# *Balancing investment, consumption and employment in Tanzania: Why consumption and input-output multipliers matter for economic planning*

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Marc Wuyts[1]

1. Professor (Emeritus) of Quantitative Applied Economics, International Institute of Social Studies, Erasmus University Rotterdam, The Netherlands. Email address: mewuyts@gmail.com

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Innovation Knowledge Development Director
Faculty of Arts and Social Sciences
The Open University
Walton Hall
Milton Keynes
MK7 6AA
Email: IKD-Enquiries@open.ac.uk
Website: http://www.open.ac.uk/ikd/

**Abstract**
This paper argues that the premise of promoting economic growth by tightening the belt on consumption is problematic in the Tanzanian context characterised by extensive surplus labour and rapid population and labour force growth. The role of consumption in the process of industrialisation is intimately linked with the question of absorbing labour in the economy. Planning from a long term perspective cannot just solely focus on setting a high target rate of growth and a high pace of investment without considering how the planned patterns of investment enable or constrain the trajectory of growth in employment and the production of wage goods over the planning horizon. The paper develops a macroeconomic conceptual framework that combines the circular flow of income with the circular flow of intermediate consumption. It uses Input / Output Tables and the Labour Force Survey data to demonstrate the importance of explicitly addressing industrial sectoral linkages and the composition of the labour force across sectors and across formal and informal employment to ensure that economic growth does not go at the expense of employment and consumption. The paper argues that multiplier analysis matters, not only as a tool for short run planning, but also within a long run perspective because the smooth operation of consumption and input-output multipliers in the future without hitting capacity constraints in the process depends on whether the future expansion of consumption and employment remains in tune with the pace and the patterns of investment today.

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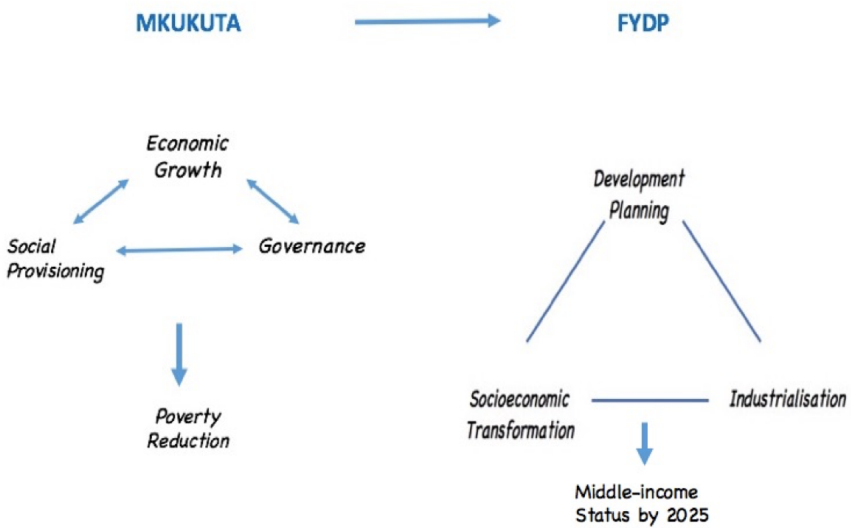
## *1. Introduction*

Tanzania's Development Vision 2025 formulated in the late 1990s envisaged that the country should reach middle-income status by 2025, through the development of sustainable productive and export capacity, poverty reduction and rapid socio-economic transformation. The vision also called for tackling the problem of what it referred to as the donor dependency syndrome in policy making and execution fuelled by heavy reliance on inflows of foreign aid.

The formulation of Tanzania Vision 2025 brought a significant change in macroeconomic policy making. From the mid-1980s onwards, macroeconomic policy had been predominantly guided by a sequence of structural adjustment programmes and, subsequently, under the Heavily Indebted Poor Countries (HPIC) initiative, by the adoption of the Poverty Reduction Strategies Paper (PRSP) in which the IMF and the World Bank played a leading role in conditioning their design and implementation.

