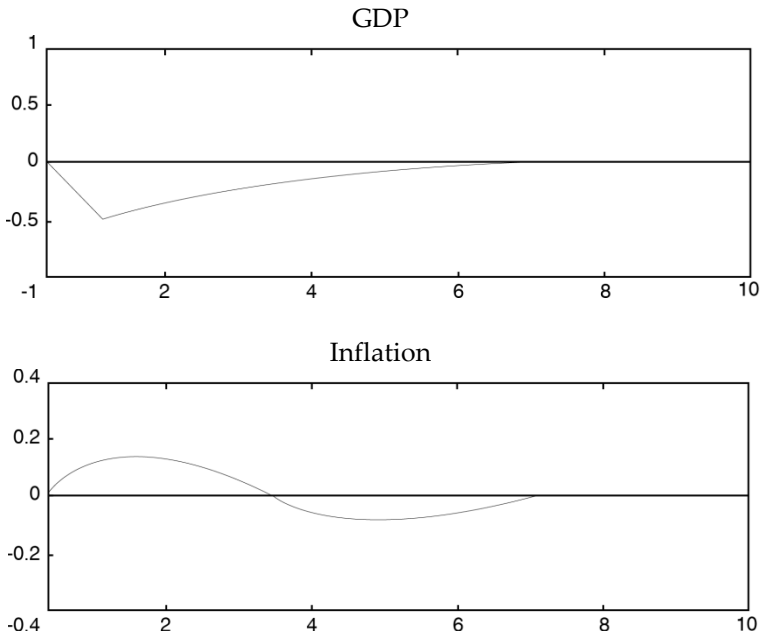
services that are said to be "necessary" for the public administration to remain operational. Therefore, public investment is seen as a relatively flexible variable, hence its role as an impromptu adjustment factor. A pertinent example would be the 11.8 billion MAD mid-year government cut in the investment budget in 2013 in order to prevent fiscal deficits from worsening, as discussed previously in section 2.3.

Whereas, according to the model's outputs shown in Figure 3.12, GI_t only reacts to the initial debt shock a year later, since the correlation with the latter is lagged in Equation 4. In fact, government investment decreases by slightly less than 4 percent, before progressively converging back to equilibrium, which is reached by the 7th period. Subsequently, GDP drops by more than 0.48 percent during the second period after the shock, mainly affected by the public investment evolution.

One of the many drawbacks of this experimental model, which were deliberately taken into account, is the fact that it does not explicitly capture all the possible aspects of demand-side shocks, particularly the "collateral" influences or relations. In this context and as a consequence of the model's compact structure, only a few insights are given on the direct impact of public debt on GDP growth, in light of the analytical elements discussed in the literature. This relation is incorporated in the model merely via the debt constraint in Equation 4, which is reflected on GDP growth in Equation 1 through variations in public investment expenditures. Therefore, it is logical to suppose that the output variation would have been steeper if said debt-GDP relation was explicitly included in the model. Our analysis and choice of debt threshold join to a certain extent the conclusions of Mandri (2015), which where a threshold ratio of 70 percent was found, and beyond which debt would drive singlehandedly a significant downward influence on GDP growth.

Also, it is worth observing that government investment should not be the sole regulator. Taxation could be an alternative budgetary adjustment variable when the government decides to bring back debt ratios into the sustainability threshold or the macroeconomic neutrality. Nonetheless, the scope of this research focuses on the expenditures side.

As regards to the inflation rate, it undergoes a one-period lagged upward influence at +0.14 percent, before switching to a mild negative value by the 4th period. In the 5th period, it reaches around -0.06 percent, and gradually converges back until it finally joins the equilibrium seven periods after the initial shock. The mitigated form of the inflation's evolution is followed to a noticeable extent by the nominal interest rate, which is seemingly the first variable to react in this specific case-scenario, with an immediate +0.039 percent more or less, most particularly as a consequence of economic agents' expectations expressed in Equation 3. The nominal interest keeps increasing at around +0.075 percent, before reversing its trend and crossing the steady state line at the 5th year following the initial shock, thereby remaining at very slightly negative rates for two periods. This evolution is consistent with theory and covers the lacking backchannel regarding the debt cost (r_t in this model) and how it should increase after the public debt ratio deteriorates, especially that r_t and i_t are implicitly linked in the model through the Fisher equation.



