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Efficiency and Welfare Effects of Fiscal Policy in Emerging Economies: The Case of Morocco⋆

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Abstract

The welfare cost of fiscal policy does not only depend on distortions by taxation, but also on how public revenues are spent in the economy, and on wealth inequality. Many of the government's spending activities are related to the provision of consumption goods and services, and the provision of public inputs. Hence, optimal taxation policy is not independent of how fiscal revenues are spent. This paper uses a model with two types of agents: Active households (who behave as Ricardian agents) and non-active government-dependent households (who behave as hand-to-mouth agents). The model economy considers a detailed government for both fiscal revenues and public spending. We compute welfare changes of different tax rates and alternative spending policies and quantify the trade-off of fiscal policy across the two groups of agents. The main results can be presented as follows: i) Distortions from some taxes on economic activity can be positive due to the presence of public inputs. ii) Output efficiency can be gained by changing the tax mix while keeping constant fiscal revenues. iii) Total welfare gains can be obtained by increasing tax rates, except the capital income tax, at the cost of reducing the welfare of active households.

Keywords: Fiscal policy; Active households; Government spending-dependent households; Taxes; Government spending; Laffer curves; Welfare.

JEL Classification: H21; H32; H42.

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1. Introduction

The role of the government in the economy is crucial in several dimensions. The government provides a number of public goods and services that would otherwise be underprovided, as well as other private publicly provided goods and services that are not perfect substitutes for private goods and services. Public capital (i.e., infrastructure) provides valuable services for both firms (production activities) and households. On the other hand, in all countries, both developing and developed economies, a fraction of the population is non-active in the labor market and instead is government-dependent, where their income critically depends on government spending. Furthermore, in countries with pay-as-you-go social security schemes, retired workers' income depends on the government social security budget. All these activities need to be financed with the levy of tax revenues, which leads to a positive non-zero optimal tax rate to maximize social welfare. In this context, the government plays a key role in wealth redistribution through fiscal policy. The design of the optimal fiscal policy is of particular interest when the government-dependent fraction of the population (poor, non-active and socially excluded agents, long-term unemployed, pensioners, etc.) is significantly high, a situation especially serious in developing economies, where maximization of social welfare requires an appropriate choice of both the tax mix to levy enough public resources and the components of public spending to minimize negative impacts on economic activity and welfare from taxation and income inequality.

In this paper, we adopt a general equilibrium approach to study the role of the government in the economy, focusing not only on the tax revenues side but also on the spending side. For that, we adopt an integrated general equilibrium framework, as both sides of the government budget cannot be determined independently, given that how the government spends also drives fiscal revenues. A large number of papers have studied the implications of fiscal policy from the fiscal revenues side on the aggregate economy, studying issues such as optimal tax rates, distortions by taxation, tax burden, incidence, etc., (see, for instance, Baxter and King, 1993; Braun, 1994; McGrattan, 1994). However, little work has been done on the implications of fiscal policy from the spending side, with a few exceptions, including Aschauser (1985, 1988), Barro (1981, 1989, 1990), and Cassou and Lansing (1998). Furthermore, in the neoclassical approach, public spending has been in general considered an element that diverts resources from the economy without affecting productivity or household's utility and is modeled as a lump-sum transfer to households.[1]

[1]Most existing dynamic general equilibrium models show that an increase in public spending causes a

This paper aims to analyze the economic implications of fiscal policies in countries where a significant fraction of the population is government-dependent, taking as an example Morocco. The paper focuses on the study of the optimal output efficiency tax mix and in quantify the welfare cost of fiscal policy. We depart from previous works by accounting for two key issues: the existence of a fraction of households whose income is provided directly by the government, and a detailed government spending side as in de-Cordoba et al. (2022). The model takes into account two types of households: Active households and non-active government-dependent households. Active households are assumed to be Ricardian agents, as they can take decisions on labor and investment. Government-dependent households are assumed to be hand-to-mouth agents, as they cannot take labor decisions and their consumption is restricted to their income which is fully provided by the government. This heterogeneity introduces an asymmetry in how fiscal policy affects the welfare of each type of agent. We prove that this distinction between active and non-active agents is crucial for assessing optimal fiscal policy. Almost all taxes will be paid by the active population, whereas a large fraction of government spending will be granted to the non-active population. In the model economy, the government gets its resources from six taxes: taxes on consumption, labor income, capital income, profits, and social contributions by employees and employers, and uses them in four types of spending: investment, consumption, transfers, and pensions. The aggregate production function uses three inputs: labor, private capital, and public capital. The model calibration is based on Moroccan economic data for the period 2010-2020.

The analysis proceeds in two steps. In the first step, we explore the implications of taxation for fiscal revenues and output. First, we compute Laffer curves to have a picture of how fiscal revenues should behave as a function of the specific tax rates. Next, we quantify the distortionary effects of the current tax mix on the economy. We measure distortions created by each tax in terms of forgone output. Contrary to the common wisdom in the literature, we find that once public spending other than lump-sum transfer is taken into account, these distortions can be positive or negative. Consistent with the common wisdom, we find that distortions on output from labor income tax and capital income tax are negative. However, it is found that distortions on economic activity from the consumption tax rate

negative income effect, leading households to increase labor supply and reduce private consumption (for example, Aiyagari et al., 1992; Baxter and King, 1993). However, a number of empirical studies using estimated VAR models find that private consumption increases in response to a positive shock in government consumption (for instance, Blanchard and Perotti, 2002; and Perotti, 2007).

are positive, whereas distortions from the employer's social contributions are positive up to a threshold value for the tax rate of around 50% and then turn out negative. Finally, taking advantage of the substitutability/complementarity between different taxes, we calculate the combinations of taxes that can maximize both government revenues and output. An efficient tax mix requires either increasing taxes on labor income at the expense of capital income or increasing taxes on consumption at the expense of labor income.

In the second part of the paper, we study the welfare cost of fiscal policy. The welfare effects of taxes and government spending components are calculated for each group of agents. We calculate the change in consumption equivalents with respect to the baseline fiscal policy of changes in taxes and government spending. Given the different relationships between the two types of households with the government, the effects of a change in the fiscal policy on welfare are also alike. We find that total welfare can be increased by increasing the consumption tax rate, the labor income tax rate, or the employers' social security contributions. By contrast, the model predicts that the optimal capital income tax rate should be zero, a result usually found in the literature. On the spending side, we find that total social welfare can be increased by increasing transfers and public investment and reducing government consumption.

The rest of the paper is structured as follows. Section 2 presents the model economy with two main characteristics: i) a detailed government agent, and ii) the distinction between active and non-active households. Section 3 describes the data used and the calibration procedure. Section 4 quantifies the distortionary effects of different taxes and uses the Laffer curves to calculate the output-efficient tax mix. Section 5 calculates the welfare cost of fiscal policy and characterizes the optimal fiscal policy to maximize total social welfare. Finally, Section 6 gives some conclusions.

2. The model

We consider a perfect-foresight economy inhabited by two types of households: Active households and non-active government-dependent households. Active households are assumed to be Ricardian agents as they decide on consumption and saving, and on labor. Non-active government-dependent agents are assumed to be hand-to-mouth agents who do not supply labor and their consumption is equal to their income. In particular, we assume a continuum $h \in [0, 1]$ of households in which a fraction ω are non-active hand-to-mouth agents who do not save or work, thus consuming all of their income in each period. These agents are indexed $i \in [0, \omega]$. The remaining households are rational and forward-looking agents who save and invest in physical capital. They are indexed $j \in [\omega, 1]$. Effective consumption is a CES function of private and publicly provided goods and services. There is a representative firm producing final output with a three-input Cobb-Douglas production technology, renting labor and private capital services in competitive factor markets, and using public capital as an additional input at no direct cost. The firm sells its homogeneous product in a perfectly competitive good market. The third agent in this model economy is a detailed government. The government uses direct and indirect taxes to finance spending on government consumption, investment, lump-sum transfers, and pay-as-you-go pensions.

2.1. Households

The household sector has two types of agents: forward-looking Ricardian agents, and non-economically active agents. The active household refers to active workers contributing to the pension system, who form a fraction $(1-\omega)$ of the total population, while the non-active household includes agents whose income depends on the government. The first type of household is expected to maximize its intertemporal utility by choosing consumption, investment, and leisure. The net wealth of this agent comes from labor income, capital income, profits, and government transfers. By contrast, non-active households maximize their utility function under a static budget constraint where consumption is equal to income. All income of non-active households is provided by the government in the form of transfers and pensions.

2.1.1. Active households

Active households behave as standard Ricardian agents. They choose the optimal quantities of consumption, investment, and labor supply to maximize his/her discounted intertemporal utility. The intertemporal utility function to be maximized, U_j, is defined as follows,

$$U_j = \sum_{t=0}^{\infty} \beta^t E_0 \left(\frac{C_{j,t}^{1-\rho}}{1-\rho} - \phi \frac{L_{j,t}^{1+\psi}}{1+\psi} \right), \tag{1}$$

where E_0 is the expectation operator at time 0, $\beta \in (0,1)$ is the intertemporal discount factor, $C_{j,t}$ is effective consumption as a combination of private and public provided goods and services, $L_{j,t}$ is labor supply, and the parameters ϕ represents the willingness to work, ψ is the marginal disutility of labor, and ρ is the relative risk aversion. The effective consumption is a constant elasticity of substitution (CES) function on the private $(C_{j,p,t})$ and publicly provided $(C_{j,g,t})$ goods and services,

$$C_{j,t} = [\pi C_{j,p,t}^{v} + (1-\pi) C_{j,g,t}^{v}]^{\frac{1}{v}}, \tag{2}$$

where π is the CES distribution parameter representing the share of private consumption goods, and υ is a parameter driving the elasticity of substitution between private and publicly provided goods. The budget constraint is given by,

$$\begin{aligned}(1+\tau_t^c)\,C_{j,p,t}+K_{j,t+1} = W_t L_{j,t}\left(1-\tau_t^w-\tau_t^{ssw}\right)+\left[\left(1-\tau_t^k\right)R_t+1-(1-\tau_t^k)\delta_k\right]K_{j,t} \\ +Tr_{j,t}+\left(1-\tau_t^b\right)\Pi_t,\end{aligned} \tag{3}$$

where W_t is the wage, R_t return on capital, $K_{j,t}$ private capital stock, $Tr_{j,t}$ government transfers, Π_t the dividends received, τ_t^b the profit corporate tax, τ_t^c the consumption tax rate, τ_t^w the labor income tax, τ_t^{ssw} is the employees' social security contribution, τ_t^k is the capital income tax, and δ_k is the physical capital depreciation rate which it is tax-deductible. From the first-order conditions of the active household maximization problem, we derive the following equilibrium conditions:

$$(1+\tau_t^c)\phi L_{j,t}^{\psi}=\pi C_{j,t}^{1-\rho-\upsilon}\;C_{j,p,t}^{\upsilon-1}\;W_t(1-\tau_t^w-\tau_t^{ssw}), \tag{4}$$

$$\frac{(1+\tau_{t+1}^c)}{(1+\tau_t^c)}\frac{C_{j,t+1}^{\rho+\upsilon-1}\;C_{j,p,t+1}^{1-\upsilon}}{C_{j,t}^{\rho+\upsilon-1}C_{j,p,t}^{1-\upsilon}}\;=\;\beta\left[\left(1-\tau_t^k\right)R_t+1-(1-\tau_t^k)\delta_k\right]\cdot \tag{5}$$

The first equation illustrates the optimal labor supply, whereas the second shows the optimal consumption path (the Euler equation). Optimal labor supply is distorted by the consumption, labor income, and employees' social security contributions taxes, whereas the optimal investment decision in the steady state is only distorted by the capital income tax.

