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Public Spending on social protection and their impacts on economic growth in Morocco: A SAM multiplier and CGE model Analysis

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Abstract

Public expenditure on social protection plays a crucial role in achieving inclusive growth and human development. Evidence in the literature shows that higher investments in social protection effectively reduce poverty and inequality, promoting political stability by alleviating social tensions and conflicts. Moreover, the available evidence highlights the significant positive impact of cash transfer programs on human development and productivity.

In Morocco, the social protection system has evolved and grown over a significant period, resulting in a complex structure. Inspired by Bismarck's model, it now strikes a balance between two major components. A contributive social security system includes a compulsory basic scheme, as well as non-contributory social assistance, which is inclusive and relies on social assistance programs.

In 2021, the government initiated an ambitious project to extend social protection by 2025, unfolding in four progressive stages. This national project needs much more public spending on all social services, such as education, health, and cash program transfers. In this view, through the multiplier model and CGE model based on the social accounting matrix for Morocco, we are trying to increase public spending on social protection, which consists of providing social protection services by the government to households and various transfers to households.

Our analysis reveals notable positive effects on key macroeconomic aggregates across all scenarios, supporting the argument for expanding social protection investments in Morocco.

Keywords: Multiplier model, Government Expenditures, CGE model, Welfare Programs, Social Security, Public Pensions, social spending, Health, education, Morocco …

JEL Classification : C67, D57, E16, E17, O21, H53…

I. Introduction:

Countries must ensure a minimum social protection level for individuals, as it is a human right recognized in the Universal Declaration of Human Rights (1948) and under international human rights law. The ultimate goal of social protection is to combat poverty and inequality and improve social inclusion for all people by providing, for example, unemployment benefits, healthcare, and education subsidies. (United Nations, 1948; ILO, 2020; OECD, 2019)

Social protection is more than just policies and measures. It's a powerful tool to empower the poor and vulnerable, helping them escape deprivation and cope with risks and shocks. It includes measures designed to address chronic and shock-related poverty and vulnerability. According to the Inter-Agency Social Protection Assessment Initiative (ISPA), social protection is defined as a set of policies and programs to prevent and protect all individuals — especially vulnerable groups — from poverty, vulnerability, and social exclusion during different stages of life. (ISPA, 2016).[*]

Public expenditure on social protection plays a crucial role in achieving inclusive growth and human development. By increasing household consumption, it boosts aggregate demand, helping economies recover from recessions and fostering growth through multiple channels. Evidence in the literature shows that higher investments in social protection effectively reduce poverty and inequality, promoting political stability by alleviating social tensions and conflicts. Moreover, the available evidence highlights the significant positive impact of cash transfer programs (or in-kind assistance) on human development and productivity. These programs can improve households' situations at different levels. First, they reduce child labor and increase school attendance ((Behrman et al., 2005; Sadoulet et al., 2004) and, also, they can enhance the educational outcomes of poor households by boosting school enrollment and attendance. Moreover, they can affect human capital in the long term by promoting the enrollment of the beneficiaries' children in secondary school, providing them with a significant opportunity to attend universities ((Molina Millán et al., 2020); Sanchez Chico et al., 2020). Third, these transfers could boost overall household consumption, savings, and investment in productive assets (Attanasio & Mesnard, 2006; Attanasio et al., 2010; Gitter & Barham, 2009). Further, they may promote short- and long-term poverty reduction and boost human capital, particularly children's (Kisiwa et al., 2023, Molina Millán et al., 2020; ILO, 2014, 2016, 2017; UNESCAP and ILO, 2021; Ortiz et al., 2015; Ortiz et al., 2019; Alderman and Yemtsov, 2012, 2014; Barrientos, 2011, 2012, 2013; Barrientos and Hulme, 2016; Gebregziabher and Niño-Zarazúa, 2014; Addison et al., 2015; Haile and Niño-Zarazúa, 2018; Gough et al., 2004; Atkinson, 1989, 1999).

The 2030 Agenda for Sustainable Development Goals (SDG) highlights the crucial role of social protection in achieving its goals. Public investment in social protection helps to end poverty (SDG target 1.3), improve health and well-being (SDG target 3.8), promote gender equality (SDG target 5.4), support decent work and economic growth (SDG target 8.5), and

[*] https://ispatools.socialprotection.org/

reduce inequality (SDG target 10.4). The need for greater investment in social protection is emphasized in SDG target 1.a, which calls for "adequate and predictable means" for developing countries, and SDG indicator 1.a.2, which tracks public spending on social protection, health, and education to "end poverty in all its dimensions."

Specifically, SDG target 1.3 which aims to “establish social protection systems and measures for all, adapted to the national context, including social protection pillar, and ensure that, by 2030, a significant proportion of the poor and vulnerable people benefit from them”. This is based on the ILO's Social Protection Floors Recommendation, 2012 (No. 202), adopted by governments, employers, and workers at the 100th Session of the International Labor Conference in 2011.

Despite some progress since the launch of the 2030 Agenda in 2015, major gaps in social protection coverage and funding persist globally. While 23 low- and middle-income countries have achieved universal coverage for at least one benefit, the ILO (2017) reports that 4 billion people, or 55% of the world’s population, still face daily risks due to lack of protection. Only 35% of children receive child benefits, 41% of women with newborns receive maternity benefits, 22% of unemployed people receive unemployment aid, and 28% of people with severe disabilities receive disability benefits. Older adults fare slightly better, with 68% receiving pensions, though these are often insufficient.

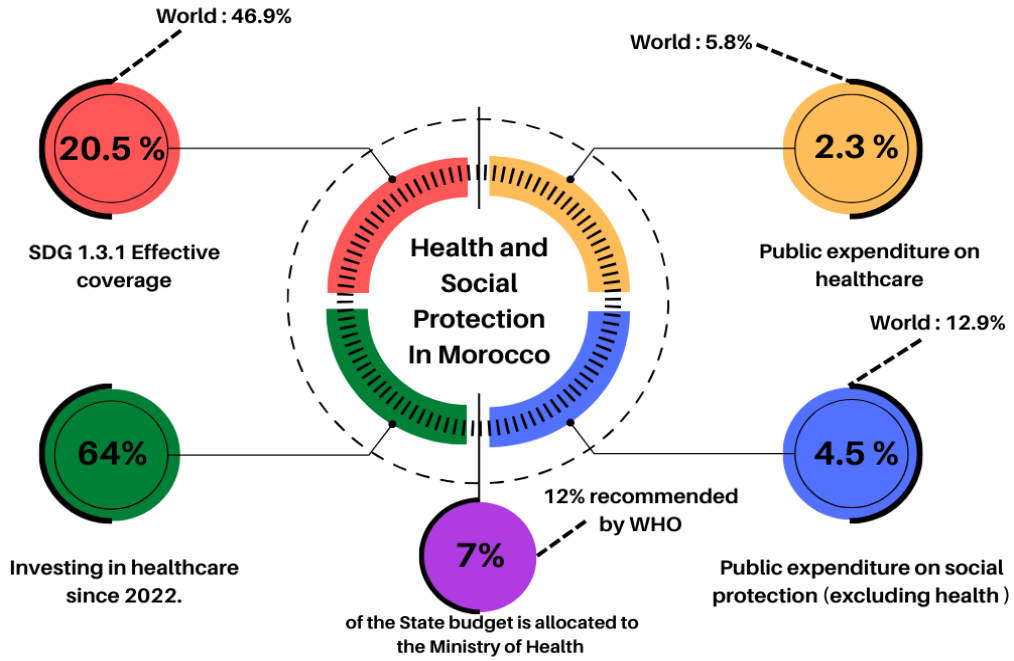
In Morocco, the social protection system has evolved and grown over a significant period, resulting in a complex structure. Inspired by Bismarck's model, it now strikes a balance between two major components (CESE, 2020). A contributive social security system includes a compulsory basic scheme (*CMR, RCAR, CNSS, CNOPS, etc*.), as well as non-contributory social assistance, which is inclusive and relies on social assistance programs (Tayssir, Kafala, DAAM, etc.).

In the same way, the Moroccan government is committed to ILO Recommendation No. 202 on the Social Protection Pillar and endorses the United Nations Agenda 2030 for the Achievement of the Sustainable Development Goals (SDGs), among which the expansion of social protection coverage is one of the targets, in particular SDG 1 target 1.3.

In this context, Morocco has embarked on significant reforms of the social protection system, such as the adoption of the Basic Medical Coverage Act, which introduced Health Insurance Compulsory (*en francais: Assurance Maladie Obligatoire- AMO*) and the Assistance Scheme Medical (*en francais: Régime d’assistance médical - RAMED*), as well as the recent expansion of the health insurance scheme for self-employed persons and the Law on the Extension of the Pension Scheme to Self-Employed Persons, the partial reform of the compensation scheme and the implementation of monetary transfers for disadvantaged populations, including children (*Tayssir and DAAM programs*). Despite these efforts, the system currently faces many risks and challenges that reduce its impact and pose governance issues related to the coordination of interventions and the efficiency of public spending.

However, the current health and social protection systems faces substantial resource gaps, especially in human resources. Despite an increased budget in recent years, investment in health remains relatively low (between 4% and 6% of GDP from 2000-2019). As of recent data (Figure 1), only 7% of the state budget is allocated to the Ministry of Health, falling short of the 12% recommended by the World Health Organization (WHO). Public expenditure on healthcare stands at 2.3%, significantly lower than the global average of 5.8%. Furthermore, public expenditure on social protection, excluding health, is at 4.5%, below the world average of 12.9%.

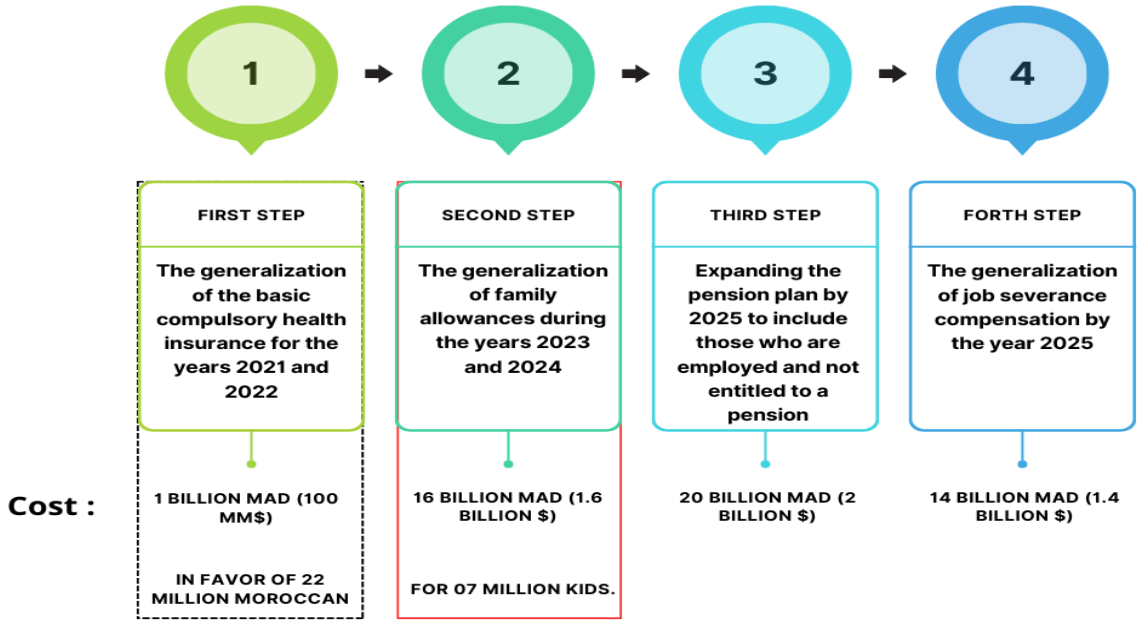
Figure 1: Key Health and Social Protection Statistics in Morocco



Source: Authors' construction, WB, ILO databases

Following the COVID-19 crisis, the Moroccan government aimed to build a national model of a social state where the citizens were at the center of all reform and development projects. Thus, in 2021, the government initiated an ambitious project to extend social protection by 2025, unfolding in four progressive stages (Figure 2): the generalization of basic compulsory health insurance, family allowances, job loss indemnity, and the expansion of the pension scheme's membership to include employed individuals who do not receive any pension. Concurrently, the government allocated $2.4 billion to the healthcare sector in 2022. (Note of the Morocco Finance Bill 2023 presentation, pp. 79).