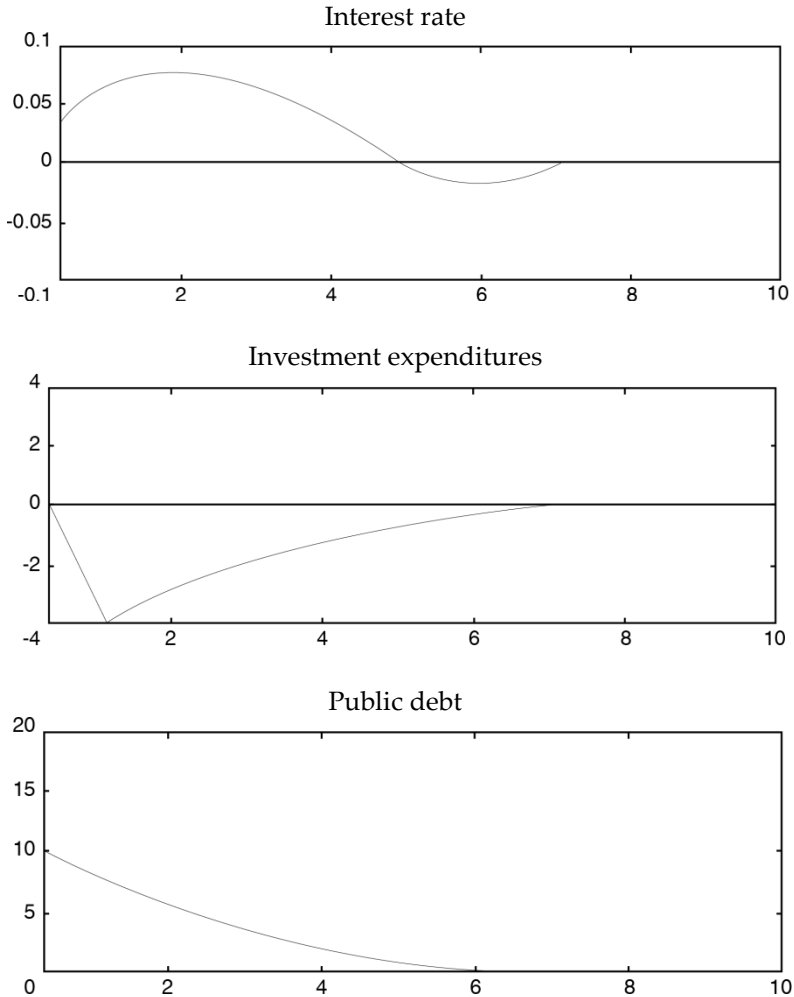


Figure 3.12. *The variables' impulse response to a public debt shock*

Section conclusion

In this section, a series of shocks was driven based on different fiscal scenarios, in order to further discuss several hypotheses developed throughout this thesis and to establish a number of fiscal policy recommendations, particularly regarding government investment.

In this framework, we drive four fiscal shocks in order to assess the economy's supposed reaction. Firstly, we simulated a scenario in which the government decides to increase its investment

expenditures by 10 percent, as a debt-financed expansionary fiscal measure. Secondly, we examined the alleged reaction to a significant government consumption increase. In the third case-scenario, we assessed the implications of a fiscal windfall that is directly reflected on government revenues. Lastly, we simulated the macroeconomic and budgetary implications of a sudden jump in government debt.

In our analysis, we considered the position of Morocco in light of the three hypotheses developed previously. Our first assumption in this regard was that the Moroccan government lags behind in terms of profitability-based selectivity of government investment projects, mostly because of the significant level of corruption and the loose definition of investment budget sections that are hardly linked to specific programs. Secondly, it was assumed that Morocco has a relatively productive position in terms of transitional dynamics, i.e. a larger macroeconomic influence of public investment as the margin of improvement in terms of infrastructure is substantial. Finally, the latter is one of the factors that explain the hypothetical existence of very little substitutability between public and private capital spending, which implies a relatively low crowding out effect and supposedly effective government investment expenditures.

When examining the model's outputs, we did find a positive effect of government investment on GDP dynamics. The correlation's magnitude remains quite mild though, despite Morocco's favorable position in terms of transitional dynamics and the non-substitutability of its private and public capital spending, with a 0.12 percent increase for every 1 percent rise in investment expenditures *ceteris paribus*. The positive influence of the latter shock is not quite persistent, with a maximum 5 years span, most likely trimmed down by the unsustainable levels that debt reaches, since no increase in government resources is accompanying the public investment shock. This is confirmed by the fact that GDP growth evolves positively for even 8 years when the public investment shock is accompanied with the improvement of the debt margin and/or a parallel increase in government resources. In the latter case, public investment has shown persistence, with a shock length of up to 8 as most shocks tend to only lose

momentum after 8 years, which could be explained by the maintenance contracts that usually enter into force a few years after the main investment and the fact that this type of expenditures, despite its aforementioned productivity deficiencies, has a ripple effect on other investments.