2.1.2. Non-active government-dependent agents

The second type of household represents the population whose income is fully provided by the government. The key characteristics of this type of household are that they do not work, they neither save, and their consumption is government-dependent. This fraction of the population is intended to represent retired and old people, the poor, the long-term unemployed, and other socially excluded people. These non-active agents are assumed to be hand-to-mouth agents. In each period, they entirely consume all of their income. As no labor is supplied, the only income for these agents comes from the government, in the form of pensions to retired workers or lump-sum transfers. Additionally, a fraction of their effective consumption is formed by goods and services provided by the government at no cost. Their effective consumption ($C_{i,t}$) is limited to the value of pension benefits received ($Z_{i,t}$), consumption of publicly provided goods ($C_{i,g,t}$), and government lump-sum transfers (Tr_i). Formally, effective consumption of non-active households is defined as,

$$C_{i,t}=\left[\pi C_{i,p,t}^{\upsilon}+(1-\pi)C_{i,g,t}^{\upsilon}\right]^{\frac{1}{\upsilon}}, \tag{6}$$

where $C_{i,p,t}$ is the private consumption and $C_{i,p,t}$ is consumption of publicly provided goods and services. The budget constraint is given by,

$$(1+\tau_t^c)\, C_{i,p,t} = Z_{i,t} + Tr_{i,t}. \tag{7}$$

where $Z_{i,t}$ are pensions. For simplicity, it is assumed that non-active households do not pay personal income taxes, except the consumption tax on their private consumption.

2.2. Firms

The productive sector of the economy is perfectly competitive and can be presented by a single firm producing an aggregate good for household consumption and investment. The problem for firms is to determine the optimal quantities of labor and capital given the production technology, assumed to be of the Cobb-Douglas type. The production of the final product, Y_t, requires labor services, L_t, private capital, $K_{p,t}$, and public capital, $K_{g,t}$. Taking factor prices as given, the firm rents the profit-maximizing capital and labor factors. Formally,

$$Y_t = A_t L_t^{\alpha_1} K_{p,t}^{\alpha_2} K_{g,t}^{\alpha_3}, \tag{8}$$

where α_1 is the elasticity of output to labor, α_2 is the elasticity of output to private capital, α_3 is the elasticity of output to public capital, and A_t is total factor productivity. We assume the existence of constant return to scale, and thus, $\alpha_1 + \alpha_2 + \alpha_3 = 1$.

Profits are defined as

$$\Pi_t = A_t L_t^{\alpha_1} K_{p,t}^{\alpha_2} K_{g,t}^{\alpha_3} - \left[\left(1+\tau_t^{ssf}\right) W_t L_t + R_t K_t\right]. \tag{9}$$

where τ_t^{ssf} is the employer's social security contribution. Profit maximization's first-order conditions are,

$$W_t L_t = \frac{\alpha_1 Y_t}{1+\tau_t^{ssf}}, \tag{10}$$

$$R_t K_{p,t} = \alpha_2 Y_t. \tag{11}$$

The contribution of public capital to final output leads to dividends to active households. Formally,

$$\Pi_t = \frac{\partial Y_t}{\partial K_{g,t}} = \alpha_3 \frac{Y_t}{K_{g,t}}. \tag{12}$$

2.3. The government

The government receives its tax revenue, T_t, from the six tax instruments: the consumption tax, the labor income tax, the capital income tax, the profit tax, and the social security contributions from both employees and employers. Fiscal revenues are,

$$T_t = \tau_t^c C_{p,t} + \left(\tau_t^w + \tau_t^{ssw} + \tau_t^{ssf}\right) W_t L_t + \tau_t^k (R_t - \delta_k) K_{p,t} + \tau_t^b \Pi_t. \quad (13)$$

It is assumed public balance period-by-period, where government spending, G_t, is equal to tax revenue. We distinguish between four categories of public spending: public investment ($I_{g,t}$), direct transfers (Tr_t), final consumption ($C_{g,t}$), and pensions (Z_t),

$$I_{g,t} = \theta_1 G_t, \quad (14)$$

$$Tr_t = \theta_2 G_t, \quad (15)$$

$$C_{g,t} = \theta_3 G_t, \quad (16)$$

$$Z_t = (1 - \theta_1 - \theta_2 - \theta_3)\, G_t, \quad (17)$$

where θ_1 is the share of public expenditure invested, θ_2 is the share of government spending transferred directly to households, and θ_3 is the share of public consumption. Finally, public capital accumulation is defined as follows,

$$K_{g,t+1} \;=\; (1 + \delta_g)\, K_{g,t} + I_{g,t}, \quad (18)$$

where δ_G is the depreciation rate of public capital.

Finally, it is assumed that both final government consumption and transfers are distributed between both active and non-active households in the fraction μ and ϕ, respectively.

2.3.1. Aggregation

Aggregate values for the economy are calculated as a weighted sum of the two types of households. The total private consumption of the economy is as follows:

$$C_{p,t} = \omega C_{i,p,t} + (1 - \omega) C_{j,p,t}, \quad (19)$$

Similarly for total private investment ($I_{p,t}$), labor (L_t) private capital ($K_{p,t}$), and dividends received (Π_t),

$$I_{p,t} = (1 - \omega) I_{j,t}, \quad (20)$$

$$L_t = (1 - \omega) L_{j,t}, \quad (21)$$

$$K_{p,t} = (1-\omega)K_{j,t}, \tag{22}$$

$$\Pi_t = (1-\omega)\Pi_{j,t}. \tag{23}$$

Aggregation of variables of the government is:

$$Tr_t = \omega Tr_{i,t} + (1-\omega)Tr_{j,t}, \tag{24}$$

$$C_{g,t} = \omega C_{i,g,t} + (1-\omega)C_{j,g,t}, \tag{25}$$

$$Z_t = \omega Z_{j,t}. \tag{26}$$

2.4. Feasibility condition

To close the model, we present the feasibility constraint for the overall economy as the sump of total (private and public) consumption and total investment:

$$Y_t = C_{P,t} + C_{G,t} + I_{P,t} + I_{G,t}. \tag{27}$$

3. Calibration

We calibrate the parameters of the model to match some key target ratios for the Morocco economy. The discount factor is chosen to represent an annual real interest rate of 3%, which corresponds to a discount factor of 0.97 approximately. The parameter representing the relative risk aversion is calibrated based on Krusell et al. (1996), who estimate a value of 2 using data for OECD countries. The same value was set for the Eurozone by Bechimol (2014). According to Lambert and Larcker (1987), this coefficient lays between 0.5 and 4, although a number of authors assume a logarithmic utility in consumption, which means that $\rho = 1$. We use an average value from the literature and fix $\rho = 1.9$. The inverse of the Frisch labor elasticity is fixed to be 0.72 according to Heathcote et al. (2010). The parameter of willingness to work is calibrated internally to produce a fraction of working hours of 0.34, resulting in a value of $\phi = 4.0$.

The technological parameter for the output-labor elasticity is calibrated using labor share data from Penn World Table (version 10.0). We use the average value for the period 2010-2019, resulting in $\alpha_1 = 0.494$. As we assume constant returns to scale, that means that $\alpha_2 + \alpha_3 = 0.506$. The literature has estimated the technological parameter for the output-public capital elasticity. Aschauer (1989) and Munnell (1990) estimate values of the public capital share of 0.39 and 0.34, respectively. However, Aaron (1990) and Tatom (1991) obtain estimates that are not statistically different from zero. Cassou (1998) considers a range of values between 0.1 and 0.123. A tentative distribution would be $\alpha_3 = 0.08$, and hence, $\alpha_2 = 0.416$.

The proportion of the hand-to-mouth population has been calculated as the fraction of the population non-active over the total population. In 2019, people aged over 60 accounted for 11.7 percent of the total population, that is, 4.3 million people. The non-active population between 17 and 60 is about 3 million people, including young people in NEET (No Education, Employment, and Training), and the informally active population aged less than 17 is 0.1 million people. Since the population aged over 16 is 27 million people, the proportion of the non-active population, ω, is fixed at 0.2725.

To calculate the average effective consumption tax rate we proceed as follows. We use data from OECD (2021) to calibrate the tax revenues to output ratio (T/Y), resulting in a value of 0.278 for the year 2019. Fiscal revenues from the consumption tax, T_c, are defined as $T_c = \tau^c \times C$. From *Ministère de l'Economie et des Finances*, for the year 2019, the average total fiscal revenues are 238,244.5 million DH, whereas fiscal revenues from indirect taxes are 117,598.9 million DH, revenues from import taxes are 9,767.6 million DH, and fiscal revenues from *"Registration and Stamp"* are 15,115.0 million DH. We consider indirect taxes, import taxes, and excises as part of the consumption tax, and hence, total fiscal revenues from the consumption taxes are 142,281.5 for the year 2019. The consumption output ratio for the year 2019 is $C/Y = 0.7665$. Therefore, we can define $C = (0.7665 \times T)/0.278$. Given that $\tau^c = T_c/C$, it results that $\tau^c = (0.278 \times T_c)/(0.7665 \times T)$. Given that $T_c/T = 142,281.5/238,244.5 = 0.598$, the average effective consumption tax rate is 0.217. We apply this procedure for the period 2010-2019, resulting in an average effective consumption tax rate for that period of 0.224. The estimated figure is not so different from the standard VAT rate of 20%.