Figure 2: The chronological cycle of the generalization of social protection 2021-2025 in Morocco



Source: Authors' construction

Research question and objective

This national project needs much more public spending on all social services, such as education, health, and cash program transfers (approximately 51 billion MAD annually)[†]. Given the socio-economic situation described in the last paragraphs and the efforts from the Moroccan government to expand social programs in the last decades, some crucial questions remain: can social expenditures, in fact, stimulate Morocco's economy and generate inclusive growth and development? Do varied categories of governmental social expenditures present different responses regarding their impacts on promoting economic growth in Morocco? What are the social expenditures with the most significant effect on Morocco aggregate considering an additional unit of public spending?

This paper seeks to answer these questions through the multiplier model based on the social accounting matrix for Morocco (SAM-2019) to analyze the effects of public spending on social protection on economic growth and household income in Morocco. Indeed, our Matrix counts three categories of labor disaggregated by the level of education and degrees held by each individual in the household (Unskilled work (USK), Skilled work (SK), and Medium skilled work (MSK)). Additionally, within our SAM, we have broken down two accounts, the Education, Health, and Social Action (MNO), into three sub-accounts: non-market education (ENM), market education (EM), and health and social action (SN). The second account, Public Administration and Social Security (L75), is divided into two sub-accounts: Public

[†] https://medias24.com/2021/02/22/generalisation-de-la-protection-sociale-un-cout-annuel-de-51-milliards-de-dh/

Administration (PA) and Social Security (SS). Indeed, we combined all non-market services, such as Education, Health, and Social Security, into a single account called Social Protection Services. This newly aggregated account will be used for our simulations in this study.

Using a Multiplier model, we are trying to increase public spending on social protection – *as the implementation of the 2021-2025 project*- which consists of providing social protection services by the government to households and various transfers to households. The objective is to capture the impact of these reforms on the economic and social levels. This simulation aims to understand the macroeconomic outcomes of increasing the level of investments in social protection in Morocco.

Our key finding is that additional government expenditure on social protection generates a significant expansion in GDP. The impact varies depending on the specific policy implemented, with broad-based social protection spending (a 1% GDP increase yielding a 1.49% increase in base price GDP over the simulation period) having a more substantial effect on overall GDP growth than an equivalent increase in targeted cash transfers (0.78% GDP growth). Crucially, a combined strategy, incorporating both broad spending and cash transfers, exhibits synergistic effects, leading to an even greater GDP increase (2.26%) that exceeds the individual policy impacts. This suggests that social protection expenditures can generate substantial output responses, exceeding the initial investment over the simulation period, particularly when combining broad-based measures with targeted interventions. These results have important policy implications, indicating the crucial role of a comprehensive and well-designed social protection system not only for short-run economic stimulus but also for long-run inclusive and sustainable economic growth, contributing to the achievement of the Sustainable Development Goals of the 2030 Agenda.

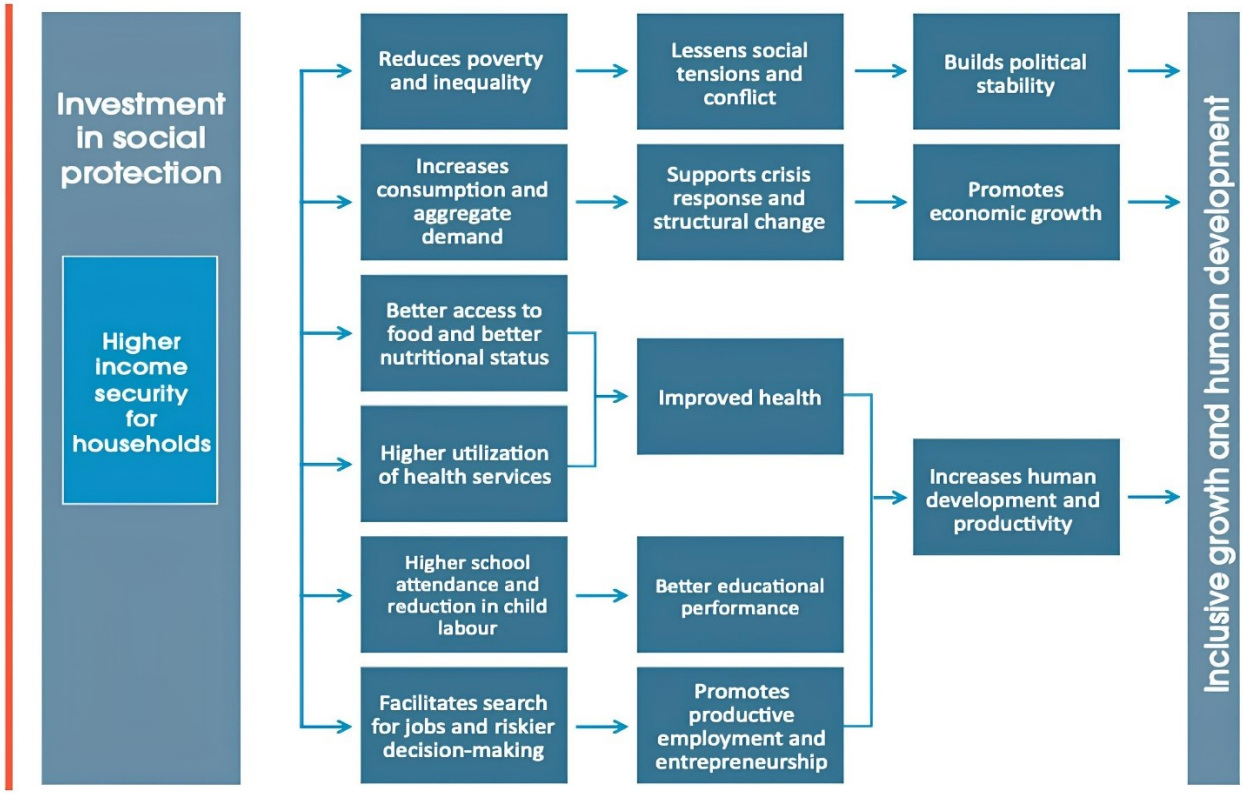
The remainder of this paper is presented as follows: Section 2 provides a review of the literature of the impact of social protection on economic growth; in Section 3, we provide a brief presentation of the methodological approach used and the related data. The results are presented in section 4, and in section 5, we conclude and give some policy recommendations.

II. Impact of social protection on economic growth: an analytical review of the literature

2.1 Theorical framework:

Public expenditure on social protection plays a crucial role in achieving inclusive growth and human development. By increasing household consumption, it boosts aggregate demand, helping economies recover from recessions and fostering growth through multiple channels as depicted in Figure 3.

Figure 3: The effects of social protection on economic growth



Source: Ortiz et al. (2019) based on ILO (2016)

Evidence in the literature shows that higher investments in social protection effectively reduce poverty and inequality, promoting political stability by alleviating social tensions and conflicts. Moreover, the available evidence highlights the significant positive impact of cash transfer programs (or in-kind assistance) on human development and productivity. These programs can improve households' situations at different levels. First, they reduce child labor and increase school attendance (Behrman et al., 2005; Sadoulet et al., 2004; Schultz, 2004) and, also, they can enhance the educational outcomes of poor households by boosting school enrollment and attendance. Moreover, they can affect human capital in the long term by promoting the enrollment of the beneficiaries' children in secondary school, providing them with a significant opportunity to attend universities (Molina Millán et al., 2020; Sanchez Chico et al., 2020). Third, these transfers could boost overall household consumption, savings, and investment in productive assets (Attanasio & Mesnard, 2005; Attanasio et al., 2006; Gitter & Caldes, 2010). Further, they may promote short- and long-term poverty reduction and boost human capital, particularly children's (Kisiwa et al., 2023, Molina Millán et al., 2020). *(ILO, 2014, 2016, 2017; UNESCAP and ILO, 2021; Ortiz et al., 2015; Ortiz et al., 2019; Alderman and Yemtsov, 2012, 2014; Barrientos, 2011, 2012, 2013; Barrientos and Hulme, 2016; Gebregziabher and Niño-Zarazúa, 2014; Addison et al., 2015; Haile and Niño-Zarazúa, 2018; Gough et al., 2004; Atkinson, 1989, 1999)*

From the figure 3, Mathers and Slater (2014) elaborate on the direct and indirect impacts of social protection on economic growth at different levels. At the micro (household or individual) level, social protection helps prevent the loss of productive capital, accumulate assets, foster innovation, and influence labor force participation. Indirectly, it promotes increased investment in human capital. At the meso (community or regional) level, it triggers multiplier effects from local consumption and production, accumulates productive community assets, and influences labor markets, including potential inflationary effects on local wages. Finally, at the macro (national) level, social protection can enhance household productivity, stimulate aggregate demand, and support capital market growth through pension funds. Indirectly, it facilitates economic reforms, promotes social cohesion, reduces inequality, improves human capital, and may influence fertility rates.

Table 1: Evidence on the direct and indirect impacts of social protection on growth by level of influence

Level	Direct Impacts on Growth	Indirect Impacts on Growth
Micro (individual or household) level	- Prevent loss of productive capital (+) - Accumulate productive assets (+) - Increase innovation and risk-taking in livelihoods of poor households (+) - Impact on labor force participation (+/-)	- Increase investment in human capital (+)
Meso (community or local regional) level	- Multiplier effects from increased local consumption and production (+) - Accumulation of productive community assets (+) - Labor market impacts including inflation effects on local wages (+/-)	n/a
Macro (national) level	- Cumulative increases in household productivity (+) - Stimulate aggregate demand (+) - Changes in aggregate labor force participation (+/-) - Increase capital markets through pension funds (+) - Effects of taxation on savings/investment (-) - Effects of government borrowing and inflation (-)	- Facilitate economic reforms (+) - Enhance social cohesion and reduce inequality (+) - Enhance human capital (+) - Impact on fertility rates (+/-)

Note: (+) potential positive impact; (-) potential negative impact; (+/-) possible positive or negative impact
Source: Authors, drawing on Arjona et al. (2002); Grosh et al. (2008), Piachaud (2008); Alderman & Yemtsov (2012); Barrientos (2012).

2.2 Empirical studies:

Empirical studies have extensively examined the impact of social protection on economic growth, with many highlighting the role of fiscal multipliers. In particular, country-specific studies often employ linear VAR (Vector Autoregressive) models to estimate the effects of exogenous shocks in public expenditures or government revenues on economic activity. This

approach, following the methodology of Blanchard & Perotti, (2002), has become a common tool for analyzing these dynamics.

Several studies demonstrated that social protection could accelerate economic growth, including works by Cashin (1994), Castles and Dowrick (1990), Korpi (1985), McCallum and Blais (1987), and Perotti (1992, 1994).

Some authors find significant multiplier effects for social expenditures, with impact multipliers close to one (Gechert et al., 2018; Gáldon, 2013; Adams and Wong, 2018). However, in some cases, the accumulated multiplier is close to zero, while in others, the effect persists above zero (Adams and Wong, 2018; Pereira and Wemans, 2013). Moreover, a few authors report a statistically insignificant negative accumulated effect (Claus et al., 2006; Bruckner and Tuladhar, 2010).

On the other hand, various studies estimate small but positive multipliers for social transfers. These studies generally show that government consumption, tax reductions, and public investments produce higher multipliers (Huseyin and Ayse, 2017; Sarangi and Bonin, 2017; Bova and Klyviene, 2019; Pereira and Wemans, 2013; Silva et al., 2013). In some cases, the multiplier for social transfers is large, but other types of expenditure still generate similar or higher impacts on overall output (Pereira and Wemans, 2013; Fatás and Mihov, 2001; Pereira and Sagalés, 2009).

Moreover, several empirical studies have employed panel techniques to estimate multipliers for various countries or regions using VAR and single-equation methods (Silva et al., 2013; Furceri and Zdzienicka, 2012; Reeves et al., 2013). For social expenditures, Furceri and Zdzienicka (2012) identify a positive accumulated multiplier, though smaller than one, across OECD countries, emphasizing the large impacts of health spending and unemployment insurance on output. Reeves et al. (2013) find a social protection multiplier in European countries that reaches up to 3 in the baseline scenario, with health expenditures displaying an even larger multiplier near 4.9.

Another approach to assess the impact of social protection on economic growth is through the use of general equilibrium models and Social Accounting Matrix (SAM) multiplier models. These models allow us to simulate various policy scenarios, analyzing the economic ripple effects of social welfare initiatives, such as unemployment benefits or pensions, on income distribution and consumption patterns. This enables a more comprehensive evaluation of how such policies contribute to overall economic activity and inclusive growth.

In this context, the International Trade Union Confederation (ITUC, 2021) evaluated the impact of social protection investments - cash programmes - on economic growth in eight countries—Bangladesh, Colombia, Costa Rica, Georgia, Ghana, India, Rwanda, and Serbia—using a dynamic CGE model combined with a Multiplier model. The findings reveal that investing 1 percent of GDP in social protection policies generates a multiplier effect on GDP ranging between 0.7 and 1.9. Additionally, this investment positively impacts employment, with a

multiplier effect between 0.1 and 1.1, and boosts fiscal revenues by 0.6 to 3.5 percent. Moreover, the study highlights that such investments reduce income inequality and poverty, both in the short and long term. This underscores the significant role of social protection in fostering inclusive growth.