The model also enables to compare investment expenditures' macroeconomic influence with the one driven by current spending. An increase in the latter seems to have a larger impact on economic growth in the very short term. However, the influence of the government consumption variation on public debt is significantly larger; hence, said shock stops generating output growth by the end of the second year. In a nutshell, the model provides tangible evidence that government consumption, even though it drives an upward influence on GDP growth in the short run through its direct relation within the aggregate demand, is not productivity-enhancing.

Debt undergoes a significant upward influence when the government increases either its current or investment spending; and it shows a significant inertia. When debt goes beyond the sustainability threshold, it takes around 7 years to fall back under said threshold. And it is worth mentioning the direct and negative relation that could exist between economic growth and public debt, especially when the debt-to-GDP ratio exceeds the 60 percent sustainability threshold. This relation was partially incorporated in the model via the debt constraint equation, which is reflected on the aggregate demand equation through variations in public investment expenditures. Modeling the latter as some sort of an adjustment factor is quite consistent with the historical data in Morocco, where government investment is the main target of budget cuts in different circumstances, whether through a direct reduction or indirectly via a low annual execution rate of the government part of the budget that is dedicated to investment.

The model demonstrated that an increase in public investment spending that is not totally or predominantly balanced with a rise in public revenues (taxation or privatization resources for instance) has a larger and longer negative impact on public debt than a positive one on GDP growth. The macroeconomic effectiveness of investment expenditures remains very low because of the

historically observable lack of project visibility, the existence of significant current expenditures in investment-related budgets and the counterproductive legal measures that are supposed to reduce corruption risks in regards to public procurement, but end up partially clogging the investment process. The discussion in this section also emphasized the fact that public investment, which had been found to be less effective than GFCF in the previous panel data and time series modeling exercises, actually fits in a framework where overall capital spending is quasi-inefficient, with an ICOR index of 8.96 at best.

The discussion in this section demonstrated, particularly in light of the 3rd shock, that a combined increase in public resources and government investment is the optimal option in terms of investment expenditures and their role in supporting GDP's evolution. Firstly, it enables investment projects to thrive, obviously under the condition that the government demonstrates a minimum of effectiveness and visibility regarding the use of the surpluses. Secondly, the evolution of debt's ratios would benefit from the improvement of public revenues. And according to the model, this would provide government investment projects with a further margin of maneuver below the sustainability threshold for a period of time that is larger than what investment projects take to start generating macroeconomic or budgetary returns.

However, in this section we argued that the privatization of different public assets cannot be a viable solution to generate positive public revenues shocks in order to offer investment expenditures the aforementioned margin of maneuver. Also, if the latter is aimed for through an increase in taxes, this should remain within the optimal tax rate values, in compliance with how taxes are usually spent by the government. Otherwise, higher tax pressure would merely trim down long-term real economic growth, mostly via the supply-side of the economy (Lee & Gordon, 2005). We also suggested other rather unorthodox alternatives when tackling a sustained improvement of government resources. The reduction of corruption is one of them. The literature overwhelmingly established a negative relationship between corruption and economic growth, and no conclusive evidence is found regarding the allegedly positive impact of corruption in

"greasing the wheels" of highly bureaucratic administrative procedures such as in Morocco. And when corruption consumes GDP points, it indirectly affects public revenues. Furthermore, corruption usually goes hand in hand with laxity in terms of tax collection as a consequence of briberies and the various forms of conflict of interests. Ergo, fighting corruption would also directly impact public revenues, thereby offering the conditions of optimal public investment, i.e. a larger margin for public investment in boosting the economic growth without jeopardizing fiscal sustainability. In a nutshell, public investment optimality in a realistic framework in Morocco is conditioned by cumulative positive variations combined with the improvement of profitability-based selectivity of investment projects, under the constraint of a debt ratio that does not exceed 60 percent.

Conclusion

In this chapter, we motivated a small scale macroeconomic model that is supposed to enable the investigation of public investment optimality. In doing so, the light is shed on the assessment of public investment effectiveness vis-à-vis output growth under the constraint of debt sustainability.