The switch from PRSP to MKUKUTA in 2005 represented both continuity and change: the key policy instrument remained programmatic in nature with extensive donor involvements in its design, financing and implementation, but greater emphasis was put on fostering economic growth to achieve the goals of the Vision 2025. Thereafter, the key instrument for policy making shifted away from MKUKUTA to the revival of development planning involving three successive Five-Year Development Plans (FYDP) from 2011 onwards.



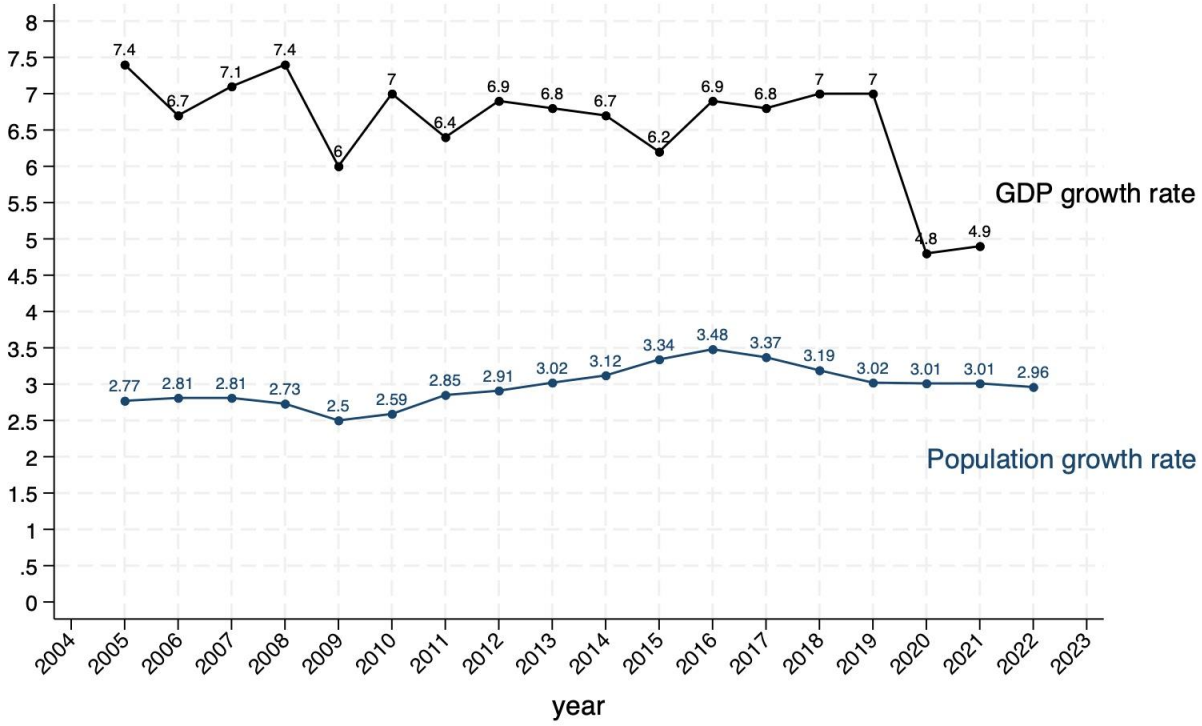

The main focus of MKUKUTA was growth and poverty reduction, and, hence, an important aspect of monitoring its progress was to investigate the relation between the rate of economic growth and the incidence of poverty (measured by the percentage of the population below the income poverty line). On the other hand, the FYDPs prioritized industrialisation, the growth of the private sector, and socioeconomic transformation in which the structure of aggregate output and of employment shifts away from agriculture towards industry (and services), and towards manufacturing in particular.[1] The ambition of these FYDPs was the definite shift from donor-driven structural adjustment programmes to domestically led planning frameworks. The macroeconomic policy and planning framework developed for these three FYDPs was based on a four-sector projection model – agriculture, manufacturing, non-manufacturing industry and services, which aimed to set planning targets for GDP growth and for the projected changes in the sectoral structure of output and of employment within the economy.[2]

[1]Mpango, P (2013) Socioeconomic Transformation for Poverty Reduction: Eight Key Messages for Unlocking Tanzania's Potential. REPOA Brief no 37 Dar Es Salaam.