In a study by Handayani, (2024), a Computable General Equilibrium (CGE) model is used to analyze the effectiveness of fiscal policy on social protection during the Covid-19 pandemic in Indonesia, focusing on economic growth, household income, and sectoral labor absorption from 2019 to 2021. Utilizing the PEP-1-1 model (static version 2.0) in GAMS 23.5, the research simulates social protection as a policy shock. Findings reveal that fiscal policy on social protection contributed to economic growth (0.03% increase) and boosted labor absorption across 24 sectors, with the banking and service sectors showing the highest employment growth, while the restaurant and air transportation sectors declined by 9%. Household income rose, particularly for the hhk6 group (0.6%), with other groups experiencing modest increases (0.1%). This study highlights social protection's role in supporting Indonesia's economic resilience and recovery during the crisis.

Hadian & Eslami Andargoli, (2016) analyze the welfare effects of different social security scenarios on the Iranian economy, focusing on the optimal income tax rate. Using a Computable General Equilibrium (CGE) model in GAMS, they simulate these scenarios by financing social security through increased private income taxes. Results indicate that GDP, as an economic welfare indicator, rises across all scenarios, with a 70% income tax increase yielding the highest impact on GDP. This study suggests that a sudden tax rate increase is more favorable to the private sector than a gradual change, highlighting the importance of coordinated macroeconomic policies and social welfare programs.

In general, to our knowledge, there are no studies for Morocco examining the detailed effects of government social expenditures on social protection. This paper aims to fill this apparent gap in the literature, and our results suggest that increases in social expenditures in this field positively impact Morocco's output and household income. Specifically, social expenditures—such as those on education, health, and social security—have well-above-average impacts on GDP at both basic and market prices compared to total government expenditures. These results partially support previous findings in the literature, albeit indirectly.

III. Methodology and data:

3.1 Data presentation: SAM 2019 for Moroccan economy

The Social Accounting Matrix (SAM) constitutes a coherent framework of data necessary for the development of CGE models and Multiplier models. Its construction took a very special place in this work.

SAMs usually serve two basic purposes: a) as a comprehensive and consistent data system for descriptive analysis of the structure of the economy and b) as a basis for macroeconomic modelling. Figure 4 below shows the basic structure of a SAM.

Figure 4: **Basic structure of a social accounting matrix (SAM)**

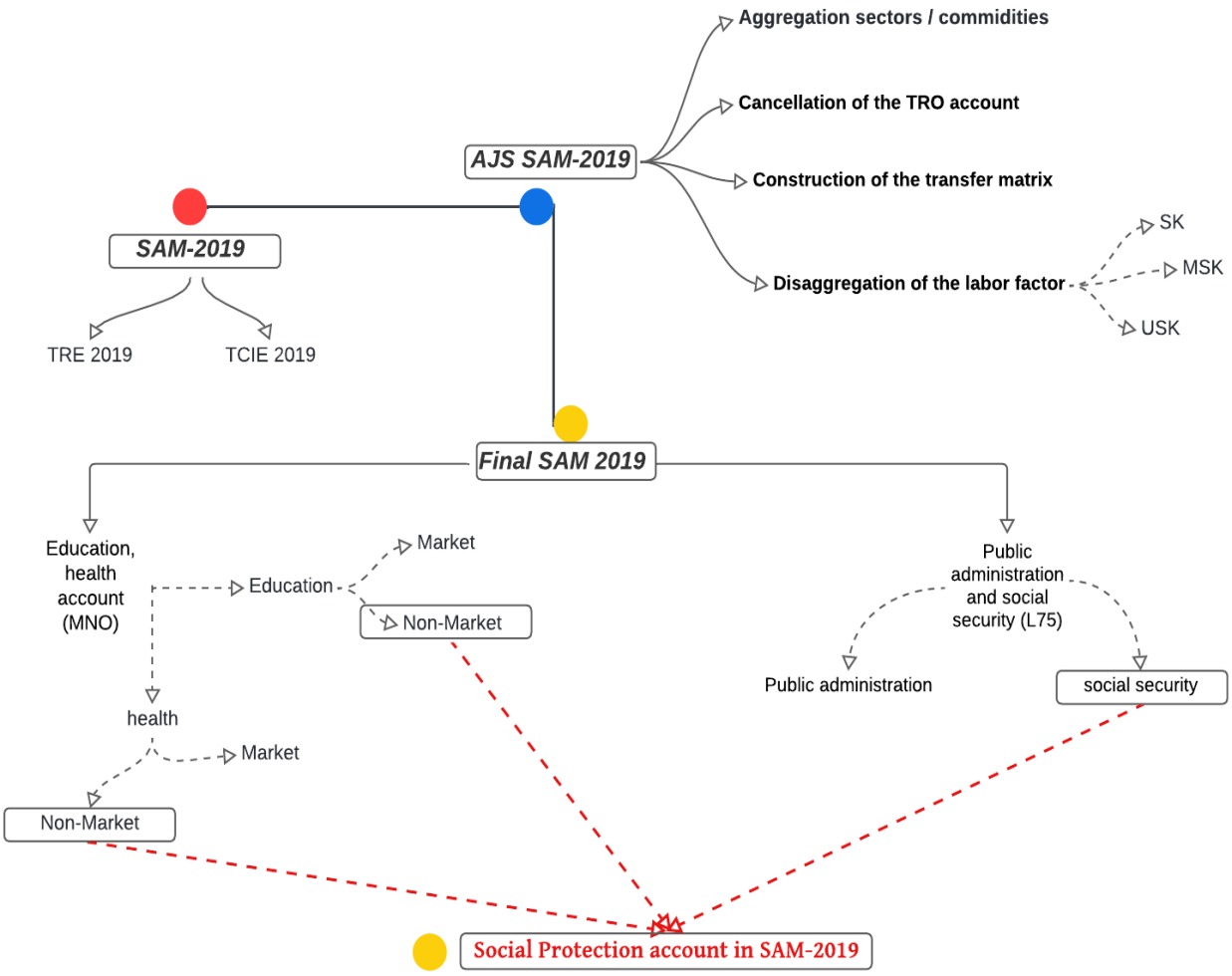
	Commodities	**Margins**	**Activities**	**Factors**	**Households**	**Enterprises / Corporations**	**Government**	**Savings-Investment**	**Rest of the World**	***Total***
Commodities (C)		$T_{C,M}$ Transaction costs (trade / transport)	$T_{C,A}$ Intermediate (inputs) consumption		$T_{C,H}$ Household consumption		$T_{C,G}$ Government expenditure	$T_{C,S-I}$ Investment and stock changes	$T_{C,RoW}$ Exports	*Demand*
Margins (M)	$T_{M,C}$ Transaction costs (trade / transport)									*Margins*
Activities (A)	$T_{A,C}$ Domestic production									*Gross output / Production (activity income)*
Factors (F)			$T_{F,A}$ Remuneration of factors / Factor income						$T_{F,RoW}$ Factor income from RoW	*Factor income*
Households (H)				$T_{H,F}$ Factor income distribution to households	$(T_{H,H})$ *(Inter Households transfers)*	$T_{H,E}$ Distribution of corporations income to households	$T_{H,G}$ Government transfers to households		$T_{H,RoW}$ Transfers to Households from RoW	*Household income*
Enterprises / Corporations (E)				$T_{E,F}$ Factor income distribution to enterprises			$T_{E,G}$ Government transfers to enterprises		$T_{E,RoW}$ Transfers to Enterprises from RoW	*Enterprise income*
Government (G)	$T_{G,C}$ Net taxes on products		$T_{G,A}$ Net taxes on production	$T_{G,F}$ Factor income to Government / Factor taxes	$T_{G,H}$ Direct Household taxes / Transfers to Government	$T_{G,E}$ Direct Enterprise taxes / Transfers to Government			$T_{G,RoW}$ Transfers to Government from RoW	*Government income*
Savings-Investment (S-I)				$(T_{S-I,F})$ *(Depreciation)*	$T_{S-I,H}$ Household savings	$T_{S-I,E}$ Enterprise savings	$T_{S-I,G}$ Government savings	$(T_{S-I,S-I})$ *(Capital accounts transfers)*	$T_{S-I,RoW}$ Capital transfers from RoW (Balance of Payments)	*Savings*
Rest of the World (RoW)	$T_{RoW,C}$ Imports			$T_{RoW,F}$ Factor income distribution to RoW	$T_{RoW,H}$ Household transfers to RoW	$T_{RoW,E}$ Corporations income to Row	$T_{RoW,G}$ Government transfers to RoW			*Payments to RoW*
Total	*Supply*	*Margins*	*Costs of production activities*	*Expenditure on factors*	*Household expenditure*	*Enterprise expenditure*	*Government expenditure*	*Investment*	*Incomes from RoW*	

Source : (Round, 2003)

The objective is to develop a SAM that is consistent with the data of the national economy. The choice of the year 2019 was made with a view to exploiting recent data, in accordance with national accounts standards, on foreign trade and also for the national project of generalization of social protection (2021-2025).

The construction of the SAM-2019, in our case, is a continuation of the methodology we have consistently used in our work (Raouf et al., 2021). However, the figure 5 below outlines the stages in the construction of the 2019 SAM and the resources used.

Figure 5: *Elaboration stages of the SAM-2019*



Source: Authors' construction

In national accounts, agents are grouped into institutional sectors (IS): Groupings of institutional units defined as the elementary center of economic decisions. We distinguish 6 institutional sectors:

- Non-financial corporations (SNF)
- Households (MEN), including sole proprietorships (EI)
- Public administrations (APU)
- Financial institutions (SF)
- Non-profit institutions serving households (NPISHs)
- The rest of the world (ROW)

We have dealt with the accounts of the allocation of primary income, the secondary distribution of income and the account of the use of income, in order to explicitly highlight the different receipts and expenditures of economic agents and especially the transfers that have been made between them. Thus, we have retained four economic agents, namely, households (HH), firms (F), the government (Gvt), and the rest of the world (ROW).

In addition, the lack of detailed data for certain accounts and the need to have consistent data did not allow us to rank the number of branches present in the SAM-HCP (40 branches of activity and 40 products according to the standard nomenclature). We have aggregated these accounts according to the classification of sectors of the national accounts by keeping 20 sectors.

Table 2: *Sectors used in SAM-2019*

Code	Name
A00	Agriculture, forestry and related services
B00	Fishing, aquaculture
C00	Extraction industry
D01	Food and tobacco industries
D02	Textile and leather industries
D03	Chemical and parachemical industry
D04	Mechanical, metallurgical and electrical industry
D05	Other manufacturing industries, except petroleum refining
D06	Refining of petroleum and other energy products
E00	Electricity et Water
F45	Building and public construction
G00	Commerce
H55	Hotels et restaurants
I01	Transports
I02	Post and telecommunications
J00	Financial activities and insurance
K00	Real estate, rental and services rendered to businesses
L75	Public administration and social security
MNO	Education, health and social action
OP0	Other non-Financial services

Source : National Accounts Nomenclatures (NMA 2010), HCP.

- **Cancellation of the TRO account: territorial corrections**

The territorial correction represents an item that corrects for direct purchases by non-residents inside Morocco and direct purchases by Moroccans living abroad who do not go through the

international trade circuit. The SAM must account for the consumption of Moroccan residents in the territory. However, the accounting data include the consumption of goods and services made by non-residents in Morocco in the household current account and by Moroccan residents outside the territory in the Rest of the World account. Thus, there is a risk of overestimation or underestimation of consumption by Moroccan residents in the territory, which requires a territorial correction.

It is first of all necessary to ensure the total deletion of the TRO account, using a method which relates to the distribution of the territorial correction according to the structure of final consumption (CF) of households, deletion of the row and column territorial correction and rebalancing. of the SAM.

The Resource-Employment Table (TRE) specifies this information but in an aggregated way which does not correspond to the SAM format. The territorial correction was therefore disaggregated according to the assumption of a consumption structure identical to that of household consumption on Moroccan territory.

The logic is then to reduce the final consumption given in the household current account from the consumption of non-resident households and to increase it from the consumption of Moroccan residents abroad because this supposes a higher income than indicated initially. for households.

Consumption by residents of goods and services abroad is assumed to be imported by Morocco, while goods and services consumed by non-residents in Morocco are assumed to be produced locally only.

- **Construction of the transfer matrix**

The SAM summarizes the formation of income for each economic agent in accordance with the accounting rules reproduced in the accounts of the institutional sectors and the table of integrated economic accounts (TIEA).