To begin with, we introduced the concept of debt sustainability as a condition for optimal investment expenditures. In this frame, we shed light on the main characteristics of government debt in Morocco, through an overview of its historical evolution and current state of affairs, to provide the reader's with an empirical foundation prior to the conceptualization of public investment optimality and its underlying modeling process. The emphasis was then shifted toward the examination of debt sustainability in the literature, where no unanimity was found regarding the exact definition of this concept. In fact, the spectrum of sustainability covers the relationship between the evolution of public debt and the government's solvency, but it could also be based on the potential influence of public debt on the main economic aggregates in a given country, such as GDP. Other than these two relatively canonical definitions, we discussed a few alternatives that could fit for merely some specific contexts, e.g. a definition according to which if no consistent and politically feasible macroeconomic

policies can lead to debt stabilization under non-extreme realistic shock scenarios, public debt would be considered unsustainable. But on overall, one can conclude that debt sustainability is highly related to a country's ability to honor its debt obligations without accumulating significant arrears or being subject to drastic debt-reduction programs. And since most ordinary public revenues often evolve roughly in the same rhythm as output, it is quite important to consider the dynamics of government spending, particularly investment expenditures.

And in light of these elements of analysis, the different definitions of optimality in the literature were examined, starting from the growth-maximizing public investment rate to tax-driven fiscal optimality. For the purpose of this research, we motivated a twofold notion of public investment optimality, where we combine macroeconomic effectiveness as discussed in chapters I and II, with the constraint of public debt sustainability as defined in this chapter. This conception of government investment optimality enables the analysis to go from a monotonic relationship between economic growth and public investment, toward defining the combination that would allow for a productivity-enhancing macroeconomic effect without jeopardizing either the public debt sustainability or the tax pressure. The objective is to assess the mechanisms through which government investment expenditures can drive a significant positive macroeconomic impact on the economic activity without pushing the debt level beyond a defined sustainability threshold *ceteris paribus*.

In order to do so, we developed an augmented version of a small scale model initially inspired from the strand of New Keynesian reduced-form models that were merely dedicated toward monetary policy analysis. This augmented version takes into account a twofold fiscal component, in order to include public debt sustainability as a constraint for government investment spending.

The model includes four main blocks: the aggregate demand, represented by an IS curve that explains output dynamics through a number of expected and lagged variables, including public investment expenditures; a Phillips curve that defines the price level according to expected inflation and GDP dynamics; a

monetary policy rule, where we made the assumption that the central bank follows a Taylor-type pattern that links the evolution of the interest rate with inflation and GDP dynamics; a twofold fiscal system to help provide insights on the relation between public investment expenditures and government debt. The model was shaped so as to remain parsimonious and coherent, thereby providing a clear understanding of the structural relations between the main variables. And in order to include the second component of public investment optimality, a debt sustainability threshold of 60 percent of GDP was introduced in the model, based on the literature and the regulation in Morocco's first economic partner, i.e. the EU (the Maastricht Treaty and the Protocol on the Excessive Deficit Procedure). Through this experimental parameterization, the deviation of the debt ratio from the sustainability threshold is thus taken into account in the very behavior of government investment spending, in a simulation-oriented model.

Based on an eclectic parameters calibration, the model started generating artificial series that followed the same evolution as the historical ones for most endogenous variables, with the exception of public debt. The artificial version of the latter showed a noticeable difference in terms of elasticity when compared the actual data. This difference could find explanation in the fact that despite leading a discretionary fiscal policy, the Moroccan authorities tend to react quasi-exclusively based on cumulative changes in fiscal variables, when it comes to adjusting government debt. However, it is worth noticing that the model-generated debt series does fluctuate around the historical one, and follows its overall trend.

In the simulation exercises, four fiscal shocks were driven in order to assess the economy's supposed reaction. When analyzing the scenario simulations, we considered the position of Morocco in light of the three hypotheses developed previously. Our first assumption in this regard was that the Moroccan government lags behind in terms of profitability-based selectivity of government investment projects, mostly because of the significant level of corruption and the loose definition of investment budget sections that are hardly linked to specific programs. Secondly, it was assumed that Morocco has a relatively productive position in

terms of transitional dynamics, i.e. a larger macroeconomic influence of public investment as the margin of improvement in terms of infrastructure is substantial. Finally, the latter is one of the factors that explain the hypothetical existence of very little substitutability between public and private capital spending, which implies a relatively low crowding out effect and supposedly effective government investment expenditures.

When examining the model's outputs, we did find a positive effect of government investment on GDP dynamics. The correlation's magnitude remains quite mild though, despite Morocco's favorable position in terms of transitional dynamics and the non-substitutability of its private and public capital spending. The positive influence of public investment shocks on GDP is more persistent when it is accompanied with an increase in government resources, as the effect of investment expenditures seems to get trimmed down by debt when it transcends the sustainability threshold. On the other hand, debt undergoes a significant upward influence when the government increases either its current or investment spending; and it shows a noteworthy inertia. When debt goes beyond the sustainability threshold, it takes around 7 years to fall back under said threshold.