Direct taxes are 0.402 of total tax revenues. For calibrating the average effective labor income tax we use the same procedure. We take the average of the compensation of employees to GDP ratio for the period 2010-2019, $(W \times L)/Y = 0.494$. Using data for *"Income tax revenues"*, the value for the labor income tax rate is fixed to be 0.075. The corporate tax rate in Morocco depends on the taxable income (profits): Up to 300,000 DH, the tax rate is 10%, from 300,000 to 1 million DH, the tax rate is 20%, and above one million DH the tax rate is 31%, except for credit institutions and insurance companies which are taxed at a 37%. Additionally, the professional tax ranges between 10% and 30%. Given these figures, we assume an average tax rate of 0.2 for the profits tax rate. This is the same figure that the tax rate for capital income. Finally, the social security contributions rate, according to the data, is 0.2716. This rate is split between employers and employees, with rates of 0.2071 and 0.0645, respectively.

Total government spending is divided into four components: Public investment, transfers, public consumption, and pensions. The share of public investment over total government spending is fixed at 22.50%, 58.10% for final consumption, whereas transfers represent 12.83%, the rest accounting for pensions. The share of consumption goods between the private and public sectors (π) is deduced from disaggregated data on total consumption, for the period 2010-2020, and set to 0.752. The data for calibrating the parameter ϕ and μ are not unavailable, and for the baseline calibration, we use a value of 0.5. Total factor productivity (A) is normalized to one in the steady state.

The elasticity of substitution between private and publicly provided goods and services (σ) is a key parameter in assessing the effects of fiscal policy. However, in the literature, only a few papers have considered the role of publicly provided goods in dynamic general equilibrium models, where the spending side of the government is rather too simplistic and limited to lump-sum transfers in most cases. The empirical literature has estimated the elasticity of substitution between private and public consumption for different countries. Amano and Wirjanto (1997) estimate an intratemporal elasticity of substitution between private and government consumption of 0.9 for the US. Chiu (2001) estimates a value of 1.2 for the intratemporal substitution between private consumption and government spending in Taiwan. Bouakez and Rebei (2007) use three alternative values for the intratemporal elasticity of substitution between private and public spending: 1, 0.45, and 0.25, and estimate a value of 0.33 for the US, much lower than the estimated value by Amano and Wirjanto (1997). Brown and Wells (2008) estimate the elasticity of substitution for Australia in the range from 0.09 to 0.17. Finally, Dawood and Francois (2018) estimate the intratemporal elasticity of substitution between private and government consumption for 24 African countries, including Morocco, obtaining significant values for 13 countries. They find that the elasticity of substitution is less than unity for 12 out of 13 countries, with estimated values in the range between 0.26 for Madagascar to 0.92 in Morocco. Excluding the estimation of Chiu (2001) of an elasticity of substitution larger than one, the rest of estimations are in the range of 0.09 to 0.92. Given these figures, for the baseline calibration, we choose a value of 0.9 (which corresponds to $\upsilon = -0.11$). Table 1 shows the values of the calibrated parameters.

Table 1: Calibrated parameters values

Parameter	Definition	Value
τ^c	Consumption tax rate	0.224
τ^ℓ	Labor income tax rate	0.075
τ^{ssh}	Employees social contributions rate	0.065
τ^{ssf}	Employers social contributions rate	0.207
τ^k	Capital income tax rate	0.200
τ^b	Profits tax rate	0.200
δ_k	Private capital depreciation rate	0.070
δ_g	Public capital depreciation rate	0.050
β	Discount factor	0.970
ρ	Relative risk aversion	1.900
ψ	Inverse of the Frisch elasticity	1.389
ϕ_R	active households transfers share	0.500
α_1	Labor income share	0.494
α_2	Private capital income share	0.416
α_3	Public capital income share	0.080
θ_1	Public investment	0.225
θ_2	Transfers	0.128
θ_3	Public consumption	0.581
ϕ	Willingness to work	4.000
ϖ	Fraction of non-active households	0.272
π	Share of private consumption goods	0.752
μ	Sharing of public consumption between populations	0.500
σ	Private-public goods elasticity of substitution	0.900
A	Total factor productivity	1.000

4. Taxes

We start the analysis by focusing on the government revenue side. Nevertheless, we should keep in mind that the effects of the tax mix are not independent of how the government spends raised revenues. First, we compute uni-dimensional Laffer curves for each tax rate. Second, we quantify the distortionary effects on economic activity from each tax. Finally, we calculate bi-dimensional Laffer curves to investigate how the tax mix can be changed, by substituting one tax with another, while keeping constant fiscal revenues and minimizing distortions on steady-state output.

4.1. Uni-dimensional Laffer curves

First, we use the calibrated model to assess the relationship between individual tax rates and fiscal revenues, building up the so-called Laffer curve. Laffer (2004) establishes a bell-shaped relationship between the tax rate and tax revenue: for low values of the tax rate tax revenues are also low. As the tax rate increases, also revenues increase, with the elasticity of revenues to the tax rate lower than one. For a high enough tax rate, tax revenues eventually reach a maximum. Further increase in the tax rate reduces revenues. The idea of a Laffer curve was originally developed by Ibn Khaldun (1377).[2]

Structural estimations of the Laffer curves using dynamic general equilibrium models have been done by Trabandt and Uhlig (2011) and Fernández-de-Córdoba and Torres (2012). Trabandt and Uhlig (2011) characterized Laffer curves for the taxation of labor and capital income for the United States, the EU-14, and individual European countries, proving that the United States (EU-14) can increase tax revenues by 30% (8%) by increasing taxes on labor and by 6% (1%) by increasing taxes on capital income. Fernández-de-Córdoba and Torres (2012) obtained similar findings for the EU-15 countries, further indicating that i) European countries can benefit from efficiency gains by increasing taxes on labor at the expense of taxes on capital, and ii) harmonizing taxes on capital at the average capital tax rate will not have a significant effect on tax revenues but, at the same time, will lead to important output results.

We follow these previous works and calculate the steady-state relationship between a range of values of each tax rate and the corresponding total fiscal revenues. Figure 1 presents the estimated Laffer curves for four tax rates in the case of Morocco: consumption tax, labor income payroll tax, capital income, and employer's social contributions. We define the labor income payroll tax, τ^l as the sum of the labor income tax, τ^w, and the employees' social contributions, τ^{ssw}. Given the baseline position of the economy along the Laffer curves (represented by a circle), it is easy to identify the relative position of current tax policy relative to the one that maximizes tax revenues. Three key results can be derived from the inspections of the plots for the different taxes. First, indirect (consumption) tax and social contributions show a positive and concave relationship between the tax rate and the tax

[2] Ibn Khaldun lived between the years 1332 and 1406 and he was the Ministry of Finance of Tunisia. He wrote a book, "The Muqaddimah" published in 1377, including several contributions to economic analysis and the role of the government in the economy (see Boulakia, 1971).

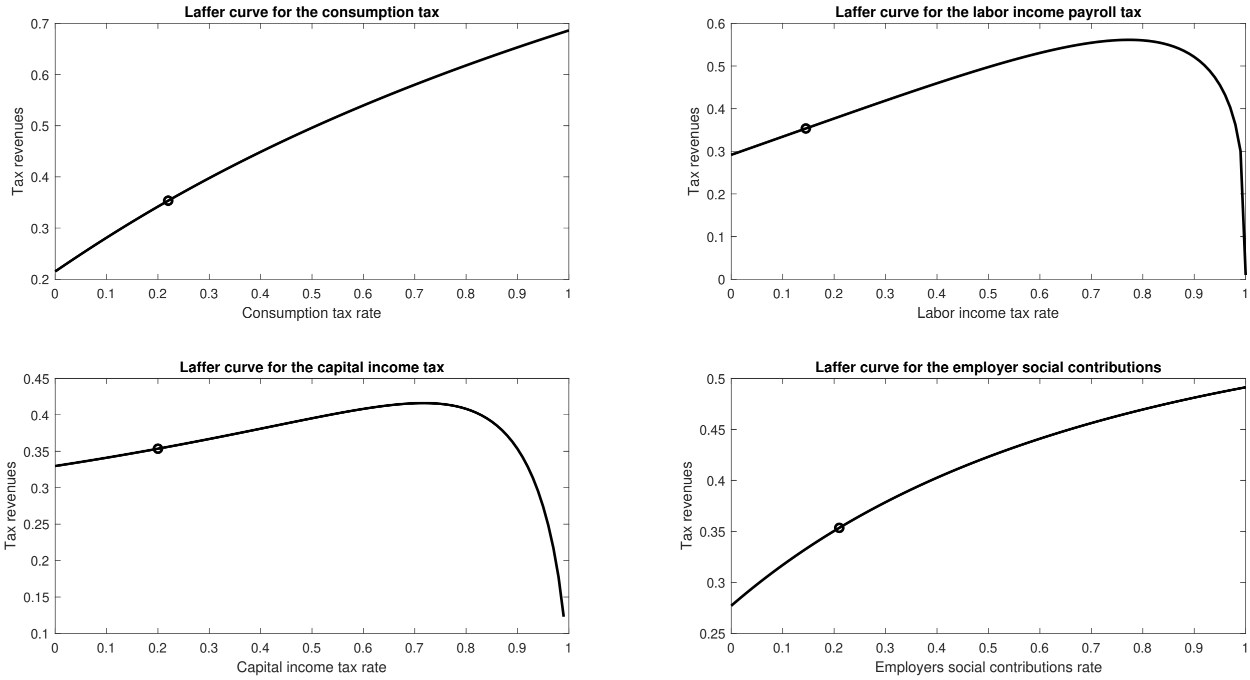

Figure 1: This figure shows the Laffer curves for the consumption tax, the labor income payroll tax (including employee's social contributions), the capital income tax, and the employer's social contribution. The curves present the steady-state tax revenues for tax rates between 0 and 1. The circles represent the combination of the baseline tax rates and the corresponding tax revenues.

revenue for all the range of the tax rates. For these two tax rates, we select a range of values between 0 and 1, but in practice, there is no upper limit for these rates. Increasing these two tax rates always increase fiscal revenues. Second, for the labor income payroll tax and the capital income tax, we find the standard Laffer curve, with a maximum. For most of the range of values for the tax rates, the slope of the curve is positive, reaching the maximum for very high rates. For the labor income payroll tax, the maximum corresponds to a tax rate of 0.77, similarly to the capital tax rate that produces the maximum fiscal revenues (of 0.72). This means that there is also significant room for increasing fiscal revenues by increasing these tax rates. Third, fiscal revenues are more sensitive to the labor income payroll tax, a steeper Laffer curve, than to the capital income tax. Indeed, fiscal revenues can be increased by a maximum of 59% using the labor income payroll tax, and by a maximum of 17.7% by using the capital income tax.