The formation of gross disposable income for each agent follows a sequence of accounts articulated between them by the balance which ensures equilibrium. In the matrix, the transactions which account for the formation of income in addition to wages and operating income, are summarized by the transfers which correspond to certain transactions of the

allocation of primary income account, the secondary distribution account of the income and income redistribution account in kind.

Taking all these transfers into account serves to release gross disposable income and generate gross savings per agent once final consumption expenditure is deducted.

Adjusting this income available for the capital transfer, knowing that investment expenditures are recorded at the level of uses, makes it possible to identify the financing capacity or need for each institutional agent which corresponds to the balance of the capital account.

The construction of the transfer matrix is essentially based on the following accounts:

- Property income.
- Taxes, Social contributions and benefits, Other current transfers.
- Adjustment for variation of the rights of households on pension funds.

These three accounts must be aggregated (the sum of the three matrices) to obtain the transfers to be introduced in SAM-2019:

$$\begin{pmatrix}\textbf{Property}\\ \textbf{income}\end{pmatrix} + \begin{pmatrix}\textbf{Taxes, social contributions}\\ \textbf{and benefits}\\ \textbf{and other current transfers}\end{pmatrix} + \begin{pmatrix}\textbf{Adjustment for changes}\\ \textbf{in the rights of households}\\ \textbf{on pension funds}\end{pmatrix} = \begin{pmatrix}\textbf{Matrix of transfers}\\ \textbf{between agents}\end{pmatrix}$$

- **Disaggregation of the education, health and social action (MNO) and public administration and social security (L75) account:**

To meet the goal of this study, we established a new account within our Social Accounting Matrix (SAM) for social protection. This account combines the Education Non-Market (ENM), Health Non-Market (HN), Social Action (SN), and Social Security (SS) accounts, as shown in Figure 5. It should be noted that this disaggregation was based on a highly detailed sectors and products table, constructed by the High Commission for Planning (HCP), which allowed for a more precise representation of the different components of social protection.

First, we disaggregated the MNO account into four sub-accounts, namely: Education Market, Education Non-Market, Market Health, and Non-Market Health. Second, we decomposed the L75 account into two sub-accounts: Public Administration (APU) and Social Security (SS). Finally, we combined all non-market services, such as Education, Health, and Social Security, into a single account called Social Protection Services. This newly aggregated account will be used for simulations in this study.

- **Disaggregation of the labor factor**

Labor income is made up of wage and non-wage labor income. The SAM 2019 counts three categories of work broken down according to the educational level and the diploma held by the individuals of the household. This disaggregation is done by the Mincer equation and which takes into account the correction for selection bias using the Heckman method. This approach

made it possible to distribute the wage bill between households according to the type of labor force they have.

Unskilled labor (USK) is offered by people with no diploma. In general, these are workers who are either without schooling or have a Koranic or preschool level, or they have completed the basic cycle but without vocational training.

Medium-skilled work (MSK) includes individuals with a diploma, basic education certificate or secondary education diploma.

Skilled work (SK) is offered by graduates (vocational qualification diploma; vocational specialization certificate; higher education diploma, etc.).

The labor factor is used by all branches of economic activity. It should be noted that the disaggregation of this factor according to the three qualifications is made on the basis of the work of Khallef (2015) in the SAM-2015.

The final dimension of the SAM-2019 matrix retained is (55*55) or 55 accounts broken down as follows:

- **4 Factors of Production**: unskilled labor (USK), skilled labor (SK), medium-skilled labor (MSK) -and Capital (Cap);
- **4 Agents:** households (HH), Firms (F), government (Gvt), and Rest of World (Row);
- **Three Taxes**: Income and Corporate Taxes (TD), Indirect Taxes and Subsidies (IT) and Customs Duties (TM);
- **21 branches of economic activity;**
- **21 Products;**
- **2 accumulation/savings accounts**: change in stocks (VSTK) and GFCF (INV)

3.2 SAM multiplier analysis:

- ***Model:***

The multiplier concept is applied using economy-wide consistent data on a particular (regional/provincial) economy as is normally contained in a SAM, which extends the basic input-output (I-O model) concept from production to income distribution and includes both social and economic data for a region (Raa & Sahoo 2005).

Multiplier models (also known as multiplier framework) described as matrix models by Thorbecke (1985), assess the consequences of a change in demand on the economy by assuming that any change in the demand for goods results in a proportional change in income use, inputs, and outputs, based on the relationships within the base-year structure of the Social Accounting Matrix (SAM).

It is assumed that in the economic system represented by the SAM, full employment of production factors has not been reached, allowing any increase in the supply of goods and services to be met without a rise in prices.

- **Assumptions of the model:**

The multiplier process is developed here on the many assumptions. In particular:

- Prices are fixed and any changes in demand lead to changes in physical output rather than prices.
- Factor resources are unlimited or unconstrained, so that any increase in demand is matched by increased supply.
- Input coefficients of producers and consumption patterns of households are unaffected by exogenous changes in demand (i.e., linkage effects are linear and there is no behavioral change).

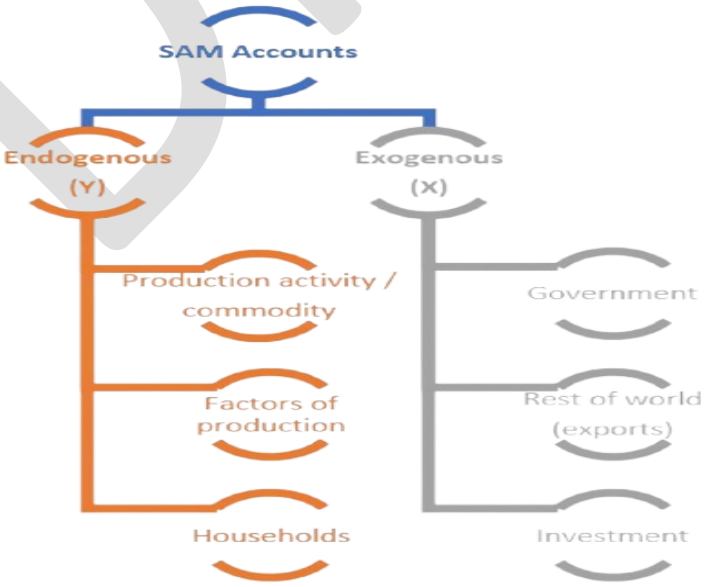
- **Modeling steps:**

To transform the Social Accounting Matrix (SAM) into a multiplier framework, we follow these steps:

1. **Separate the SAM into endogenous and exogenous accounts**:

Typically, accounts such as the government expenditure including social protection, the rest of the world, and capital accumulation are considered exogenous (Breisinger, Thomas, & Thurlow, 2009). In this context, we assume this division to evaluate the impact of increased public spending on social protection as an investment on productive sectors, production factors, and institutional sector incomes. (Figure 6) Indeed, endogenous accounts, where coefficients are considered constant, have a strong correlation between expenditure levels and income, while, for exogenous accounts, expenditures are independent of income.

Figure 6: Endogenous and exogenous accounts of a SAM model



Source: (Breisinger et al., 2009)

2. **Construct the transaction matrix**:

This matrix includes only endogenous accounts and is a square matrix, similar in structure to the original SAM. The transaction matrix is expressed in monetary flows.

3. **Transform the transaction matrix into an average expenditure propensity matrix (A_n)**:

This is achieved by dividing each element of the transaction matrix by the total of its corresponding column. The A_n matrix is expressed as a ratio, where each column sums to one.

4. **Calculate the income vector for endogenous accounts:**

Let y_n represent the vector of total endogenous incomes. According to the income-expenditure relationship, we have:

$$\boldsymbol{y_n = A_n y_n + x_n}$$

where:

- $\boldsymbol{A_n}$ is the average expenditure propensity matrix derived in the previous step,
- $\boldsymbol{x_n}$ is the vector of exogenous injections (e.g., government spending, foreign demand and investment).

5. **Reformulate the income equation:**

To express y_n solely in terms of exogenous injections $\boldsymbol{x_n}$, rearrange the above equation:

$$\boldsymbol{y_n = A_n y_n + x_n}$$

$$\boldsymbol{y_n - A_n y_n = x_n}$$

$$\boldsymbol{y_n(I_n - A_n) = x_n}$$

Finally, we find:

$$\boldsymbol{y_n = (I_n - A_n)^{-1} x_n = M_n x_n}$$

where $\boldsymbol{I_n}$ is the identity matrix, and $\boldsymbol{(I_n - A_n)^{-1} = M_n}$ is the **SAM multiplier matrix**. This matrix measures the impact of changes in exogenous injections $\boldsymbol{x_n}$ on endogenous incomes $\boldsymbol{y_n}$. Each element in this matrix represents the total income change in each endogenous account due to a unit change in an exogenous account.

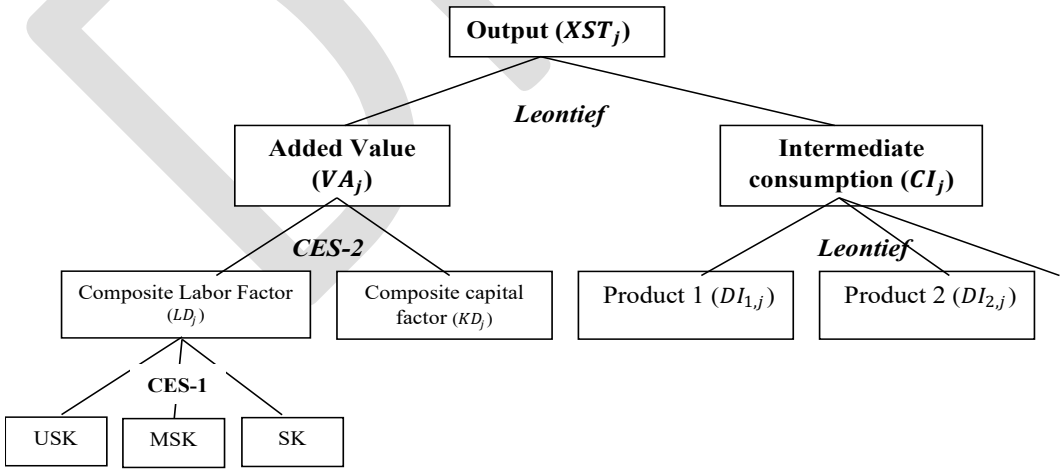
According to Pyatt and Round (1978) the multiplier matrix ($\boldsymbol{M_a}$) can be decomposed into three economically meaningful additive components: *(i) a transfers matrix that picks up the net multiplier effects induced on a given set of accounts by exogenous transfers accruing to the given set; (ii) an open-loop matrix that captures the cross effects between different groups; and (iii) a closed-loop matrix specifying the multiplier effects of an exogenous inflow on an endogenous account and return to the original recipient.*

3.3 CGE Model analysis: The standard PEP-1-t model:

We extend the PEP-1-t Model, a recursive dynamic CGE model, of Decaluwe et al., (2013). Here we briefly outline the main specifications of this model.

The economy's production side is split into sectors, each with a nested structure. Each production level uses a production function that assumes constant returns to scale. At the first level, a Leontief function of value-added and intermediate consumption. At the next level, value added is a constant elasticity of substitution (CES) function of composite labor (LDC) and composite capital (KDC). Each composite input is itself a CES function of different types (Figure **). This approach allows for a detailed analysis of the production process. It can help identify the sources of economic growth, but it relies on the simplifying assumption of constant returns to scale in each production function.

Figure **: Nested production structure



Source: Decaluwe et al., (2013)

On the other hand, the intermediate consumption required for each commodity is directly proportional to the production level in each sector. Each sector may produce multiple

commodities aggregated using a constant elasticity of transformation (CET) function. Finally, quantities to sell domestically or exported are determined by a CET function and relative prices.

On the demand side, the consumption of a commodity is a CES function and depends on the combined quantities of domestic and imported goods. A typical household divides its disposable income, which comes from capital, labor, and transfers from other agents, between spending and saving. The demand for commodities by household is a linear-expenditure system (LES). In this savings-driven-investment model, the combined savings of households, government, and foreign entities determine the total investment amount. The investment demand distinguishes between gross fixed capital formation (GFCF) and changes in inventories (VSTK). Government revenue (income), indirect taxes (related to production, commodities, and foreign trade), and transfers from others are divided among savings, spending on commodities, and transfers to others. The commodity demand for investment and government spending is directly proportional to the total expenditures.

The demand for domestically produced commodities in foreign markets is modeled as an isoelastic function of relative prices, which is calculated as the foreign price of the commodity divided by the domestic price. The level of exogenous foreign savings determines the current account balance in the balance of payments. The nominal exchange is defined as numeraire in this model.

The stock of each type of capital is augmented by investment but decreased by depreciation (Solow (1956)). Investment in public service sectors is typically considered exogenous while that endogenous and dependent on the return in other sectors, which is determined by the ratio of the rental rate to the user cost of capital (i.e., the depreciation and interest rate).