The model also enabled to compare investment expenditures' macroeconomic influence with the one driven by the allegedly non-productive current spending. An increase in the latter seems to have a larger impact on economic growth in the very short term. However, the influence of the variation in government consumption on public debt is significantly larger; hence, said shock stops generating output growth by the end of the second year. In a nutshell, the model has provided tangible evidence that government consumption, even though it drives an upward influence on GDP growth in the short run through its direct relation within the aggregate demand, is not productivity-enhancing.

Most importantly, it is possible to conclude that an increase in public investment spending that is not totally or predominantly balanced with a rise in public revenues has a larger and longer negative impact on public debt than a positive one on GDP growth. Subsequently, by the end of this chapter we offered

evidence that a combined increase in public resources and government investment is the optimal option in terms of investment expenditures and their role in supporting GDP's evolution. Firstly, it enables investment projects to thrive, obviously under the condition that the government demonstrates a minimum of effectiveness and visibility regarding the use of the surpluses. Secondly, the evolution of debt's ratios would benefit from the improvement of public revenues. And according to the model, this would provide government investment projects with a further margin of maneuver below the sustainability threshold for a period of time that is larger than what investment projects take to start generating macroeconomic or budgetary returns.

Of course, the privatization of different public assets cannot be a viable solution to generate positive public revenues shocks in order to offer investment expenditures the aforementioned margin of maneuver. Also, if the latter is aimed for through an increase in taxes, this should remain within the optimal tax rate values, in compliance with how taxes are usually spent by the government. On a different register, it is also possible to argue in favour of a few rather unorthodox alternatives when tackling a sustained improvement of government resources. The reduction of corruption is one of them. The literature overwhelmingly established a negative relationship between corruption and economic growth, and no conclusive evidence is found regarding the allegedly positive impact of corruption in "greasing the wheels" of highly bureaucratic administrative procedures such as in Morocco. And when corruption consumes GDP points, it indirectly affects public revenues. Furthermore, corruption usually goes hand in hand with laxity in terms of tax collection as a consequence of briberies and the various forms of conflict of interests. Ergo, fighting corruption would also directly impact public revenues, thereby offering the conditions of optimal public investment, i.e. a larger margin for public investment in boosting the economic growth without jeopardizing fiscal sustainability. In a nutshell, public investment optimality in a realistic framework in Morocco is strictly conditioned by a cumulative series positive variations combined with the improvement of profitability-based

selectivity of investment projects, under the constraint of a debt ratio that does not exceed 60 percent.

Conclusion

This book tackled the relation between economic growth and public investment expenditures. It investigated the level and means to improve the macroeconomic effectiveness of government investment spending and explores the concept of optimality through debt sustainability.

Firstly, the light was shed on economic growth in the literature as a core variable of the economic activity, its determinants and the role of investment, and particularly public investment, as a potential contributor. In this framework, growth theorists agree in principle that public and private investment plays a decisive role in the sense that it enhances the economy's productivity, particularly by driving an upward influence on technology and education, among other physical and societal variables. Public investment's particularity lays in the fact that it is sought to provide key infrastructural components, which theoretically constitute the fundamental basis for any economic activity. Regardless of the specific magnitude of its impact on GDP and productivity according to different empirical studies, a large part of the theoretical and empirical literature recognizes public investment to be a superior determinant of economic growth.

Nevertheless, the relationship remains non-linear and the debate unfasten, starting from the Keynesian-Classical controversies, down to the divergent empirical findings regarding

the very impact of public spending, particularly government investment, on GDP growth. Based on the different research works reviewed in Chapter I, it would be difficult to definitely ascertain the extent of the relationship between public investment expenditures and the economic activity. A large number of empirical studies confirmed the existence of a significant upward influence of public investment on economic growth and, in some cases, on private investment. However, several other authors found public capital to be of no avail when it comes to promoting output growth, and some even came up with the conclusion that public spending has a detrimental macroeconomic effect. Those two perspectives are conciliated in this thesis by linking the significance of public investment's impact on GDP growth, to various levels of crowding-out, efficiency, investment project selectivity and public-private capital substitutability, among other factors. Thus, the difference in terms of public investment's macroeconomic influence from a country to another could be explained by the crowding out hypothesis, and the possibly low or negative marginal productivity of public investment. Other than these elements, there is another plausible explanation, i.e. the potentially high level of taxation that often results from further public investment once it exceeds a specific level, which could trim down GDP growth and disturb private investment and saving.