4.2. The distortionary cost of taxation

Next, we quantify the distortionary effects of the current tax menu produced by the different taxes. It is well known, see for instance McGrattan (1994), that tax rates other than lump-sum taxes produce distortions in the economy, as they affect the optimal behavior of economic agents. Even if taxes improve allocation, they produce harmful effects on consumption-saving and consumption-leisure decisions by households, affecting the quantity of inputs, and thus, final output. Here, we measure distortions created by each tax in terms of forgone output. For that, we compute the steady-state output of the economy for a range of values of the tax rates.

We find that, once the different components of public spending are taken into account, the cost of the distortion from a particular tax can be positive or negative, depending on how tax revenues are expended in the economy and on the particular tax instrument. This is a consequence of the fact that distortions from the different taxes are also distinct. In particular, the introduction of public inputs is crucial for the final cost of taxes distortions. In a standard neoclassical model with a government, where lump-sum transfers are considered the only source of public spending, distortions from direct or indirect taxes are always negative, reducing economic activity as the tax rate increases. However, the model developed here considers other types of public spending, such as physical capital formation, which increase with fiscal revenues and have a positive impact on productivity, and thus, economic activity.

Figure 2 plots the distortions produced by each tax by showing the steady-state output for each tax rate. The relationship between output and tax rates varies depending on the tax. We find that distortions from the consumption tax are positive, increasing steady-state output as the consumption tax increases. This positive distortion is explained by the positive effect of public spending on economic activity which compensates for the negative distortionary effect of this tax rate on labor supply. Comparing the current consumption tax rate with a regime with a zero consumption tax, we find that output gains from this tax are 5.57%. This high output gain derives from the fact that negative distortions from a consumption tax are relatively low and that positive effects of these revenues are spent following the current distribution of total government spending across components. Negative distortions by the labor income tax are small, causing an output loss of -0.25%. This output loss is even larger if the total labor payroll tax is considered, as a fraction of social security contributions is paid by the employees. In this case, output loss is off -0.34%. The higher cost of taxation comes from the capital income tax. Output loss by this tax is estimated

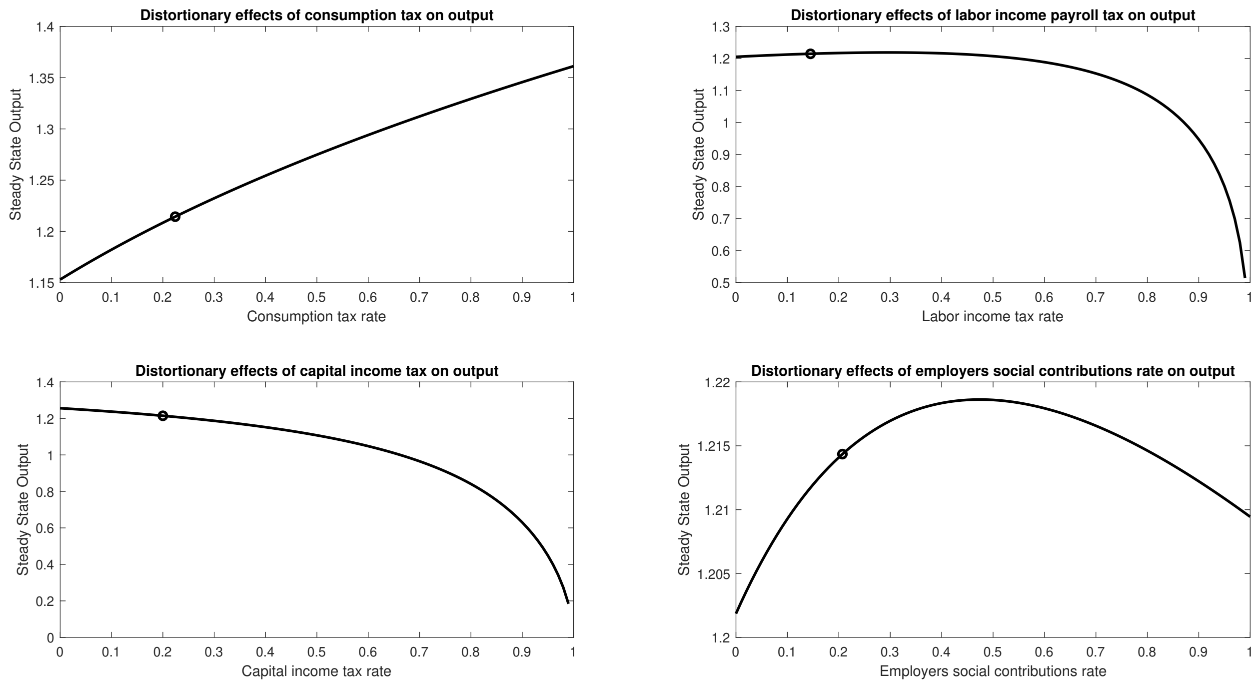

Figure 2: This figure illustrates how steady-state output reacts to different values of the tax rates. The baseline steady-state output for each tax rate is indicated by a circle.

to be -4.08%. Finally, for employers' social contributions we also find a positive effect on output, although close to zero (an output gain of 0.09%). Interestingly, for this tax rate, we find a hump-shaped effect, increasing output for initial values of the tax rate starting from zero. Positive distortions from the employers' social contributions are obtained up to a rate of 0.43-0.48%. Overall, we find that distortions measured as output losses of the current tax menu of Morocco are close to zero, and even they are positive, with a net balance of an output gain of 1.24%.

Two simple prescriptions for the optimal tax mix are derived from the results plotted in Figure 2. First, the capital income tax rate should be zero. Any value of the capital income tax above zero reduces output. This is not surprising and in the literate several authors argue that the optimal capital income tax should be zero. Even if a given fraction of fiscal revenues is devoted to capital accumulation, distortions from the capital income tax are always negative. Second, both consumption tax and employers' social contributions should be increased. By increasing these two taxes, both fiscal revenues and output increase. Notice that these two taxes represent an over-priced. In the case of the consumption tax, the tax is an over-price over the price of final goods and services. In the case of the employer's social security contributions, the tax is an over-price over gross labor cost for the firm. For both taxes, we find that the productivity effect from the provision of public inputs is larger than the distortionary effects of these taxes on labor supply. Therefore, there is room for changing the tax mix, by increasing indirect taxes and reducing direct taxes, while keeping constant fiscal revenues and increasing output. We explore this possibility in the next section.

4.3. Bi-dimensional Laffer curves and the efficient tax menu

Next, we study the output-efficiency of the tax mix. For that, we build bi-dimensional laffer curves as the combination of taxes two-by-two that produce a particular level of fiscal revenues. Presumably, different combinations of taxes that produce the same level of fiscal revenues can result in different levels of output. Therefore, fiscal authorities have the option to choose the combination of taxes that maximizes output without affecting tax revenues. In fact, some previous studies have performed optimality analysis assuming some degree of substitutability/complementarity between tax instruments. For example, F-de-Córdoba and Torres (2012) calculate Laffer curves linking simultaneously labor and capital income taxes for a number of European countries and determine which combination of the tax rates leading to the same level of fiscal revenues produces the lower distortions and is the more output-efficient.

Here, we carry on a similar exercise and calculate the iso-revenue curves for each pair of taxes: $(\tau^l;\ \tau^k)$, $(\tau^c;\ \tau^l)$, $(\tau^c;\ \tau^k)$,and $(\tau^c;\ \tau^{ssf})$, and the comparison with the iso-output curves, i.e., the combination of taxes that produces the same distortions and results in the same level of output. We investigate which tax mix leads to the maximum output at the same time that maximizes fiscal revenues. Results are shown in Figures 3-6. Technically, it consists of calculating the tangent point between the current iso-revenue curve corresponding to the baseline tax mix and the higher iso-output curve. This analysis gives us two insights. First, is the possibility of substituting one tax with another without affecting fiscal revenues. And second, we can determine the combination of taxes that produces the lower level of distortions on economic activity by choosing the efficient tax menu defined as the combination of taxes that maximizes output.

Figure 3 represents all pairs (τ^l, τ^k) that produce identical levels of tax revenue (thin curves) and output (thick curves), which levels are expressed relative to the baseline level normalized to 1. The maximum revenue that these taxes can produce (the maximum of the bi-dimensional Laffer curve) exceeds the current level by about 67%, using a mix of $(\tau^l = 0.77;\ \tau^k = 0.60)$. Two interesting results appear in this figure. First, the maximum

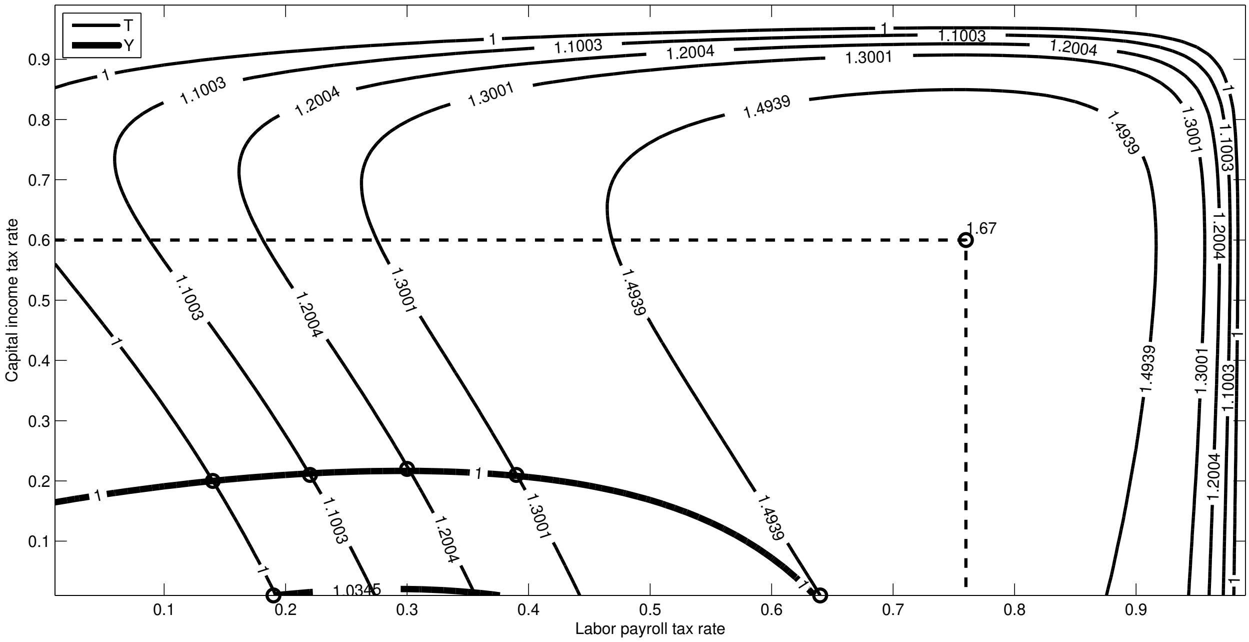

Figure 3: This figure shows iso-revenue curves (thin curves) for the combination of labor payroll tax rates and capital income tax rates that produces the same level of fiscal revenues. Iso-output curves (thick curves) represent the combination of the two tax rates that produce the same level of output. The values on the curves represent the values of fiscal revenues and output, where the baseline value has been normalized to 1. The baseline combination of fiscal revenues and output is presented by the point at which the iso-revenue for a level of 1 crosses the iso-output curve for that value. The baseline iso-output curve crosses a number of iso-revenues curves, representing combinations of the two taxes that lead to the same level of output and produce different levels of fiscal revenues. It is also plotted the iso-output curve tangents to the baseline iso-revenue curve. The tangent point corresponds to a tax mix of $\left(\tau^{\ell} = 0.19,\ \tau^{k} = 0.0\right)$ with an output increase of 3.45%.

level of tax revenue corresponds to high values of tax rates that are far from current values. Thus, given the current level of taxation and if the government wishes to increase tax revenues, there is much space to increase the tax rates on capital and labor. Second, the iso-output curve for the current tax mix is almost flat, indicating that fiscal revenues can be increased by increasing the labor payroll tax without negatively affecting output. The higher iso-output curve corresponds to a tax mix of ($\tau^l = 0.19$; $\tau^k = 0.00$). For this combination of taxes, that is, increasing the labor payroll tax and eliminating the capital income tax, the output shall increase by 3.45%.