As mentioned, the model incorporates nominal rigidities such as government spending and foreign savings, which are nominal variables treated as exogenous variables.

Population growth is considered in the model, but not technological change. As a result, in the Balanced Growth Path (BGP), all variables except prices grow at the same rate as the population growth rate.

- **Incorporating unemployment (Labor Market in Morocco):**

The original model assumes full labor employment, which is not the reality in Morocco. To capture the existence of unemployment in the Moroccan labor market, we adapted the wage curve, which consists in assuming a negatively sloped relationship between the unemployment rate and the wage rate in each labor market (Blanchflower & Oswald, 1995) as written:

$$\boldsymbol{\omega(l) = A(l).ump(l)^{\sigma(l)}.PIXCON}$$

Where:

- $PIXCON$: the consumer price index;
- $ump(l)$: the unemployment rates;
- $A(l)$: a scale parameter;
- $\omega(l)$: the wage rate;
- $\sigma(l)$: The elasticity of wages with respect to unemployment is negative and equal to -0.1[‡].

We have modified the equilibrium in the labor market to introduce this wage curve in the model. Thus, the labor supply (LS) and the wage rate ($W(l)$) are written as functions of the unemployment rate.

For the calibration, we used data published by the HCP. Indeed, the unemployment rate in 2019 by qualification is presented in the following table:

Table **: The unemployment rate by qualification in Morocco

The unemployment rate in 2019 by qualification	
- **Unskilled labor (USK)**	3,10%
- **Medium skilled work (MSK)**	12,40%
- **Skilled Labor (SK)**	21,90%

Source: HCP, 2019

- **Capturing spillover effects of health in CGE model:**

[‡] as found by Kingdon and Knight (2006).

In the CGE model, externalities related to health can be represented to capture their economic impacts. Externalities are the unintended spillover effects that occur when one economic agent's actions affect others' well-being without being reflected in market prices.

The approach used to model the externality of health is inspired by the literature research that establishes a link between health status and labor productivity. Previous econometric studies found that household incomes depend on health levels and that improving health levels increases worker productivity (Schultz & Tansel, 1997; Lee, 1982; Weisbrod et al., 1974).

In our CGE model, we assume that the externality of health intervenes only at the level of worker productivity, and it can affect health worker status (equation 5 in our model). A healthy worker will be in better physical condition and, therefore, more productive (Rosenzweig & Pitt, 1984; Weisbrod et al., 1974; Malenbaum, 1971). Moreover, a higher level of health extends the life expectancy of a population. As a result, more experienced workers in the economy persist longer and are more productive than the younger workers who would replace them (Ram & Schultz, 1979).

In our CGE model, we follow the same methodology as Savard & Adjovi, (1998) to represent these externalities in the CGE model. At this level, we use a two-parameter logistic growth function as proposed by Oliver (1969) written as follows:

$$\gamma(j) = \frac{k^m}{1 + \epsilon^{-\vartheta X_{SN}}}$$

Where $\gamma(j)$: is the health externality variable, X_{SN}: is government spending on health, ϑ: is the externality's elasticity[§], and k^m: is the maximum level of the externality.

This function enables modeling positive and negative health externalities in the labor market. The function is influenced by government spending on health, the elasticity of health expenditure, and the maximum level of the externality.

- **Welfare measures:**

[§] For the calibration, we used the same elasticity as Savard estimated.

To take account of the variation in household welfare in our model, we use two indicators: the equivalent variation (EV) (Chipman & Moore, 1980) in household utility and the approach introduced by Chen & Ravallion (2004) and Ravallion & Lokshin (2008).

As a starting point, the formation of indirect utility from the Stone-Geary function of households is necessary to calculate the first indicator. The equivalent variation (EV) starts from the reference situation, considering the variation in consumer income equivalent to that in the relative price of products for these consumers to reach the utility level of the new situation.

$$EV = \prod_{i=1}^{I} \left(\frac{P_i^0}{P_i^1}\right)^{\beta_i} \left(Y^1 - \sum_{i=1}^{I} \gamma_i P_i^1\right) - \left(Y^0 - \sum_{i=1}^{I} \gamma_i P_i^0\right)$$

Well-being is improved if EV>0.

In the second indicator introduced by Chen & Ravallion (2004) and Ravallion & Lokshin (2008), changes in household welfare are calculated based on four factors: the price effect, production effect, labor income, and consumption and can be expressed as follows:

$$W_h = (change\ in\ revenue) - (change\ in\ expenditure) - (change\ in\ input) + (change\ in\ wage)$$

- **Model closure:**

The model is run for 10 periods of time (2019-2029). Capital is sector-specific and exogenously set at the base year level for the first period of time. Labor is fully mobile across all sectors.

All commodity markets follow the neoclassical market-clearing system in which each market is cleared when the total endogenous demand equals the total supply through price adjustment. Our numeraire is the nominal exchange rate. World import and export prices are set fixed following the small price-taking economy hypothesis. Current account balance is set fixed at the first period and increases yearly with population growth.

Other variables that grow at the population growth rate are: minimum consumption of commodities in the LES demand equations, government current expenditures, public investment by category and by public sector industry, and changes in inventories. Likewise, total investment expenditure is equal to the sum of agents' savings. For the savings-investment account, real investment adjusts to changes in savings (i.e., savings-driven investment). Also, the sum of the different forms of investment expenditure is equal to total investment.

IV. Choix and justifications of Simulations:

4.1 Strategy of simulations:

Measuring social protection services can be challenging, but using a combination of data from non-market services—such as education, healthcare, social security programs, and cash transfers—provides a valuable proxy for understanding social protection efforts (Ul Mustafa et al., 2021). This approach captures a nation's commitment to supporting its citizens through access to essential services and financial assistance.

Non-market services, often provided by the government or non-profit organizations, include public healthcare, education, and social work, which contribute directly to social protection by enhancing well-being and offering support during vulnerable periods. Further, social security programs offer a financial safety net that addresses social risks and vulnerabilities, further reinforcing social protection. And more, cash transfers, including child allowances and social pensions, provide immediate financial relief and play a key role in poverty alleviation, a primary objective of social protection systems.

Nevertheless, it's important to acknowledge the limitations of this representation. The actual effectiveness of social protection depends on various factors beyond the scope of this analysis, such as the robustness of labor market regulations, the design and accessibility of social assistance, and the resilience of informal support networks, all of which merit further study.

This study's scenarios do not evaluate the design or merits of current social protection programs in Morocco. Instead, the focus is to understand the macroeconomic effects of scaling up investments in social protection programs using a SAM multiplier and CGE model analysis, shedding light on the potential economic growth impacts of increased public spending in this area.

4.2 Plan of Simulations:

In this study, we conduct simulations using a multiplier model and CGE model to examine the potential economic impacts of increased public spending on social protection. The scenarios are as follows:

Simulations in the Multiplier Model

- Sim 1: Increase public spending on social protection by 1% of GDP.
- Sim 2: Increase public spending on social protection by 2% of GDP.

- Sim 3: Increase cash transfer from government to households by 1% of GDP.
- Sim 4: Combined scenario (sim 1 and sim 3)

Simulations in the CGE model

- Sim 5: Increase public spending on social protection by 1 % of GDP on 5 years.
- Sim 6: Increase cash transfer from government to households by 1% of GDP on 5 years.
- Sim 7: Combined scenario (sim 5 and sim 6)

By using the CGE model, we can simulate these scenarios with different financial sources—external, internal, or both—to fund these programs and analyze their dynamic effects on the Moroccan economy. This approach also addresses two key limitations of the multiplier framework.

V. Results and Discussions:

This section discusses each approach's results, beginning with the multiplier model and next with the CGE model. The Multiplier Model analyzes the impact of changes in one sector of the economy on other sectors through a multiplier effect. On the other hand, the CGE model is a more comprehensive approach that considers interdependencies between different sectors and factors of production.

- **Multiplier Model results:**

This study employs a Social Accounting Matrix (SAM) multiplier model to analyze the potential impacts of increased public spending on social protection on the Moroccan economy. We simulated four scenarios: a 1% and 2% GDP increase in overall social protection spending (Sim 1 and Sim 2, respectively), a 1% GDP increase in cash transfers from the government to households (Sim 3), and a combined scenario incorporating both the 1% overall social protection spending increase and the 1% GDP increase in cash transfers (Sim 4). Our analysis reveals notable positive effects on key macroeconomic aggregates across all scenarios, supporting the argument for expanding social protection investments in Morocco. (Tables 3-8)

Table 3: Changes in Macroeconomic Aggregates

Aggregate (aggr)	Base	Sim1	Sim2	Sim3	Sim4
GDP (base price)	1019658	1034714,126	1049770,25	1027568,623	1042624,749
GDP (market price)	1262927	1280573,135	1298472,27	1272933,03	1290832,165

Consumption	660652	668706,1797	676760,359	673094,2986	681148,4783
VA (Value Added)	1006442	1021357,084	1036272,17	1014231,048	1029146,132
Production	1791132	1813469	1835807	1805080	1827418
Imports	563942	567002,7952	570063,59	567402,8142	570463,6094
Exports	464897	464897	464897	464897	464897
Intermediate Consumption	771474	778755	786036	5605696	5653782
Private Savings	93752	94895	96038	95518	96661

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Table 4: Intermediate Consumption Changes

Intermediate Consumption	BASE	SIM 1	Diff	SIM 2	Diff	SIM 3	Diff	SIM 4	Diff
A00	116264	117350	**1086**	118436	**2172**	64145	**-52119**	64695	**-51569**
B05	7606	7676	**70**	7746	**140**	45958	**38352**	46352	**38746**
C00	38385	38690	**305**	38994	**609**	47133	**8748**	47538	**9153**
D01	54535	55102	**567**	55668	**1133**	47363	**-7172**	47770	**-6765**
D02	35650	35848	**198**	36046	**396**	148951	**113301**	150229	**114579**
D03	51918	52673	**755**	53428	**1510**	148758	**96840**	150034	**98116**
D04	135433	136165	**732**	136897	**1464**	139151	**3718**	140345	**4912**
D05	142839	143786	**947**	144733	**1894**	138615	**-4224**	139804	**-3035**
E00	22669	23020	**351**	23371	**702**	135287	**112618**	136448	**113779**
F45	5545	5634	**89**	5723	**178**	133426	**127881**	134570	**129025**
G00	6212	6305	**93**	6398	**186**	132991	**126779**	134132	**127920**
H55	9716	9871	**155**	10025	**309**	132976	**123260**	134117	**124401**
I01	17473	17651	**178**	17829	**356**	132965	**115492**	134105	**116632**
I02	8181	8331	**150**	8481	**300**	131420	**123239**	132548	**124367**
J00	41799	42175	**376**	42551	**752**	325768	**283969**	328563	**286764**
K00	70078	71130	**1052**	72182	**2104**	325274	**255196**	328064	**257986**
APU	0	0	**0**	0	**0**	519650	**519650**	524108	**524108**
PS	1868	1938	**70**	2009	**141**	714087	**712219**	720212	**718345**
EM	0	0	**0**	0	**0**	714087	**714087**	720212	**720212**
SNM	812	820	**8**	828	**16**	714087	**713275**	720212	**719400**
OP0	4491	4591	**100**	4691	**200**	713603	**709112**	719724	**715233**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Table 5: Changes in sectorial production

Production	BASE	SIM 1	Diff	SIM 2	Diff	SIM 3	Diff	SIM 4	Diff
A00	191976	193644	**1668**	195312	**3336**	194437	**2461**	196105	**4129**
B05	15251	15371	**120**	15491	**240**	15429	**178**	15549	**298**
C00	35964	36161	**197**	36357	**393**	36138	**174**	36335	**371**
D01	189500	191305	**1805**	193111	**3611**	192158	**2658**	193964	**4464**
D02	63473	63776	**303**	64078	**605**	63900	**427**	64203	**730**
D03	66343	66851	**508**	67360	**1017**	66739	**396**	67247	**904**
D04	149845	150268	**423**	150690	**845**	150278	**433**	150701	**856**

D05	67224	67673	**449**	68122	**898**	67718	**494**	68167	**943**
E00	51890	52545	**655**	53199	**1309**	52576	**686**	53231	**1341**
F45	142770	142908	**138**	143047	**277**	142894	**124**	143032	**262**
G00	138529	139389	**860**	140249	**1720**	139527	**998**	140387	**1858**
H55	46722	47271	**549**	47821	**1099**	47411	**689**	47961	**1239**
I01	85160	85760	**600**	86360	**1200**	85845	**685**	86445	**1285**
I02	36013	36438	**425**	36864	**851**	36522	**509**	36947	**934**
J00	77264	78014	**750**	78764	**1500**	78203	**939**	78954	**1690**
K00	153211	154500	**1289**	155789	**2578**	154316	**1105**	155605	**2394**
L75	155826	157683	**1857**	159540	**3714**	156107	**281**	157964	**2138**
EM	67287	67999	**712**	68710	**1423**	67333	**46**	68045	**757**
ENM	11008	14464	**3457**	17921	**6913**	11093	**85**	14549	**3542**
SN	24583	29888	**5304**	35192	**10609**	24830	**247**	30134	**5551**
OP0	21293	21562	**269**	21830	**537**	21626	**333**	21895	**602**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Table 6: Changes in Macroeconomic Aggregates