These assumptions were empirically tackled in Chapter II, as the Moroccan macro-financial framework was examined as well as a benchmark panel data model, in light of the three main hypotheses established by the end of the first part of this thesis. Hypothesis 1 emphasizes the importance of budget efficiency, whether through the fight against corruption or the enforcement of macroeconomic profitability-based selectivity of investment projects and government expenses in general. As for Hypothesis 2, it states that from a "transitionaldynamics" perspective, public investment is likely to have a larger effect in small and middle income countries such as Morocco where the capital stock to GDP ratio is the lowest. Here, the margin of improvement in terms of infrastructure is substantial, among other development and economic variables. And according to Hypothesis 3, the higher is the public-private investment substitutability the more important

is the crowding out effect, which drives a downward influence on public investment's effectiveness. The substitutability is more present in advanced economies than in Morocco and other comparable countries, which could explain why the public investment multiplier effect is found to go up to 1.4 in middle income countries while it is weak –and even negative in some cases- in advanced economies.

When discussing the stylized facts, the Moroccan GDP growth was found to suffer, to a significant extent, from year-to-year volatility due to the relatively unpredictable agricultural output that is highly tributary to weather conditions. Also, the share of industry in GDP has been suboptimal; improving the industrial output would most likely reduce the year-to-year volatility of the economy as a whole. Another observation was that the Moroccan GDP growth has been driven by domestic demand, i.e. consumption and investment, despite the different export promotion policies launched by the government throughout the years. It is important to emphasize in this regard that the Moroccan economy has a history of substantial interventionism that aimed to support GDP growth and to steer the economic activity through legislation, fiscal incentives and direct public investments.

As regards to public capital spending, the emphasis was put on the three main institutions that contribute to public investment in the Kingdom, i.e. public establishments and corporations (PECs), local councils and the government. The part of public investment led by PECs was found to be directly linked to specific projects with thoroughly defined objectives in most cases. Therefore, the impact of said investment is assessable and supposedly meets a significant degree of effectiveness. Following this finding, PECs are likely to have a significantly smaller margin of improvement in terms of macroeconomic impact. Subsequently, we deemed that it would be more relevant to explore optimality-oriented measures in less effective public investors, namely local councils and government.

When discussing local councils' role in overall public investment, we found that it remains quite small when compared to investment expenditures made by the government and PECs. Furthermore, vital investment programs such as rural

electrification, drinking water supply and rural roads, which are supposed to be under local councils' responsibility, are still managed directly through governmental programs. Subsequently, the impact of local councils' investments on national GDP growth is not likely to be important, nor does the expected marginal profitability of the implementation of efficiency-oriented measures. On the other hand, the part of public investment led by the government proved to be quite important when compared to overall public investment; hence, it is supposed to have a visible influence on GDP growth following the elements of analysis discussed in Chapter I. It also showed to have large margins of improvement, on both the budgetary and the institutional levels.

In the first modeling exercise in this thesis, we considered Morocco as part of a group of developing countries, in order to compare the latter's characteristics with a certain number of advanced economies in light of the aforementioned hypotheses. With this perspective in mind, we estimated a panel data model with a total of ten developed and developing countries. One of the main findings were that government investment has a slightly negative impact coefficient in the sample group of advanced economies, while in the developing countries, the influence is clearly positive. Also, GFCF shows a larger impact on GDP than public spending in both categories of countries.

In the last part of Chapter II, we estimated public investment expenditures' impact on GDP in Morocco, along with other variables, such as the GFCF and public consumption. In this particular estimation, we used a GLS time series econometric model. The latter suggests that a 100 percent increase in government investment spending would lead to a 16 percent increase in real GDP. This regression coefficient is in fact higher than in some Sub-Saharan economies, but remains significantly below that of several comparable economies; it is also smaller than the coefficient associated to GFCF, where a 100 percent increase would lead to a 64 percent increase in GDP. Nonetheless, in terms of structural trends, the coefficient of government investment improves notably. This could find explanation in the fact that public investment expenditures ultimately meet a significant part of their objectives, despite the deficiencies discussed this thesis as a

whole, e.g. the large rate of carry-overs, the relatively long procurement procedure, the loosely defined investment budget sections and the existence of non-productive current expenses within said budget.