2 M. Moyo, R. Simson, A. Jacob and F-X de Mevius (2010) Attaining Middle Income Status. Tanzania: Growth Strategy and Structural Transformation Required to Reach Middle Income Status by 2025. Working Paper IGC (International Growth Centre. (This paper served as an input for the Planning Commission for developing a macroeconomic strategy and methodology).

Figure 1 shows the evolution of GDP growth in Tanzania from 2005 to 2021. In Figure 1, GDP is measured at constant prices and, hence, the graph shows the evolution of GDP growth in real terms (net of inflation). In addition, Figure 1 also features the rate of population growth in Tanzania during this same period.

*Figure 1 GDP and population growth between 2005 and 2021 (%)*




Source: GDP data: National Accounts of Tanzania (NBS); Population Growth (World Bank data tables)

As this graph shows, Tanzania witnessed high and stable GDP growth during this period with exception of the decline in the growth rate during 2020-21 – the period when the Covid-19 epidemic hit hard.

Population growth was high but variable during this period: declining from around 2.8% in 2005 to 2.5% in 2009, but then accelerating significantly to a maximum of nearly 3.5% in 2016, and subsequently declining to around 3% at the start of the 2020s. To put this in perspective, at a constant growth rate of 2.5% per annum population doubles every 28 years, while at a constant rate of 3.5% per annum population doubles every 20 years.

We can roughly estimate the growth in GDP *per capita* as the difference between GDP growth and population growth. For example, in 2009, GDP *per capita* grew approximately 6% - 2.5% = 3.5%, while in 2016, GDP *per capita* grew 6.9% - 3.5% = 3.4%.

Tanzania is East Africa's largest and most populous country and one of the countries in the world with higher population growth. Labour force growth lags behind population growth with a lag of about 15 to 20 years: children born today, therefore, are likely to join the labour force in about 15 to 20 years or so, depending on how long they remain in school. The implication of the patterns of population growth during the 2005 to 2021 period is that from 2025 onwards (= period of Tanzania Vision 2050) labour force growth will first accelerate as a result of the peak in population growth in the 2010s and then decelerate while still remaining very high thereafter.

Currently however, Tanzania's development planning is centred on investment planning, mostly involving ambitious projects. This reflects the familiar premise that to achieve rapid industrialisation requires stepping up the rate of investment and thus, by implication, the rate of savings within the economy. More specifically, economic growth is said to be constrained by the rate of saving. Saving determines investment, and investment in the factors of production, labour, capital and land determine the rate of growth.

Consumption, therefore, is seen as a *leakage* from savings and leads to lower investment over time. Put differently, in this view, investing in rapid industrialisation inevitably involves a trade-off between present and future consumption to enable greater mobilisation of domestic public and private savings to enhance economic growth. Domestic resource mobilization by raising the rate of savings to finance investment is thus seen as the binding constraint on the pace of development. Implicit or explicit in this argument, therefore, is the need for tightening the belt on consumption during a phase of rapid socioeconomic transformation.

In this paper I shall argue that this premise of promoting economic growth by tightening the belt on consumption is problematic in an economy characterised by extensive surplus labour and rapid growth of its labour force. The biggest economic challenge that Tanzania is likely to face during the next 25 years is how to leverage its rapidly growing labour force for socio-economic development. The role of consumption in the process of industrialisation is intimately linked with this question of absorbing labour in the economy. Indeed, growth of employment must go hand in hand with the growth of consumption, and particularly with the growth in production of consumer goods consumed by the labour force (wage goods).