Importations	**BASE**	**SIM 1**	**Diff**	**SIM 2**	**Diff**	**SIM 3**	**Diff**	**SIM 4**	**Diff**
A00	23729	23935	**206**	24141	**412**	24034	**305**	24240	**511**
B05	489	493	**4**	496	**7**	494	**5**	498	**9**
C00	18146	18244	**98**	18342	**196**	18233	**87**	18331	**185**
D01	32904	33220	**316**	33536	**632**	33373	**469**	33689	**785**
D02	39135	39320	**185**	39505	**370**	39398	**263**	39583	**448**
D03	46996	47362	**366**	47727	**731**	47270	**274**	47635	**639**
D04	214920	215493	**573**	216065	**1145**	215505	**585**	216078	**1158**
D05	117865	118660	**795**	119454	**1589**	118741	**876**	119535	**1670**
E00	193	195	**2**	198	**5**	196	**3**	198	**5**
F45	0	0	0	0	0	0	0	0	0
G00	0	0	0	0	0	0	0	0	0
H55	3314	3354	**40**	3393	**79**	3364	**50**	3403	**89**
I01	38882	39124	**242**	39366	**484**	39195	**313**	39437	**555**
I02	1822	1843	**21**	1865	**43**	1848	**26**	1869	**47**
J00	1921	1940	**19**	1958	**37**	1944	**23**	1963	**42**
K00	22289	22467	**178**	22646	**357**	22450	**161**	22628	**339**
APU	0,00	0	0	0	0	0	0	0	0
PS	0,00	0	0	0	0	0	0	0	0
EM	0,00	0	0	0	0	0	0	0	0
SNM	0,00	0	0	0	0	0	0	0	0
OP0	1337	1354	**17**	1371	**34**	1358	**21**	1375	**38**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Table 7: Changes in Household Consumption

Household Consumption	**BASE**	**SIM 1**	**Diff**	**SIM 2**	**Diff**	**SIM 3**	**Diff**	**SIM 4**	**Diff**
A00	83307,69165	84323	**1016**	85339	**2031**	84877	**1569**	85892	**2585**

B05	3773,482601	3819	**46**	3865	**92**	3845	**71**	3891	**117**
C00	375,6904939	380	**5**	385	**9**	383	**7**	387	**12**
D01	160275,1012	162229	**1954**	164183	**3908**	163294	**3019**	165248	**4972**
D02	29396,91678	29755	**358**	30114	**717**	29951	**554**	30309	**912**
D03	16239,58878	16438	**198**	16636	**396**	16545	**306**	16743	**504**
D04	30206,81419	30575	**368**	30943	**737**	30776	**569**	31144	**937**
D05	51056,87591	51679	**622**	52302	**1245**	52018	**962**	52641	**1584**
E00	31434,61737	31818	**383**	32201	**766**	32027	**592**	32410	**975**
F45	4713	4770	**57**	4828	**115**	4802	**89**	4859	**146**
G00	8623	8728	**105**	8833	**210**	8785	**162**	8891	**268**
H55	38732,52772	39205	**472**	39677	**944**	39462	**729**	39934	**1202**
I01	36303,0663	36746	**443**	37188	**885**	36987	**684**	37429	**1126**
I02	30613,45068	30987	**373**	31360	**746**	31190	**577**	31563	**950**
J00	35429,18694	35861	**432**	36293	**864**	36096	**667**	36528	**1099**
K00	51541,86724	52170	**628**	52799	**1257**	52513	**971**	53141	**1599**
APU	3349,00	3390	**41**	3431	**82**	3412	**63**	3453	**104**
PS	13385,05	13548	**163**	13711	**326**	13637	**252**	13800	**415**
EM	1370,63	1387	**17**	1404	**33**	1396	**26**	1413	**43**
SNM	7526,32	7618	**92**	7710	**184**	7668	**142**	7760	**234**
OP0	22998,12212	23278	**280**	23559	**561**	23431	**433**	23712	**714**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Table 8: Changes in factors production

		A00	B05	C00	D01	D02	D03	D04	D05	E00	F45	G00	H55	I01	I02	J00	K00	L75	EM	ENM	SN	OP0
BASE	Unskilled work (USK)	8788	5574	864	5627	3613	5842	7053	3281	1628	13662	9035	4189	5316	1850	1035	6081	13792	8829	161	1385	320
	Medium skilled work (MSK)	1160	1275	354	2010	1445	2252	2719	1264	763	3238	4018	1932	2296	799	434	946	6713	28481	520	4467	134
	Skilled work (SK)	227	978	1479	3038	1613	4060	4902	2279	7071	1972	10281	3192	5083	1769	16585	13881	70901	21205	387	3326	5124
	Capital	118366	3323	22857	42726	12617	13480	28363	18955	22143	42263	66260	20640	34203	17689	33915	109957	16017	1932	8597	8315	9325
Sim 1	USK	8864	5617	869	5681	3630	5887	7073	3302	1649	13675	9091	4238	5353	1872	1045	6132	13956	8922	212	1684	324
	MSK	1170	1285	356	2029	1452	2269	2726	1273	772	3241	4042	1955	2313	809	438	954	6793	28782	683	5431	136
	SK	229	986	1487	3067	1621	4091	4915	2294	7160	1974	10345	3229	5119	1790	16746	13998	71746	21429	509	4044	5189
	Capital	119394	3349	22982	43133	12677	13583	28443	19082	22422	42304	66671	20883	34444	17898	34244	110882	16208	1953	11296	10109	9443
Sim 2	USK	8940	5661	874	5734	3647	5932	7093	3324	1669	13689	9147	4288	5391	1894	1055	6183	14121	9016	262	1982	328
	MSK	1180	1295	358	2048	1459	2286	2734	1281	782	3244	4067	1978	2329	818	442	962	6873	29083	847	6395	137
	SK	231	994	1495	3096	1628	4122	4929	2310	7250	1976	10409	3267	5155	1811	16907	14115	72591	21653	630	4761	5253
	Capital	120423	3375	23107	43540	12737	13687	28523	19208	22702	42345	67083	21125	34685	18107	34574	111807	16399	1973	13996	11903	9560
Sim 3	USK	8900	5639	868	5706	3637	5877	7073	3305	1650	13674	9100	4251	5358	1876	1048	6124	13817	8835	162	1399	325
	MSK	1175	1290	356	2038	1455	2265	2726	1274	773	3240	4046	1961	2315	811	439	953	6725	28500	524	4512	136
	SK	230	990	1486	3081	1624	4084	4916	2296	7165	1974	10355	3239	5124	1794	16787	13982	71029	21219	390	3359	5204
	Capital	119883	3362	22968	43325	12702	13560	28445	19094	22436	42300	66737	20945	34478	17939	34327	110750	16046	1934	8663	8398	9471
Sim 4	USK	8977	5682	873	5760	3654	5922	7093	3327	1670	13687	9156	4300	5396	1898	1058	6176	13981	8928	213	1698	329
	MSK	1185	1300	358	2057	1462	2283	2734	1282	782	3243	4071	1984	2331	820	443	961	6805	28801	687	5476	138
	SK	232	998	1495	3110	1632	4115	4930	2311	7254	1976	10419	3276	5160	1815	16948	14098	71874	21444	512	4077	5269
	Capital	120912	3388	23093	43732	12762	13664	28525	19221	22715	42341	67149	21187	34719	18148	34657	111675	16237	1954	11363	10192	9588
Diff Sim 1	USK	76	44	5	54	17	45	20	22	21	13	56	49	37	22	10	51	164	93	51	299	4
	MSK	10	10	2	19	7	17	8	8	10	3	25	23	16	9	4	8	80	301	163	964	2
	SK	2	8	8	29	8	31	14	15	89	2	64	38	36	21	161	117	845	224	122	718	65

	Capital	1028	26	125	407	60	103	80	127	279	41	411	243	241	209	329	925	191	20	2700	1794	118
Diff Sim 2	**USK**	153	88	9	107	34	90	40	44	41	26	112	99	75	44	20	102	329	187	101	598	8
	MSK	20	20	4	38	14	35	15	17	19	6	50	45	32	19	8	16	160	602	327	1928	3
	SK	4	15	16	58	15	62	28	30	178	4	128	75	72	42	322	234	1690	449	243	1435	129
	Capital	2057	52	250	814	120	207	160	253	559	82	823	485	482	418	659	1850	382	41	5399	3588	235
Diff Sim 3	**USK**	113	65	4	79	24	35	20	24	22	12	65	62	43	26	13	44	25	6	1	14	5
	MSK	15	15	2	28	10	13	8	9	10	3	29	29	18	11	5	7	12	19	4	45	2
	SK	3	11	7	43	11	24	14	17	94	2	74	47	41	25	202	100	128	14	3	33	80
	Capital	1517	39	111	599	85	80	82	139	293	37	477	305	275	250	412	793	29	1	66	83	146
Diff Sim 4	**USK**	189	109	9	133	42	80	40	46	42	25	121	111	80	48	23	95	189	99	52	313	9
	MSK	25	25	4	47	17	31	16	18	20	6	54	51	35	21	9	15	92	321	167	1009	4
	SK	5	19	15	72	19	55	28	32	183	4	138	85	77	46	363	217	973	239	125	751	145
	Capital	2546	65	236	1006	145	184	162	266	572	78	889	547	516	459	742	1718	220	22	2766	1878	263

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Simulations 1 and 2: increase public spending on social protection

Start by examining Simulations 1 and 2, which involve increasing public spending on social protection by 1% and 2% of GDP. The diagram below (Figure 7) illustrates the circular flow of income resulting from this increase in public spending on social protection.

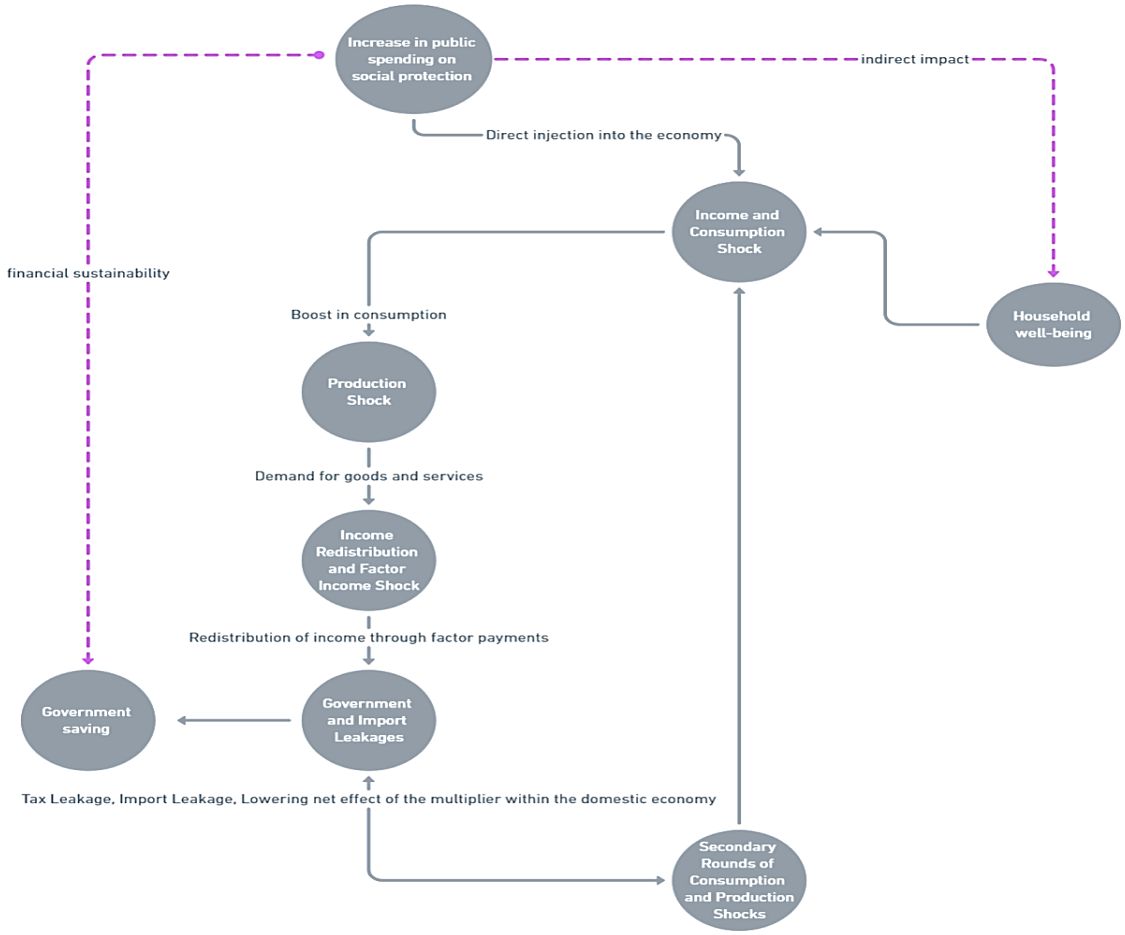
The direct injection of funds enhances consumption, initiating a production shock. This surge in demand for goods and services leads to a boost in income and consumption, further amplifying production and ultimately enhancing household well-being. This cycle continues with subsequent rounds of consumption and production increases.