However, one should bear in mind that Morocco is actually a developing country, which implies a relatively small capital to GDP ratio and very low public private capital substitutability, hence a very limited crowding out effect according to the hypotheses developed in this research. Moreover, in the logic of transitional dynamics, Morocco remains way below the threshold beyond which the returns of capital spending start to diminish or become counterproductive. Therefore, we consider that the macroeconomic impact of public investment expenditures is below the effectiveness level, in both model configurations, as their influence is way below the 1.4 multiplier effect found in middle income countries as discussed in chapter I and in Hemming *et al.,* (2002). This finding confirmed that government investment is non-optimal in Morocco, considering that the macroeconomic effectiveness of investment expenditures is defined in this thesis as the first condition, out of two, of optimality.

As a response to this empirical finding, we motivated an initial series of hypotheses and recommendations. Firstly, we recommended the enforcement of restrictions on the carry-over of government investment budget appropriations, particularly through the strict implementation of the 30 percent threshold, stipulated by the new organic law of finance (130-13). Also, the accent was put on the adjustment of the procurement regulation by reducing the counterproductively long administrative procedure, and by introducing public investment-specific measures that promote effectiveness and performance. Another recommendation was for the government to link investment expenditures to specific infrastructure projects or equipments that should be mandatorily defined before the approval of the budget. Most importantly, said projects and equipments should be subject to appraisals even before being approved and submitted in the project of finance bill of their respective year.

These recommended measures should take into account the sustainability of public finance as a central constraint, since it is

considered in our perspective as the second and most important condition for public investment optimality. In this framework, the introduction of the latter notion becomes quite crucial, in the sense that it enables the analysis to go from a canonical relationship between economic growth and public investment, toward defining the adequate fiscal configuration that would allow for a productivity enhancing macroeconomic effect of public investment expenditures without jeopardizing either the public finance sustainability or the tax pressure.

In this perspective, Chapter III starts by investigating the characteristics of government debt in Morocco and defining the concepts of debt sustainability and fiscal optimality. We shed light on the main characteristics of government debt in Morocco, through an overview of its historical evolution and current state of affairs, to provide the reader's with an empirical foundation prior to the conceptualization of public investment optimality and its underlying modeling process. The emphasis was then shifted toward the examination of debt sustainability in the literature, where no unanimity was found regarding the exact definition of this concept. In fact, the spectrum of sustainability covers the relationship between the evolution of public debt and the government's solvency, but it could also be based on the potential influence of public debt on the main economic aggregates in a given country, such as GDP. But on overall, one can conclude that debt sustainability is highly related to a country's ability to honor its debt obligations without accumulating significant arrears or being subject to drastic debt-reduction programs. And since most ordinary public revenues often evolve roughly in the same rhythm as output, it is quite important to consider the dynamics of government spending, particularly investment expenditures. And in light of these elements of analysis, the different definitions of optimality in the literature were examined, starting from the growth-maximizing public investment rate to tax-driven fiscal optimality. But for the purpose of this research, we motivated a twofold notion of public investment optimality, where we combine macroeconomic effectiveness as discussed in chapters I and II, with the constraint of public debt sustainability as defined by a given threshold ratio.

In Chapter III also, we developed an augmented version of a small scale model initially inspired from the strand of New Keynesian reduced-form models that had been merely dedicated toward monetary policy analysis. This augmented version takes into account a twofold fiscal component, in order to include public debt sustainability as a constraint for government investment spending.

The model includes four main blocks: the aggregate demand, represented by an IS curve that explains output dynamics through a number of expected and lagged variables, including public investment expenditures; a Phillips curve that defines the price level according to expected inflation and GDP dynamics; a monetary policy rule, where we made the assumption that the central bank follows a Taylor-type pattern that links the evolution of the interest rate with inflation and GDP dynamics; a twofold fiscal system to help provide insights on the relation between public investment expenditures and government debt. The model was shaped so as to remain parsimonious and coherent, thereby providing a clear understanding of the structural relations between the main variables. And in order to include the second component of public investment optimality, a debt sustainability threshold of 60 percent of GDP was introduced in the model, based on the literature and the regulation in Morocco's first economic partner, i.e. the EU (the Maastricht Treaty and the Protocol on the Excessive Deficit Procedure). Through this experimental parameterization, the deviation of the debt ratio from the sustainability threshold is thus taken into account in the very behavior of government investment spending, in a simulation-oriented model.