Figure 4 repeats the analysis for the combination of the consumption tax and the labor income payroll tax. Again, output gains can be obtained by changing the combination of the tax rates while keeping constant fiscal revenues. Similarly, fiscal authorities can increase tax revenues without affecting output. For instance, moving to ($\tau^c = 0.21; \tau^l = 0.27$), that is, reducing the consumption tax and increasing the labor payroll tax, has no effect on economic activity, but increases tax revenue by 10%; choosing the combination ($\tau^c = 0.21; \tau^l = 0.33$) increases tax revenues by 20%; and choosing ($\tau^c = 0.22; \tau^l = 0.41$) will increase tax revenue by 30% without impacting output. A small positive change in consumption tax combined with a large positive (negative) change in labor payroll tax will eventually have negative (positive) effects on economic activity, aside from the positive effects on government revenue. The map of iso-revenues curves does not show any maximum for fiscal revenues, which is explained by the positive relationship between tax revenue and the consumption tax rate. In terms of output efficiency, the combination of iso-revenues and iso-output curves recommends the strategy of increasing the consumption tax rate and eliminating the labor payroll tax. The iso-output tangents to the baseline iso-revenue-curve correspond to a combination of taxes of ($\tau^c = 0.32; \tau^l = 0$), leading to an increase of 1.3%)of output. In other words, increasing the consumption tax without changing the labor payroll tax would increase both output and fiscal revenues as shown by the map of iso-revenue and iso-output curves.

Figure 5 plots the iso-revenues and iso-output curves for the combination of the consumption tax and the capital income tax. Again, we observe how the baseline point is not maximizing output (or minimizing distortion on economic activity), given that changing the baseline tax rates output gains can be obtained. The iso-revenue map indicates that fiscal revenues shall increase by increasing the consumption tax rate in a relatively small quantity compared to the capital income tax. For a very high capital income tax, the iso-revenue curve is almost horizontal, indicating that even increasing the consumption tax by a large amount, fiscal revenues would remain almost constant. This result is explained by the fact that for high enough capital income tax, steady-state output and consumption are almost zero, and little additional tax revenues can be produced by increasing the consumption tax rate. Additionally, the iso-output curves are quite flat, indicating that the capital income tax has harmful effects on economic activity, as shown previously. In particular, moving to a combination $\tau^c = 0.26; \tau^k = 0.00$), the output would increase in a 4.1%, keeping constant tax revenues. Therefore, by increasing in a small quantity the consumption tax rate (in less than 400 basic points) and eliminating the capital income tax significant output gains can be obtained. Alternatively, tax revenues can be increased by increasing both taxes without affecting output.

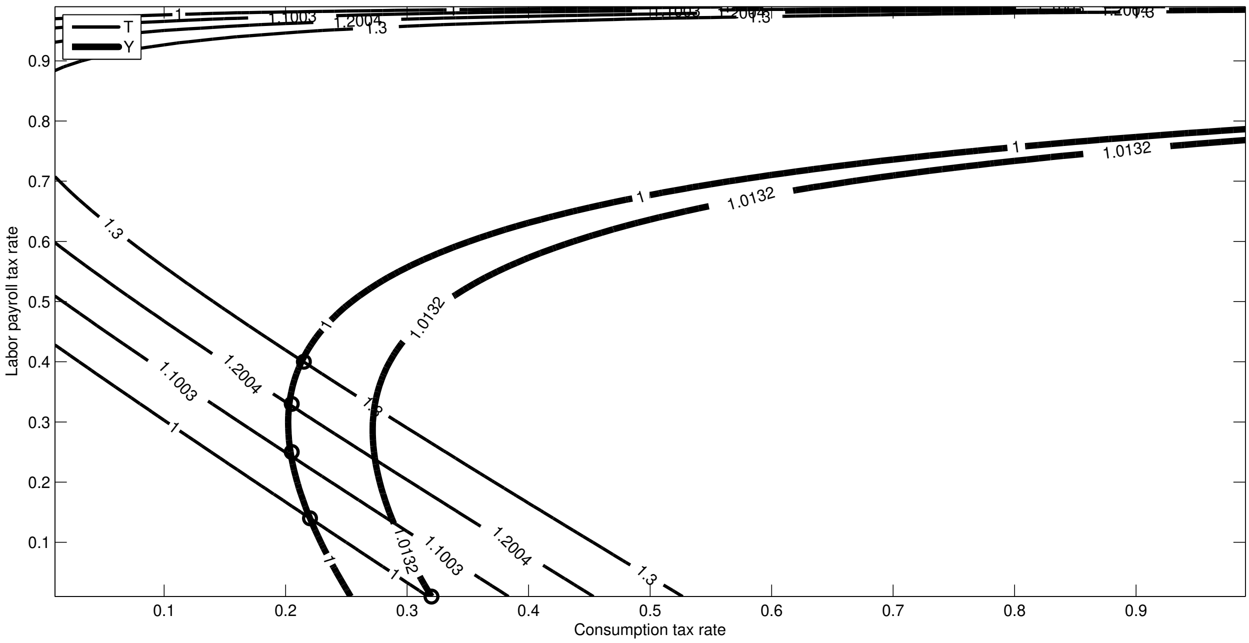

Figure 4: This figure shows iso-revenue curves (thin curves) for the combination of the consumption tax and the labor payroll tax that produces the same level of fiscal revenues. Iso-output curves (thick curves) represent the combination of the two tax rates that produce the same level of output. The values on the curves represent the values of fiscal revenues and output, where the baseline value has been normalized to 1. The baseline combination of fiscal revenues and output is presented by the point at which the iso-revenue for a level of 1 crosses the iso-output curve for that value. The baseline iso-output curve crosses a number of iso-revenues curves, representing combinations of the two taxes that lead to the same level of output and produce different levels of fiscal revenues. It is also plotted the iso-output curve tangents to the baseline iso-revenue curve. The tangent point corresponds to a tax mix of ($\tau^c = 0.32,\ \tau^w = 0.0$) with an output increase of 1.32%.

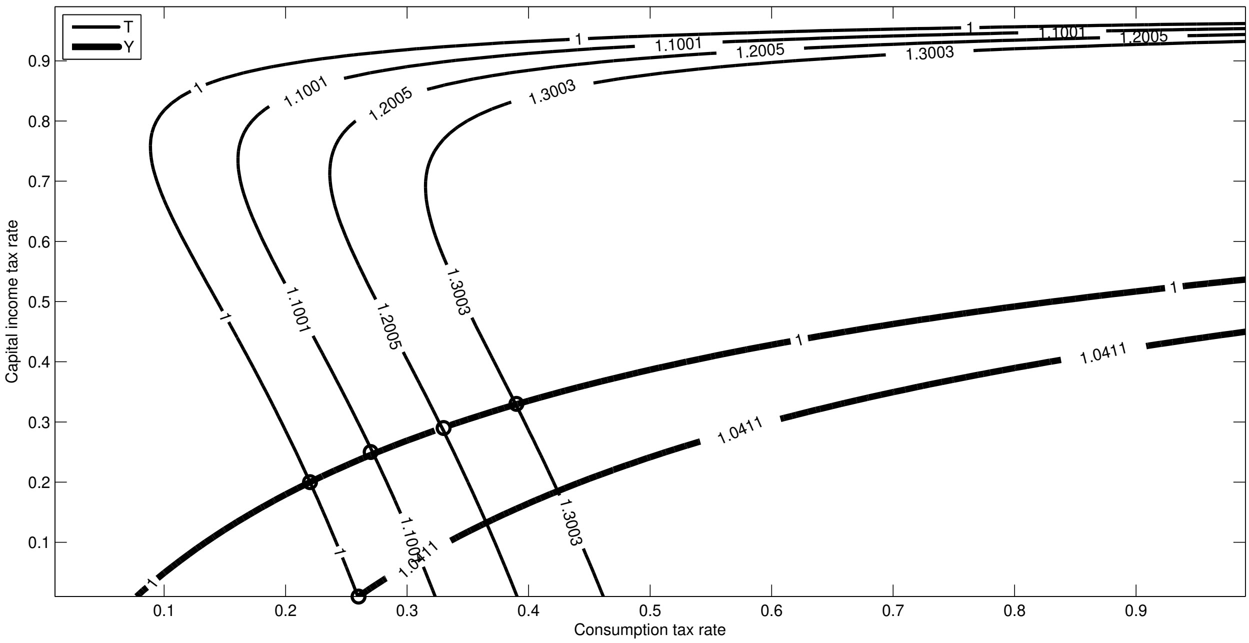

Figure 5: This figure shows iso-revenue curves (thin curves) for the combination of the consumption tax and capital income tax rates that produces the same level of fiscal revenues. Iso-output curves (thick curves) represent the combination of the two tax rates that produce the same level of output. The values on the curves represent the values of fiscal revenues and output, where the baseline value has been normalized to 1. The baseline is presented by the point at which the iso-revenue for a level of 1 crosses the iso-output curve for that value. The baseline iso-output curve crosses a number of iso-revenues curves, representing combinations of the two taxes that lead to the same level of output and produce different levels of fiscal revenues: $\left(\tau^c = 0.224,\ \tau^k = 0.20\right)$. It is also plotted the iso-output curve tangents to the baseline iso-revenue curve. The tangent point corresponds to a tax mix of $\left(\tau^c = 0.26,\ \tau^k = 0.00\right)$ with an output increase of 4.11%.