However, government savings and leakages from taxes and imports reduce the overall multiplier effect within the domestic economy. The dashed purple line represents the indirect impact of enhanced social protection on household well-being, separate from the direct economic effects.

Simulations 1 and 2 examine the impact of increasing public spending on social protection by 1% and 2% of GDP, respectively. We observe from table 3 a gradual increase in GDP at base prices across the simulations. Starting from the base scenario of 1019658, GDP increases by 1.43% in Sim 1 (1034714) and by 2.93% in Sim 2 (1049770). This growth indicates that public spending on social protection positively influences economic output. By redistributing income and supporting vulnerable groups, increased social protection may boost demand and contribute to economic expansion.

Similarly, GDP at market prices rises with each simulation. In Sim 1, it climbs to 1280573, a 1.38% increase, and in Sim 2, it reaches 1298472, or a 2.83% increase from the base scenario. These results suggest that the rise in demand from higher social protection spending stimulates aggregate demand, raising the price level and potentially benefiting overall economic activity.

Figure 7: Circular Income Flow in the Multiplier Process (sim 1)



Source: Developed by the authors.

Consumption grows steadily across the simulations, with values reaching 668706 in Sim 1 and 676760 in Sim 2, representing increases of around 1.22% and 2.44%, respectively. This positive shift reflects an increase in household consumption due to greater income stability and improved welfare from social protection benefits. When individuals have more disposable income, they tend to spend more on goods and services, which in turn stimulates demand and boosts economic growth.

Value Added (VA), which measures the total value added by the production process, follows a similar trend of steady increases. From a base value of 1006442, VA rises by 1.47% to 1021357 in Sim 1 and by 3% to 1036272 in Sim 2. This indicates that social protection spending not only boosts overall economic activity but also enhances productivity within sectors. The increase in VA suggests that businesses respond to heightened demand by producing more, leading to a healthier economy and potentially more job creation.

Production levels also exhibit growth with each increase in social protection spending. Starting from a base value of 1791132, production reaches 1813469 in Sim 1 (a 1.25% increase) and 1835807 in Sim 2 (a 2.49% increase). This rise in production is likely due to the multiplier effect of social protection spending, where initial increases in spending stimulate further rounds of spending in the economy. As households experience increased security and financial support, they purchase more goods and services, prompting businesses to ramp up production to meet the demand. (Production linkages)

These results clearly indicate that increasing social protection spending can serve as an effective stimulus. By injecting more funds into the economy, the government supports households, which leads to higher aggregate demand. This increase in demand translates into higher production, GDP, and value added, which are beneficial to economic stability and growth.

The steady rise in consumption emphasizes the role of social protection in driving consumption-led growth. When lower-income households receive more support, their spending power increases, which can stimulate sectors that provide essential goods and services.

By focusing on social protection, the economy may also benefit in the long term from improved well-being and reduced poverty, which can foster a healthier and more productive workforce. This welfare-oriented approach helps address inequalities and ensures broader, more inclusive economic development.

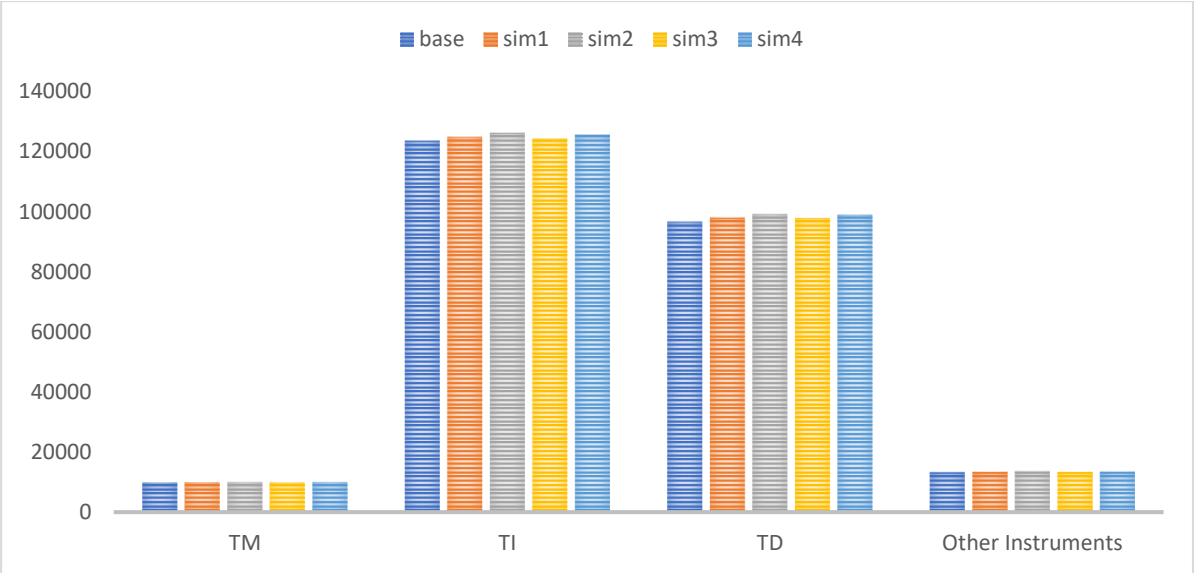
However, increases in public spending on social protection were funded through changes in various tax instruments, including Customs Duties (TM), Income and Corporate Taxes (TD), Indirect Taxes and Subsidies (TI), and Other Instruments. While each tax category shows incremental increases across simulations, the public savings consistently decrease from the base value. (Table 9)

Table 9: Changes in Taxes Instruments

Taxes instruments	TM	TI	TD	Other Instruments	public savings
Base	9768	123633	96652	13216	44271
Sim1	9834,808733	124778,5097	97888,64825	13357,04171	37256
Sim2	9901,617467	126177,0194	99125,29651	13498,08342	30241
Sim3	9858,866313	124359,9949	97807,97073	13337,57532	37066
Sim4	9925,675046	125758,5045	99044,61898	13478,61703	30051

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Figure 8: Changes in Taxes Instruments



Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

In the base scenario, public savings are at 44271, but they decrease to 37256 in Sim 1 and 30241 in Sim 2. This decline indicates that, despite increased tax revenue from various sources, the higher spending on social protection negatively impacts the fiscal balance, leading to reduced public savings.

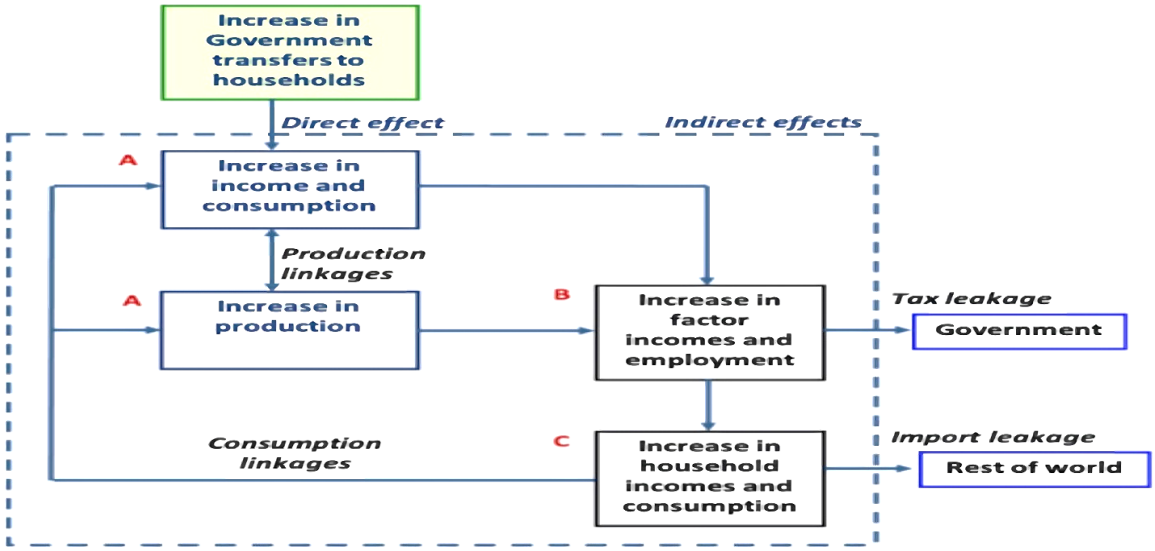
The outcome suggests that the financing of increased public spending through taxes alone may not be effective in sustaining public savings levels. As spending on social protection rises, the government's financial capacity to save diminishes, which could imply potential challenges for long-term fiscal sustainability if the spending is maintained without additional sources of revenue or budget adjustments. This highlights the need for careful fiscal planning, as relying solely on taxes may not suffice to offset the expenditure impact fully.

Simulations 3: increase in cash transfers from government to household

The government's decision to shift from a universal subsidy system to a targeted cash transfer program needs to be evaluated before the policy is implemented. In this case, we are assessing the impact of an increase in government transfers to households. That is, we aim to evaluate how the economy would respond to an injection of one monetary unit of government transfers into household accounts. In this context, the simulation 3 -1% GDP increase in cash transfers- showcases a slightly different income flow (Figure 9). The direct cash injection to households immediately boosts their disposable income, resulting in a more pronounced initial impact on consumption. This consumption surge stimulates production, though potentially with a different

sectoral distribution compared to Sim 1, given the broader spending choices available to households receiving cash transfers. The subsequent rounds of the multiplier process are similar to Sim 1, with increased production leading to higher incomes, further driving consumption and economic growth.

Figure 9: Circular Income Flow in the Multiplier Process (sim 3)



Source: based on (…)

The results presented in Table 3 demonstrate the positive effects of the simulated transfer cash on major macroeconomic aggregates. Across all scenarios, GDP (both at base and market prices), consumption, value added, and production exhibit increases. However, Sim 3 (cash transfers) leads to a proportionally larger increase in consumption compared to the equivalent GDP percentage increase in Sim 1, suggesting a higher marginal propensity to consume out of cash transfers than out of general social protection spending.

In the other words, Growth Rates of Macroeconomic Aggregates Relative to Baseline of simulation 1 and 3 show that Sim 1, generates greater GDP, value-added, and production growth (Table 10). This stems from its wider impact on various economic sectors and its indirect boost to household incomes, particularly benefiting medium-skilled workers (Table 11). While Sim 1 increases consumption, its effect is less direct than Sim 3.

Moreover, Sim 3, focusing on direct cash transfers, generates a larger increase in consumption (Table 10) due to the immediate rise in disposable income. Although it generates positive

growth in household income across all factors, the magnitudes are smaller than in Sim 1 (Table 10). Its overall effect on GDP and production is also more limited.

Table 10: Growth Rates of Macroeconomic Aggregates Relative to Baseline

Indicator	Sim 1 Growth Rate (%)	Sim 3 Growth Rate (%)
GDP (base price)	1.49%	0.78%
GDP (market price)	1.40%	0.55%
Consumption	1.34%	1.88%
Value Added (VA)	1.48%	0.78%
Production	1.25%	0.78%
Imports	0.54%	0.61%
Private Savings	1.22%	1.89%

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Table 11: Growth Rates of household income from Baseline

Factor	Sim 1 Growth Rate (%)	Sim 3 Growth Rate (%)
Unskilled Work (USK)	1.07%	0.77%
Medium Skilled Work (MSK)	2.52%	0.48%
Skilled Work (SK)	1.31%	0.49%
Capital	1.45%	0.89%
Household Income	1.50%	0.71%

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Fiscally, both simulations reduce public savings (Table 12). Sim 1, however, leads to slightly higher growth in tax revenues due to its broader economic stimulus. Sim 3 shows a comparatively larger decrease in public savings, highlighting the trade-off between direct household support and its immediate budgetary cost.