When examining the model's outputs, we did find a positive effect of government investment on GDP dynamics. The correlation's magnitude remains below its level in comparable countries as mentioned above, despite Morocco's favorable position in terms of transitional dynamics and the non-substitutability of its private and public capital spending. The positive influence of public investment shocks on GDP is more persistent when it is accompanied with an increase in government resources, as the effect of investment expenditures seems to get trimmed down by debt when it transcends the sustainability

threshold. On the other hand, debt undergoes a significant upward influence when the government increases either its current or investment spending; and it shows a noteworthy inertia. When debt goes beyond the sustainability threshold, it takes around 7 years to fall back under said threshold.

The small scale model also enabled to compare between investment expenditures' macroeconomic influence with the one driven by the allegedly non-productive current spending. An increase in the latter seemed to have a larger impact on economic growth in the very short term. However, the influence of the variation in government consumption on public debt is significantly larger; hence, said shock stops generating output growth by the end of the second year. In a nutshell, the model has provided tangible evidence that even though government consumption could drive an upward influence on GDP growth in the short run through its direct relation within the aggregate demand, it is not productivity-enhancing.

Our policy simulation concludes that an increase in public investment spending that is not totally or predominantly balanced with a rise in public revenues has a larger and longer negative impact on public debt than a positive one on GDP growth. Subsequently, by the end of the assessment of the different scenarios, we offered evidence that a combined increase in public resources and government investment is the optimal option in terms of investment expenditures and their role in supporting GDP's evolution. Firstly, it enables investment projects to thrive, obviously under the condition that the government demonstrates a minimum of effectiveness and visibility regarding the use of the surpluses, which is still hardly the case in Morocco. Secondly, the evolution of the debt ratios would benefit from the improvement of public revenues. And according to the model, this would provide government investment projects with a further margin of maneuver below the sustainability threshold for a period of time that is allegedly larger than what investment projects take to start generating macroeconomic or budgetary returns.

At the end, it is important to emphasize in light of the results of this thesis that the privatization of different public assets cannot be a viable solution to generate positive public revenues shocks in

order to bring down debt below the sustainability threshold or to offer investment expenditures a margin of maneuver. Also, if the latter is targeted through an increase in taxes, this should remain within the optimal tax rate values, in compliance with how taxes are usually spent by the government. On a different register, it is also possible to argue in favour of a few rather unorthodox alternatives when tackling a sustained improvement of government resources. The reduction of corruption could be one of them. The literature overwhelmingly established a negative relationship between corruption and economic growth, and no conclusive evidence is found regarding the allegedly positive impact of corruption in "greasing the wheels" of highly bureaucratic administrative procedures such as in Morocco. And when corruption consumes GDP points, it indirectly affects public revenues. Furthermore, corruption usually goes hand in hand with laxity in terms of tax collection as a consequence of briberies and the various forms of conflict of interests. Ergo, fighting corruption would also directly impact public revenues, thereby offering the conditions of optimal public investment, i.e. a larger margin for public investment in boosting the economic growth without jeopardizing fiscal sustainability. In a nutshell, public investment optimality in a realistic framework in Morocco is strictly conditioned by a cumulative series of positive variations combined with the improvement of profitability-based selectivity of investment projects, under the constraint of a debt ratio that does not exceed 60 percent.

The ultimate goal of this research is to kick the door open for at least three other PhD theses, which could exploit our analysis of the legislative and institutional framework of public investment and test the consistency of our experimental small scale model. Future research should focus on the limits of this academic work. As a starting point, the results of the panel data model and the GLS estimation should be considered with a fair amount of criticism. The reliability of their implications could largely be improved if the risks of collinearity and endogeneity are controlled for. Said risks come mainly from the potential interactions between government investment expenditures and GFCF. Despite the fact regarding government investment containing non-productive

expenses, its most productive part is likely to coincide with some components of GFCF, which we use as a proxy in the absence of available data on private investment or infrastructure. The panel data model's outputs could also be improved by the introduction of country-fixed effects dummy variables. Future research should also reexamine the current specification of the small scale model, which does not capture the potential long-term effects of government investment spending on GDP. Moreover, the fiscal component of the model could certainly be approached differently. Here, it is mainly based on only one previous research work, i.e. Collignon (2012).

The research effort can be completed by covering economic and human development variables instead of GDP growth. The scope is also to be focused on the repercussions of corruption on the notion of public investment optimality. This thesis mentions corruption as a binding variable, but merely discusses its potential effect *hypothetically*. Future studies can attempt to encompass corruption as a variable in the model based on a behavioral/ microeconomic approach, then reexamine the hypotheses we presented on this front.

Finally, it is worth noticing that this thesis is also a novelty linguistically speaking; it is the first one to be written in English in a Moroccan public faculty, and should therefore encourage more PhD candidates to do the same, thereby increasing the international visibility of our research work.

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