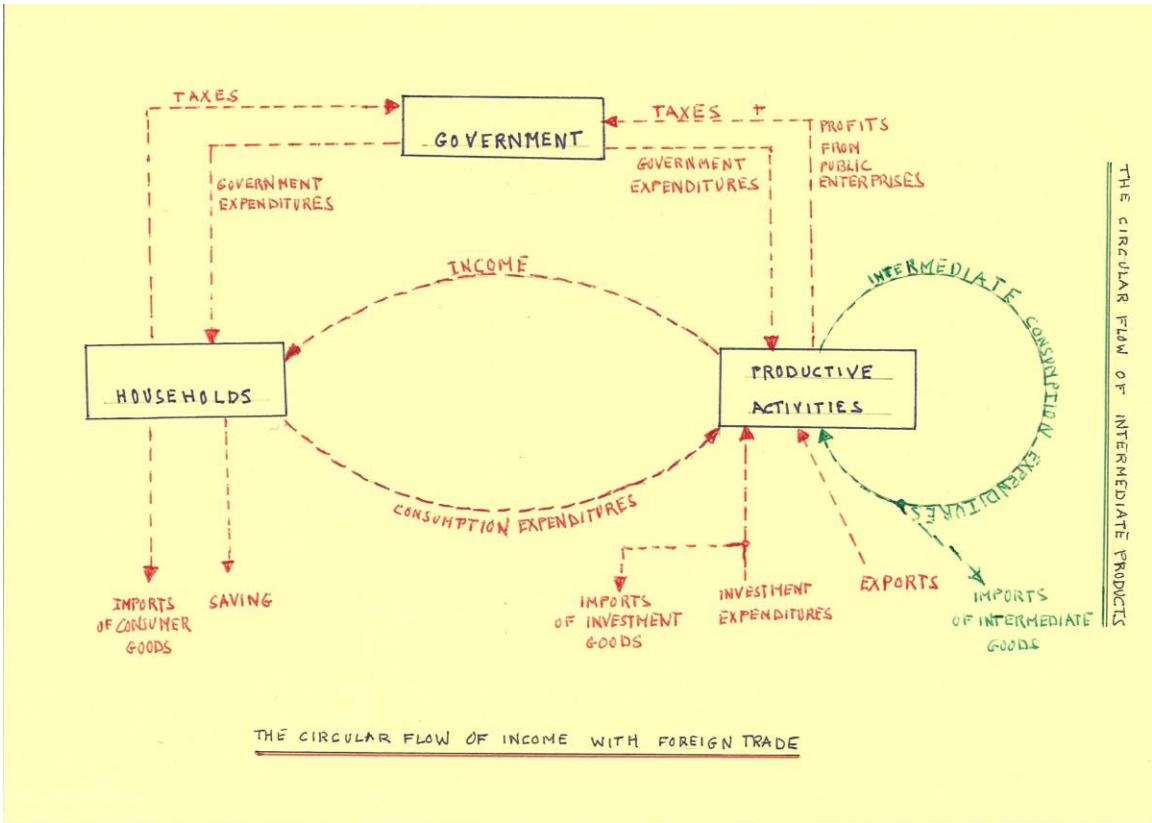
## *2. Visualising macro linkages: the circular flows of income and of intermediate goods*

Circular flow analysis provides a conceptual framework that puts aggregate production as a physical process that continuously renews itself at the centre of the stage. At the core of this analysis is the idea that a modern monetary economy is characterised by the *production of commodities by means of commodities*, which means that every process of production involves the productive consumption of intermediate goods. Put differently, every process of production depends on a *supply chain of intermediate goods* that need to be replenished after each cycle of production. Hence, part of the total gross output of an economy necessarily consists of the production of intermediate goods. The other component is GDP, the value-added part of the total (gross) output of an economy which equals the aggregate income that accrues to labour and to capital, which, in turn, fuels expenditures in the economy.[3]

Circular flow analysis of a macro economy, therefore, has two interconnected components: the circuit of income and the circuit of intermediate consumption. The easiest way to illustrate how these two circular flows operate within an economy is to *visualise* their interconnectedness.