Finally, Figure 6 presents the same exercise based on the consumption tax and the employers' social contributions. The iso-revenue curves are decreasing and convex, while iso-output curves are very steeper, contrary to previous results. This means that output is not sensitive to the employer's social contributions rate and that for a given employer's social contribution rate both fiscal revenues and output can be increased by raising the consumption tax rate. Again, we find that output can be expanded by increasing the consumption tax rate and reducing the employers' social contributions. For example, choosing a combination ($\tau^c = 0.3; \tau^{ssf} = 0.25$) shall increase output by 10%, 20% by choosing ($\tau^c = 0.37; \tau^{ssf} = 0.29$), and 30% by choosing ($\tau^c = 0.44; \tau^{ssf} = 0.34$). The output-efficient combination of these two taxes is to increase the consumption tax to 0.35 and eliminate the employers' social contributions. This new combination of these two taxes would increase output by 1.65% keeping constant fiscal revenues.

The results demonstrate that in order to maximize production efficiency, the fiscal authorities have several options. They can replace either the capital income tax with the labor income payroll tax, the labor payroll and the capital income taxes with the consumption tax, or increase the consumption tax at the expense of the employer's social contribution rate. Therefore, there are a number of combinations of different taxes that can be used to increase output while keeping constant fiscal revenues. Furthermore, it is possible to identify combinations of taxes such as both fiscal revenues and output would be higher compared to the baseline.

5. The welfare cost of fiscal policy

Indirect and direct taxes are distortionary as they affect the optimal decisions of economic agents. On the other hand, public spending also distorts agents' optimal decisions, depending on the type of public expenditure. The final effect will depend on how distortions from taxes and distortions from public spending interact. Additionally, how the effects of taxes and public spending are distributed among different social groups, depends on how redistribution aspects are accounted for in the implementation of the fiscal policy.

The question we investigate here is how changes in fiscal policy affect the social welfare of both active and non-active groups. Total social welfare is defined as a weighted sum of each group's welfare. For that, we compare households' utility in the baseline situation (the steady state given the current tax mix and the structure of public spending), with utility from an economy with an alternative fiscal policy. Utility for active agents in the baseline

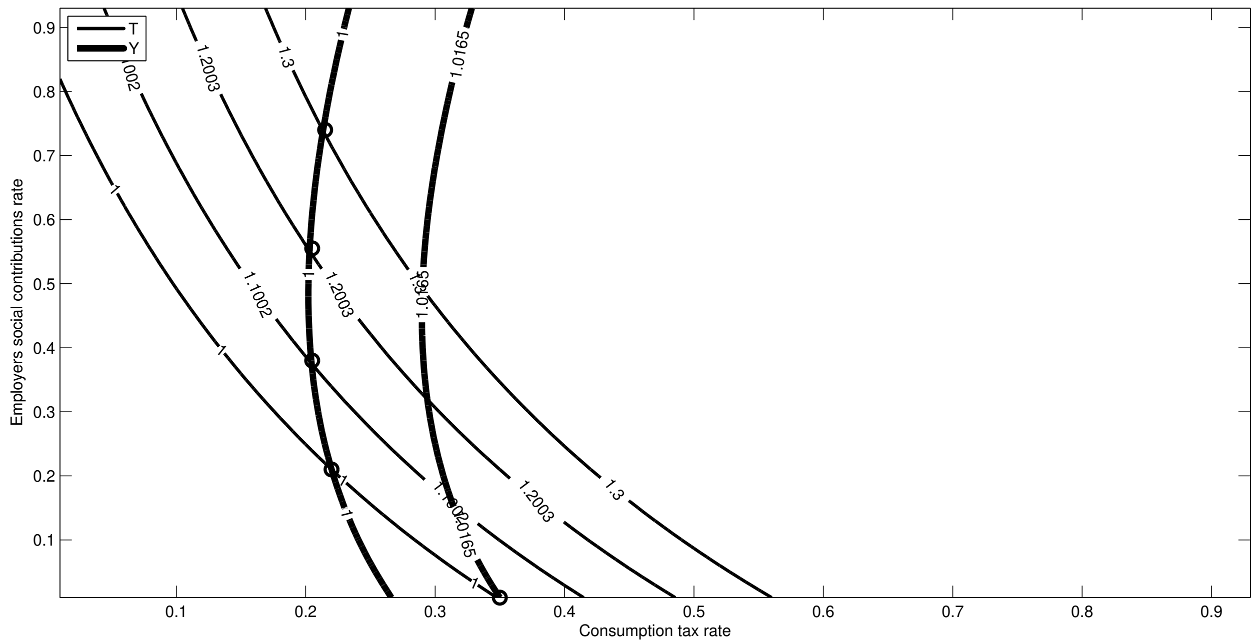

Figure 6: This figure shows iso-revenue curves (thin curves) for the combination of labor payroll tax rates and capital income tax rates that produces the same level of fiscal revenues. Iso-output curves (thick curves) represent the combination of the two tax rates that produce the same level of output. The values on the curves represent the values of fiscal revenues and output, where the baseline value has been normalized to 1. The baseline is presented by the point at which the iso-revenue for a level of 1 crosses the iso-output curve for that value. The baseline iso-output curve crosses a number of iso-revenues curves, representing combinations of the two taxes that lead to the same level of output and produce different levels of fiscal revenues. It is also plotted the iso-output curve tangents to the baseline iso-revenue curve. The tangent point corresponds to a tax mix of $\left(\tau^c = 0.35,\ \tau^{ssf} = 0.0\right)$ with an output increase of 1.65%.

steady state is defined as,

$$\sum_{t=0}^{\infty} \beta^t U^a(C_a^*, L_a^*, \tau^*, G^*) = \frac{1}{1-\beta} U^R(C_a^*, L_a^*, \tau^*, G^*) \tag{28}$$

where $U^a(C_a, 1-L, \tau^*, G^*)$ denotes utility with the current fiscal policy. For the non-active agents, steady state utility is defined as,

$$\sum_{t=0}^{\infty} \beta^t U^{na}(C_{na}^*, \tau^*, G^*) = \frac{1}{1-\beta} U^{NR}(C_{na}^*, \tau^*, G^*) \tag{29}$$

We measure the cost of fiscal policy in consumption equivalent variation, that is, we calculate how many percentage points we would have to increase or decrease the consumption of a household living in the steady state for an alternative fiscal policy, so as to make the household as well off as a household living in a world without any change in the fiscal policy. We do that by solving the following equations,

$$U^a((1+\Delta_a)C_a, L_a, \tau, G) = U^a(C_a^*, L_a^*, \tau^*, G^*) \tag{30}$$

$$U^{na}((1+\Delta_{na})C_{na}, \tau, G) = U^{na}(C_{na}^*, \tau^*, G^*) \tag{31}$$

where $\Delta \lesseqgtr 0$ represents the change (positive or negative) in consumption for each type of agent. Total welfare is defined as:

$$U = \omega U^{na} + (1-\omega) U^a \tag{32}$$

5.1. Tax policies

Figures 7-10 represent how welfare for each group of agents and the total social welfare responses to different tax rates. Figure 7 presents welfare, measured as consumption equivalent, as a function of the consumption tax rate. The circle in the curve represents the baseline consumption tax rate, corresponding to a zero welfare change. Positive values represent welfare gains whereas negative values represent welfare losses. It is observed that welfare for active households shows a hum-shaped relationship and, somewhat surprisingly, with the baseline consumption tax rate positioned left to the maximum. This means that it is possible to obtain welfare gains for active households by increasing the consumption tax rate. In particular, the maximum welfare corresponds with a consumption tax rate of 0.30%. However, this higher consumption tax rate would increase the welfare of active households by a mere 0.33%. By contrast, the relationship between welfare and the consumption tax rate is always positive for non-active households with no limit for the optimal consumption tax rate. This is a direct consequence of the gains in consumption by these agents as the government increases fiscal revenues. Thus, the higher the consumption tax rate, the higher government spending, and the larger the non-active household's welfare. The plot on the right shows the relationship between total welfare and the consumption tax rate. In this case, we obtain a hump-shaped relationship. From this figure, we find that the optimal consumption tax rate that maximizes social welfare, all other things equal, is 0.58, well above the current tax rate. This high optimal consumption tax rate is a direct consequence of the high fraction of non-active households. Total welfare would increase a 4.84%. The policy recommendation derived from these results is clear: Morocco should increase the consumption tax rate, as a policy for increasing output efficiency, fiscal revenues, and welfare.

The same exercise was done for the labor payroll tax as shown in Figure 8, for the capital income tax shown in Figure 9, and for the employer's payroll tax rate shown in Figure 10, respectively. Figure 8 plots the results for the labor income payroll tax rate. As expected, this tax rate has a negative impact on the welfare of active households, except for low enough values of this tax. We find a maximum for a labor income payroll tax rate of 0.1, but welfare gains from choosing that rate are insignificant. For the non-active households, we find a hump-shaped relationship. For most of the range of the values of this tax the relationship is positive, that is, the higher the tax rate the higher the welfare. However, for a large enough labor income payroll tax, the relationship turns out negative. This is explained by the fact that a very high labor income payroll tax rate significantly reduces labor supply and final output, reducing fiscal revenues. Given that consumption of non-active households fully depends on public spending, this leads to welfare losses for this group. The optimal labor income payroll tax rate for non-active households is 0.77, resulting in a gain of the welfare of 58.5% for this group of agents. The relationship between total welfare and the labor payroll tax is also hump-shaped. Total welfare reaches a maximum for a labor income payroll tax of 0.47. Therefore, other things equal, welfare gains up to 5.1% can be obtained by increasing the labor income tax rate. This optimal labor income payroll tax would be much lower in the case the fiscal authorities decide to increase the consumption tax rate.