Indeed, Sim 1, representing broad-based social protection spending, stimulates wider economic growth, while Sim 3, focused on direct cash transfers, more effectively targets consumption and provides immediate household support. Our simulations demonstrate that public spending on social protection in Morocco has significant impacts on macroeconomic aggregates and fiscal instruments, differing notably from the effects of a direct cash transfer policy. Specifically, broad social protection spending (Sim 1) generates greater overall economic expansion, as evidenced by higher growth in GDP, value-added, and production. This wider impact comes at the cost of a larger decrease in public savings, though it also generates modestly higher tax revenues. Conversely, direct cash transfers (Sim 3), while having a smaller overall economic impact, lead to a more substantial increase in consumption and a comparatively larger decrease in public savings, reflecting the direct and immediate nature of this intervention.

Table 12: Growth Rates of fiscal instruments from Baseline

Instrument	**Sim 1 Growth Rate (%)**	**Sim 3 Growth Rate (%)**
TM (Customs Duties)	0.68%	0.60%
TI (indirect Tax Instruments)	1.17%	0.58%
TD (Direct Taxes)	1.28%	1.14%
Other Instruments	0.92%	0.85%
Public Savings	-15.84%	-16.52%

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Simulations 4: increase in cash transfers and public spending on social protection

Simulation 4, representing a combined approach to social protection by integrating both broad spending increases and targeted cash transfers (each at 1% of GDP), demonstrates the strongest and most balanced positive impacts across the Moroccan economy. (table 13)

This combined strategy leverages the strengths of both individual approaches. While broad social protection spending (Sim 1) stimulates overall economic activity, direct cash transfers (Sim 3) efficiently boost consumption and provide immediate household support. The combined effect is greater than the sum of its parts, indicating synergistic benefits.

This synergy is evident in the macroeconomic results. Sim 4 generates the highest growth rates for most aggregates, including GDP (base price: 2.26%), consumption (3.23%), value-added (2.25%), and production (2.02%). This robust growth is fueled by both the increased economic activity from the broader spending and the direct boost to consumer demand from cash transfers, creating a positive feedback loop. The increase in private savings (2.86%) further strengthens the economy's long-term prospects.

Table 13: Growth Rates of Macroeconomic Aggregates Relative to Baseline

Indicator	**Sim 1 Growth Rate (%)**	**Sim 3 Growth Rate (%)**	**Sim 4 Growth Rate (%)**
GDP (base price)	1.49%	0.78%	**2.26%**
GDP (market price)	1.40%	0.55%	**2.11%**
Consumption	1.34%	1.88%	**3.23%**
Value Added (VA)	1.48%	0.78%	**2.25%**
Production	1.25%	0.78%	**2.02%**
Imports	0.54%	0.61%	**0.81%**
Private Savings	1.22%	1.89%	**2.86%**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

The benefits of the combined approach also extend to factor incomes. While Sim 1 primarily benefits medium-skilled workers, Sim 4 generates strong growth across all factor categories, including unskilled work (1.72%), skilled work (2.01%), and capital (2.28%). Importantly, overall household income experiences a significant boost (2.25%), highlighting the combined policy's effectiveness in improving household welfare.

Table 14: Growth Rates of Factor Income from Baseline (%)

Factor	**Sim 1 Growth Rate (%)**	**Sim 3 Growth Rate (%)**	**Sim 4 Growth Rate (%)**

Unskilled work (USK)	1.07%	0.77%	1.72%
Medium skilled work (MSK)	2.52%	0.48%	2.89%
Skilled work (SK)	1.31%	0.49%	2.01%
Capital	1.45%	0.89%	2.28%
Household Income	**1.50%**	**0.71%**	**2.25%**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

Furthermore, Sim 4 leads to the highest growth in tax revenues (1.83% for total tax revenue), driven by the robust economic expansion. This synergistic effect on fiscal instruments suggests that the combined policy can partially offset its budgetary costs by generating higher tax revenues, improving the fiscal sustainability of social protection programs.

Table 15: Growth Rates of Fiscal Instruments from Baseline (%)

Instrument	**Sim 1 Growth Rate (%)**	**Sim 3 Growth Rate (%)**	**Sim 4 Growth Rate (%)**
TM (Customs Duties)	0.68%	0.60%	1.61%
TI (Indirect Taxes)	1.17%	0.58%	1.81%
TD (Direct Taxes)	1.28%	1.14%	2.39%
Other Instruments	0.92%	0.85%	1.30%
Total Tax Revenue	**1.11%**	**0.70%**	**1.83%**

Source: Developed by the authors (Multiplier model based on Morocco's 2019 SAM)

- **CGE Model simulations results:**

The model employs specific closure rules to ensure equilibrium conditions across key macroeconomic accounts. For the savings-investment balance, two options are available: (1) fixing the savings rate while allowing investment to adjust endogenously, or (2) fixing investment while letting savings rates adjust.

The government account offers three closure choices: (1) fixing government demand for commodities, (2) allowing government demand to adjust, or (3) fixing both government demand and savings while adjusting direct household income taxes.

For the foreign exchange market, equilibrium is achieved either by fixing foreign savings (FSAV) with a flexible exchange rate or by fixing the exchange rate while allowing foreign savings to adjust. These closures reflect alternative macroeconomic assumptions, such as Keynesian or neoclassical adjustments, and are selected based on the UNI-CGE model (Burfisher, M., & Thierfelder, K., 2024).

Currently working on.

VI. Conclusion and policy recommendation:

Despite these limitations, our findings provide compelling evidence that increased public spending on social protection can stimulate economic growth in Morocco. The multiplier effects generated by both overall social protection spending and targeted cash transfers lead to positive impacts on key macroeconomic aggregates, consumption, income, and production across various sectors in Morocco. Furthermore, the simulations suggest potential for social protection spending to improve income of household and in turn, may reduce inequality and contribute to poverty alleviation. These findings highlight the importance of social protection not just as a social welfare measure, but also as a driver of economic development in Morocco. While further research is needed to fully understand the dynamic and distributional impacts, our analysis strongly supports the expansion of strategic investments in social protection programs.

The key recommendations in this study are as follows. First, combining social protection policies may contribute more significantly to economic growth and development. Second, fiscal reforms are essential to create greater fiscal space to fund these programs, as simulations show that the growth of tax instruments is less than the growth of the public deficit. Finally, public spending on social protection in Morocco significantly impacts macroeconomic aggregates and fiscal instruments, differing notably from the effects of a direct cash transfer policy.

Our study employs a static Social Accounting Matrix (SAM) multiplier model, which provides important insights into the short-run effects of social protection spending. However, it falls short of capturing dynamic adjustments, such as shifts in labor supply, investment behavior, and technological progress, all of which can impact long-term growth trajectories. To address this limitation, we utilize a dynamic computable general equilibrium (CGE) model in the second part of our analysis to explore the longer-term impacts of these programs.

Furthermore, our scenarios consider only aggregate changes in social protection spending without analyzing the specific design and targeting of individual programs. The effectiveness of social protection in promoting economic growth and reducing poverty depends crucially on program design, implementation, and the broader institutional context. Future research should delve deeper into these program-specific aspects to understand the optimal design and targeting of social protection interventions in Morocco.

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APPENDIX:

A. EQUATION SYSTEM FOR SAM MULTIPLIER:

In appendix, we present equation for SAM Multiplier model (source: **)

We replace actual numbers in the SAM with the following symbols.

	Activities		Commodities		Factors	House-holds	Exogenous demand	Total
	A1	A2	C1	C2	F	H	E	
A1			X_1					X_1
A2				X_2				X_2
C1	Z_{11}	Z_{12}				C_1	E_1	Z_1
C2	Z_{21}	Z_{22}				C_2	E_2	Z_2
F	V_1	V_2						V
H					$V_1 + V_2$			Y
E			L_1	L_2		S		E
Total	X_1	X_2	Z_1	Z_2	V	Y	E	

We divide columns by their total to derive the coefficients matrix (M-matrix). Note that the M-matrix excludes the exogenous components of demand.

	Activities		Commodities		Factors	House-holds	Exogenous demand	Total
	A1	A2	C1	C2	F	H	E	
A1			$b_1 = X_1/Z_1$					X_1
A2				$b_2 = X_2/Z_2$				X_2
C1	$a_{11}=Z_{11}/X_1$	$a_{12}=Z_{12}/X_2$				$c_1 = C_1/Y$	E_1	Z_1
C2	$a_{21}=Z_{21}/X_1$	$a_{22}=Z_{22}/X_2$				$c_2 = C_2/Y$	E_2	Z_2
F	$v_1=V_1/X_1$	$v_2=V_2/X_2$						V
H					1			Y
E			$l_1 = L_1/Z_1$	$l_2 = L_2/Z_2$		s = S/Y		E
Total	1	1	1	1	1	1	E	

Values

X Gross output of each activity (i.e., X_1 and X_2)

Z Total demand for each commodity (i.e., Z_1 and Z_2)

V Total factor income (equal to household income)

Y Total household income (equal to total factor income)

E Exogenous components of demand (i.e., government, investment, and exports)

Shares

a Technical coefficients (i.e., input or intermediate shares in production)

b Share of domestic output in total demand

v Share of value-added or factor income in gross output

l Share of the value of total demand from imports or commodity taxes

c Household consumption expenditure shares

s Household savings rate (i.e., savings as a share of household income)

So we can now derive equations representing the relationships in the SAM. We start with the simple demand equations.

$$\begin{aligned} Z_1 &= a_{11}X_1 + a_{12}X_2 + c_1Y + E_1 \\ Z_2 &= a_{21}X_1 + a_{22}X_2 + c_2Y + E_2 \end{aligned} \tag{A1}$$

Total demand = intermediate demand + household demand + exogenous demand

From the SAM, we know that domestic production X is only part of total demand Z.

$$X_1 = b_1Z_1 \quad \text{and} \quad X_2 = b_2Z_2$$

We know that household income Y depends on the share each factor earns in each sector.

$$Y = v_1X_1 + v_2X_2 \quad \text{or} \quad Y = v_1b_1Z_1 + v_2b_2Z_2$$

Now we replace Xs and Vs in Equation A1.

$$\begin{aligned} Z_1 &= a_{11}b_1Z_1 + a_{12}b_2Z_2 + c_1(v_1b_1Z_1 + v_2b_2Z_2) + E_1 \\ Z_2 &= a_{21}b_1Z_1 + a_{22}b_2Z_2 + c_2(v_1b_1Z_1 + v_2b_2Z_2) + E_2 \end{aligned}$$

We move everything except for E onto the left-hand side.

$$\begin{aligned} Z_1 - a_{11}b_1Z_1 - c_1v_1b_1Z_1 - a_{12}b_2Z_2 - c_1v_2b_2Z_2 &= E_1 \\ -a_{21}b_1Z_1 - c_2v_1b_1Z_1 + Z_2 - a_{22}b_2Z_2 - c_2v_2b_2Z_2 &= E_2 \end{aligned}$$

We group Zs together.

$$\begin{aligned} (1 - a_{11}b_1 - c_1v_1b_1)Z_1 + (-a_{12}b_2 - c_1v_2b_2)Z_2 &= E_1 \\ (-a_{21}b_1 - c_2v_1b_1)Z_1 + (1 - a_{22}b_2 - c_2v_2b_2)Z_2 &= E_2 \end{aligned} \tag{A2}$$

We express Equation A2 in matrix format.

$$\begin{pmatrix} 1-a_{11}b_1-c_1v_1b_1 & -a_{12}b_2-c_1v_2b_2 \\ -a_{21}b_1-c_2v_1b_1 & 1-a_{22}b_2-c_2v_2b_2 \end{pmatrix}\begin{pmatrix} Z_1 \\ Z_2 \end{pmatrix} = \begin{pmatrix} E_1 \\ E_2 \end{pmatrix} \quad \text{(A3)}$$

The first term in Equation A3 is the identity matrix (I) minus the coefficient matrix (M).

$$\begin{pmatrix} 1-a_{11}b_1-c_1v_1b_1 & -a_{12}b_2-c_1v_2b_2 \\ -a_{21}b_1-c_2v_1b_1 & 1-a_{22}b_2-c_2v_2b_2 \end{pmatrix} = I - M$$

If we rename the other two vectors Z and E then we can simply Equation A3.

$$(I - M).Z = E \quad \text{(A4)}$$

Rearranging, we get the final multiplier equation.

$$Z = (I - M)^{-1}E \quad \text{(A5)}$$

Total demand = multiplier matrix × exogenous demand

This tells us that when exogenous demand [E] increases, then after you have taken all the direct and indirect multiplier effects into account [$(I\text{-}M)^{-1}$], you will end up with a final increase in total demand equal to Z.

B. MODEL PEP 1.T: EQUATIONS, SET AND BLOCS

Currently working on.