Results for the capital income tax are pretty similar, as shown by Figure 9. For active households, the optimal capital income tax rate should be zero with a welfare gain of 1.8%. As the capital income tax rate increase, the welfare of this group reduces. By contrast, the relationship between the welfare of non-active agents and this tax is hump-shaped, with a

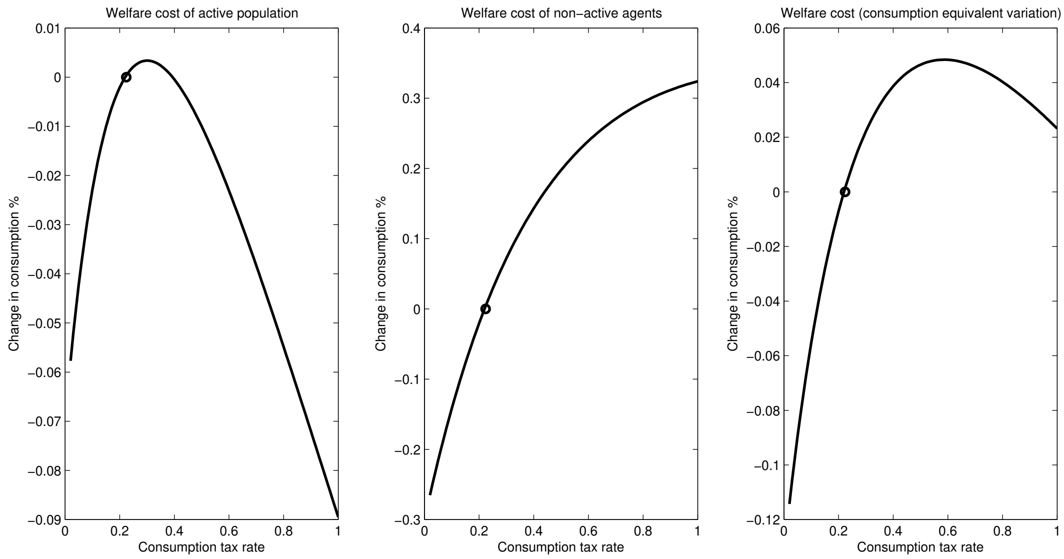

Figure 7: This figure presents welfare changes of the active, non-active, and total population as a function of the consumption tax rate. The baseline position of the economy is indicated by a circle.

maximum rate of 0.72. This tax rate would increase welfare by 17.7% for this group. The weighted combination of the shape for both groups of agents is almost negative but flat for relatively low values of the tax rate around the baseline value. Therefore, no welfare gains can be obtained by changing the capital income tax rate. Indeed, if the objective of the fiscal authorities is the maximization of social welfare, the current capital income tax would be optimal.

Notice that in the case of non-active households, the optimal tax rates for labor and capital that maximizes their welfare coincide with the tax rates that maximize fiscal revenues, as shown in Figure 1. This is a natural result of the model economy. Non-active household consumption fully depends on government spending. Therefore, the higher the government spending, the higher the consumption of this group of agents, and the higher their welfare. Therefore, optimal taxes for this group are those that maximize fiscal revenues.

Finally, Figure 10 plots the welfare changes as a function of the employer's social contributions. In this case, results are similar to the ones obtained for the consumption tax rate but some differences are observed. The relationship between welfare and the employer's social contributions is hump-shaped for the active households and for the whole population and positive for the non-active households. For active households, the employer's social contribution is too high. Welfare gains can be obtained by reducing the employer's social

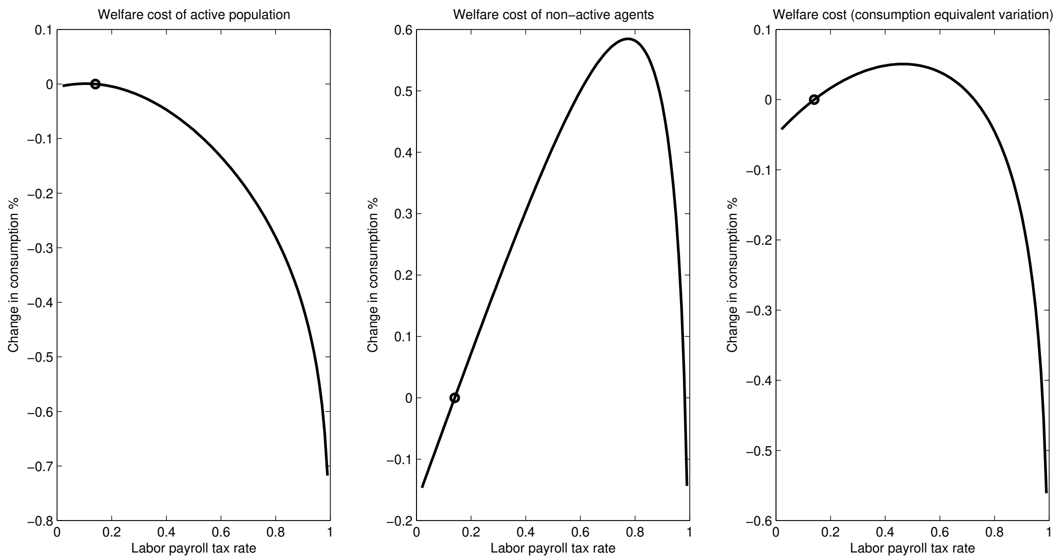

Figure 8: This figure presents welfare changes of the active, non-active, and total population as a function of the labor payroll tax rate. The baseline position of the economy is indicated by a circle.

contribution to 0.16 but of an almost insignificant amount. For non-active households, there is no maximum and the greater the employer's social contributions the higher the welfare. Total welfare has a hump-shaped relationship with the employer's social contributions, but most of the range of the rate is positive. The maximum welfare is reached for a value of the employer's social contribution of 0.93, resulting in a welfare gain of 5%.

In general, we find that the welfare of the non-active households' responses to changes in the tax menu appears to correspond to the behavior of tax revenues in the uni-dimensional Laffer curves. Thus, any amplified positive change in the consumption tax rate or employers' social contributions will have amplified positive effects on the welfare of this population. For labor and capital income taxes, the curves offer optima identical to those of the Laffer curves. By contrast, for active households taxes have in general a negative effect on their welfare, with the capital income tax being zero and the labor payroll tax no more than 0.1. Also, the employers' social contributions are above the optimal for this group of agents. The only tax that does not have a negative effect on their welfare is the consumption tax.

Finally, it is worth noting that total welfare is calculated as the average of the welfare of different populations. This means that optimal fiscal policy and the optimal tax menu are highly dependent on the fraction of active versus non-active households. This is of particular importance in developing economies, where a large fraction of the population is non-active.

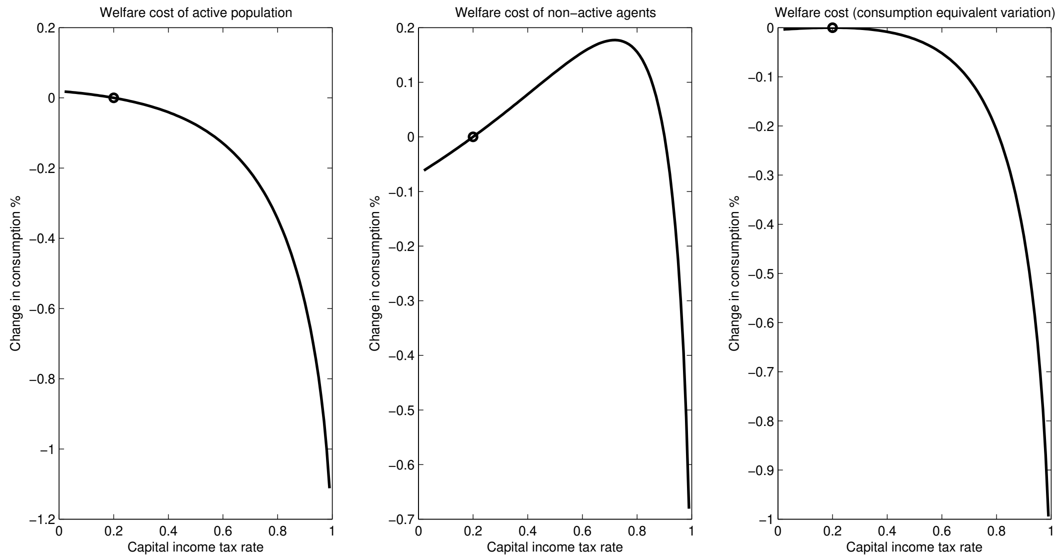

Figure 9: This figure presents welfare changes of the active, non-active, and total population as a function of the capital income tax rate. The baseline position of the economy is indicated by a circle.

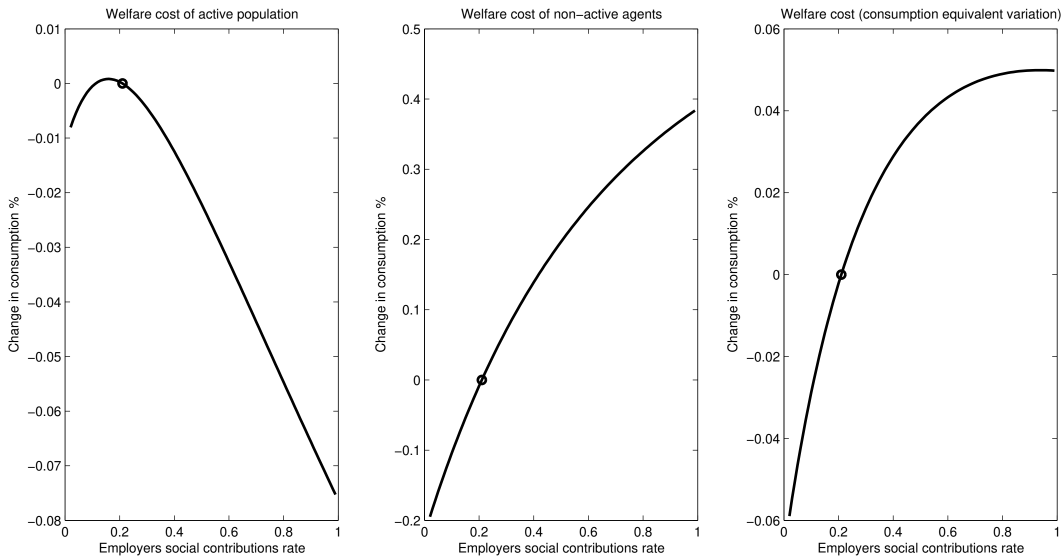

Figure 10: This figure presents welfare changes of the active, non-active, and total population as a function of the employers' social contributions. The baseline position of the economy is indicated by a circle.

Two effects are in place due to changes in taxes. First, a substitution effect by the change in optimal decisions by households produces a negative effect on output. Second, a productivity effect as a fraction of tax revenues is spent on public inputs, increasing output. Next, we focus on how the different components of government spending affect welfare.

In general, we find evidence that increasing the consumption tax rate is the best option for the fiscal authorities. This results is consistent with previous results by Summers (1981), Auerbach et al. (1983), Jones et al. (1993), and Coleman (2000), supporting the conventional public finance wisdom in favor of consumption taxes over income taxes. On the other hand, the results also indicate that the capital income tax should be reduced or even eliminated, consistent with Summers (1981).

5.2. Public spending policies

We now turn out to the spending side of the government. In our model economy, any government spending, both productive and not productive, increase the welfare of the government-dependent agents. This is not always the case for active households, given income redistribution policies. On the other hand, given a tax mix, macroeconomic equilibrium depends on how fiscal revenues are spent. This arises the question of how welfare can be improved by changing the composition of government spending given a tax menu.

The welfare implications of tax policy can be deduced for each tax independently of the others. This is not the case on the spending side, were given a level of public spending, an increase in one type of government spending necessarily implies a decline in another. This complicates the response to the question of what the optimal distribution of government spending for welfare maximization is. However, some insights can be derived by studying some combinations of different types of expenditures. In particular, we will study two scenarios. The government can interact by combining i) public investment and government consumption, or ii) direct transfers and government consumption. The question we want to answer is how fiscal revenues must be spent to maximize social welfare.

Figures 11-12 illustrate the effects of changes in the composition of public spending on the welfare of the two groups of agents. Figure 11 shows welfare changes by substituting government consumption with investment, keeping constant total government spending. For all the cases we have hump-shaped functions, indicating that a combination of both types of spending is necessary for welfare. Indeed, we find that the current spending policy is not far from optimal. For the active group, welfare could be increased by reducing the proportion of government consumption to 0.53 and increasing the proportion of public investment to 0.275 of total spending. This change would increase welfare by 0.37%. Similarly, the welfare

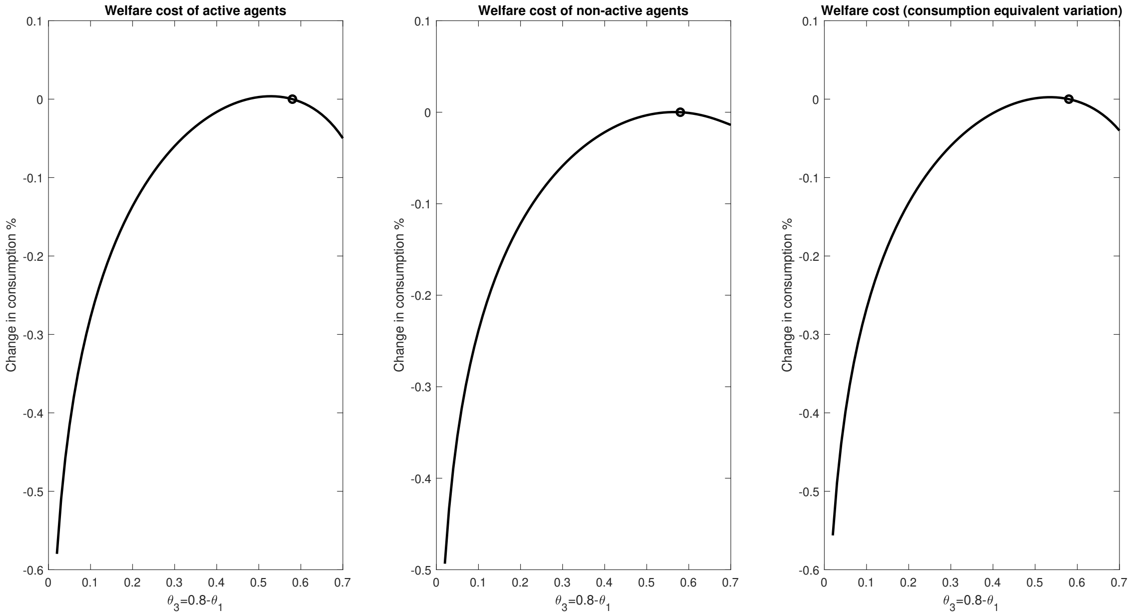

Figure 11: The x-axis gives the set of combinations of $(\theta_3,\ \theta_1)$ keeping the shares of public transfers and pensions constant $(\theta_1 + \theta_3 = 0.8)$. The origin of the axis represents the extreme case where all public consumption is added to public investment. The circles denote the baseline steady-state of the economy.

of non-active agents could be increased by reducing the proportion of government spending to 0.56, although the change in welfare is negligible (a gain of 0.01%). A similar result is obtained for the whole population. Total welfare could be increased by 0.24% by reducing the fraction of government consumption to 0.54 and increasing the fraction of public investment to 0.265.

Figure 12 repeats the analysis by substituting transfers and government consumption. Welfare changes are calculated as a function of the fraction of transfers against the fraction of government consumption. For active agents, welfare is always a negative fraction of the fraction of transfers. For non-active agents and for the whole population, the relationship is hump-shaped. Welfare gains for active agents can be obtained by eliminating transfers and reallocation these resources to government consumption. This policy would increase welfare by 2.27% for the active population. By contrast, welfare gains for non-active agents can be obtained by increasing the fraction of transfers up to 0.53 (and reducing government consumption to a fraction of 0.18), resulting in a welfare gain of 66.44%. The combination of these two opposite effects, given the fraction of non-active versus active agents, lead to an optimal distribution of a fraction of transfers of 0.36 and a fraction of 0.35 for government

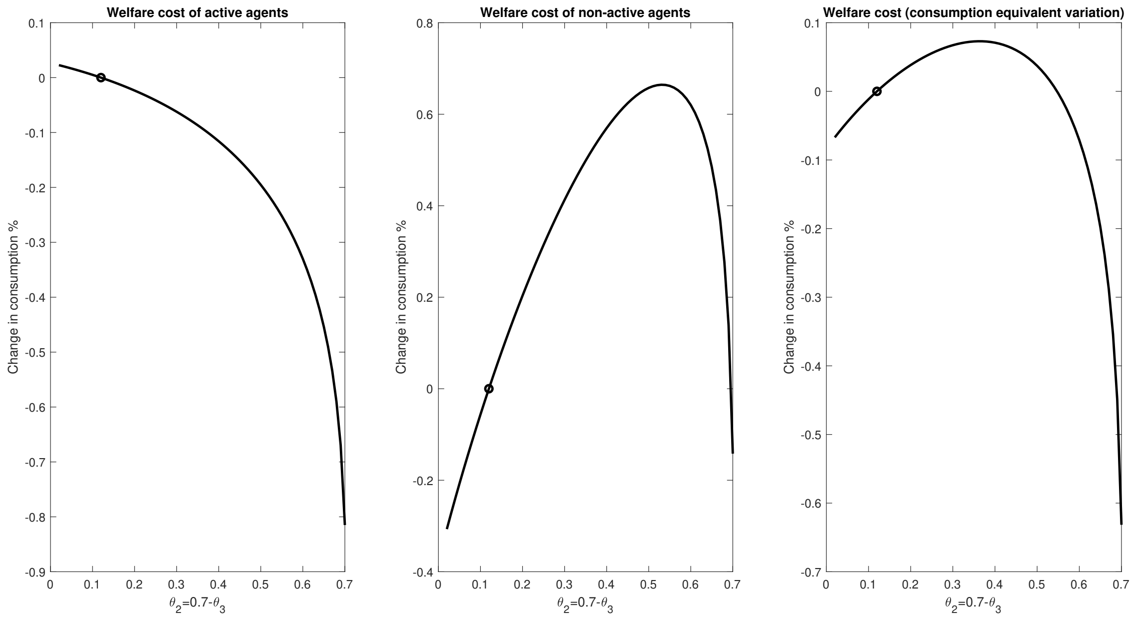

Figure 12: The x-axis gives the set of $(\theta_3,\ \theta_2)$ holding constant the total percentage of direct transfers and government consumption. The origin of the axis represents the case where direct transfers are canceled. The circles denote the baseline steady-state of the economy.

consumption. This new composition of government spending would result in a welfare gain of 7.30%.

Summing up, we find that welfare gains from the reallocation of public spending are already small and far from possible welfare gains from changes in the tax menu. This means that the way in which Moroccan's fiscal authorities allocate total fiscal revenues on the different components of public spending is not far from the optimum, although some room for increasing the share of public investment and reducing the share of government consumption would be welfare enhancing. By contrast, better policies could be implemented by changing the tax mix.

6. Concluding remarks

This paper studies the implications of fiscal policy for output efficiency and welfare by taking into account both the revenues and the spending sides of the government. The paper makes two key contributions. First, the model considers a detailed government spending specification apart from lump-sum transfers, in particular, spending on public inputs. Second, it is considered that a fraction of the population is fully dependent on government spending policies. The model is calibrated for Morocco, a developing country where a significant fraction of the population is highly dependent on government spending policies. We show that these two elements are crucial for choosing the optimal fiscal policy as a combination of the tax mix and the different components of government spending.

We calculate Laffer curves for the different taxes and show that there is room for increasing fiscal revenues by increasing tax rates. Contrary to the common wisdom in the literature, we find that distortions over output from the different taxes can be positive. This is the case with the consumption tax and the employer's social security contributions, although distortions from labor income payroll tax and capital income tax are negative, decreasing output. This positive relationship between final output and the consumption tax rate and the employer's social contributions is explained by the provision of public inputs finances by taxation. On the other hand, the paper investigates the tax mix that maximizes output while keeping constant fiscal revenues. This can be done either by increasing the labor income payroll rate and decreasing the capital income tax rate or by increasing the consumption tax rate and reducing the labor income payroll rate. Alternatively, the government can increase tax revenues without affecting output by changing the tax mix.

The social welfare effects of fiscal policy are also evaluated. Given the different relationships that active and non-active households have with the governments, we expect a different effect of fiscal policy on each group of the population. In general, we obtain opposite effects of the tax policy on the two groups of economic agents. We find that any loss of welfare of one group of agents is a gain for the other, so the final effect depends on the relative size of each group of agents. In terms of taxation, any increase in taxes generates a welfare loss for active households and a gain for non-active households. This is a consequence of the fact that most of the taxes are paid by active households as non-active households only are forced to pay the consumption tax. Additionally, the positive effect of taxation on the welfare of non-active households is due to their dependence on government spending policies. A larger tax burden implies more income, and hence more consumption, for this group of the population.

These results lead to a strong policy recommendation for Morocco's fiscal authorities: The tax burden should be increased, particularly by increasing the consumption tax rate, whereas the capital income tax should be reduced. This would increase government revenues without negatively affecting economic activity, allowing more public spending for investment and re-distributive policies. However, less room is found on the spending side, where little welfare gains can be obtained by reallocating resources among the different components of public spending. Furthermore, the government can choose fiscal policies that increase both output and tax revenues.

Finally, the analysis done in this paper opens the door for assessing the implications of fiscal policy in an integrated framework taking into account the two sides of the government. Distortions by taxation are not independent of how the government spends fiscal revenues. As a consequence, optimal taxation policy is not independent of optimal government spending policy. This integrated analysis will reveal that taxes are not bad for the economy, but a necessary contribution by some individuals or groups for the welfare of society as a whole. This is of particular interest to developing economies where income inequality is high.

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