[3] The key foundations of the modern approach to circuit theory are rooted in the respective contributions of J.M. Keynes and V. Leontief. J.M. Keynes developed the concept of the circular flow of production, income and expenditures as the cornerstone of his approach to macroeconomics and, more specifically, to his analysis of the consumption (and employment) multiplier. This gave the impetus to the development of National Income Accounting. V. Leontief laid the foundations of input-output analysis which focuses primarily on the analysis of the circular flow of intermediate products. In this paper I shall use of Kenichi Miyazawa's theoretical approach that combined Keynes' consumption (and employment) multiplier of the circular flow of income with Leontief's input-output multiplier of the circular flow of intermediate products. See also: Claude Gnos (2023) 'Money and Macroeconomic Methodology', pp. 154-160 , in Jesper Jespersen, Victoria Chick and Bert Tieben (eds.) Routledge Handbook of Macroeconomic Methodology. London and New York: Routledge; Ronald E. Miller and Peter D. Blair (2022) *Input-Output Analysis: Foundations and Extension* (Third Edition). Cambridge: Cambridge University Press; Kenichi Miyazawa (1960) 'Foreign Trade Multiplier, Input-Output Analysis and the Consumption Function', pp. 53-64 in *The Quarterly Journal of Economics,* Vol 74 (1), February; G. Tily (2023) 'National Accounts and Macroeconomic Methodology, pp. 315-326 in Jesper Jespersen, Victoria Chick and Bert Tieben (eds.) Routledge Handbook of Macroeconomic Methodology. London and New York: Routledge.

*Figure 2: The interdependencies between circular flow of income and circular flow of intermediate goods*




Note: *The arrows indicate the direction of expenditures of the different aggregate institutional sectors: households, production enterprises, and government, and also include foreign trade exchanges with the rest of the world (ROW).*

Figure 2 depicts the interlinkage between two circular flows:

> *The circular flow of income* focuses on the production of value added and the ensuing formation and spending of money incomes in the domestic economy. Hence, aggregate value added originates the community's income that in turn will be spent on goods produced in the economy or abroad.
>
> *The circular flow of intermediate goods* focuses on how the intermediate goods required in the production process need to be renewed each time a new production cycle starts. The circular flow of intermediate goods, therefore, deals with the interconnectedness of supply chains within an economy.

Each of these two circular flows is characterised by a feedback mechanism – a multiplier process. Both these processes are essentially consumption multipliers: the former for household consumption and the latter for intermediate consumption. Both multipliers interact because each successive round of the production of value added requires the constant renewal of the intermediate goods that enter into its production.
Household consumption expenditures out of income takes place continuously with smaller and bigger expenses (depending on items consumed) taking place within a pattern of spacing determined by the rhythm of income earning activities of households. The consumption cycle of households, therefore, mainly depends on the size and regularity of the income they receive and the differential needs for different consumer goods, which also depends on the demographic composition of the household. Not all of the income earned by households, however, is spent on consumption; some of the income is set aside for savings. As illustrated in Figure 2, the feedback loop from aggregate production to aggregate income and then to household expenditures (excluding the savings and imports which are leaked out of the cycle) fuels the consumption multiplier process in the circular flow of income. Household expenditures on imported consumer goods, however, do not feedback to domestic production.

Under normal circumstances, the proportion of income households spent on consumption is fairly stable and predictable and depends mainly on the level of household income for most of the working population. However,

for many households who mainly or exclusively depend on their labour to earn a living, particularly outside the formal sector, labour earnings may be highly irregular as well as volatile as a result of uncertain income fluctuations or loss of a job. It is the nexus between labour employment, labour incomes (wages and payments for labour services), and the subsequent consumer expenditures out of labour incomes on consumption goods (wage goods) that play a key role in setting this consumption multiplier process in motion.[4]

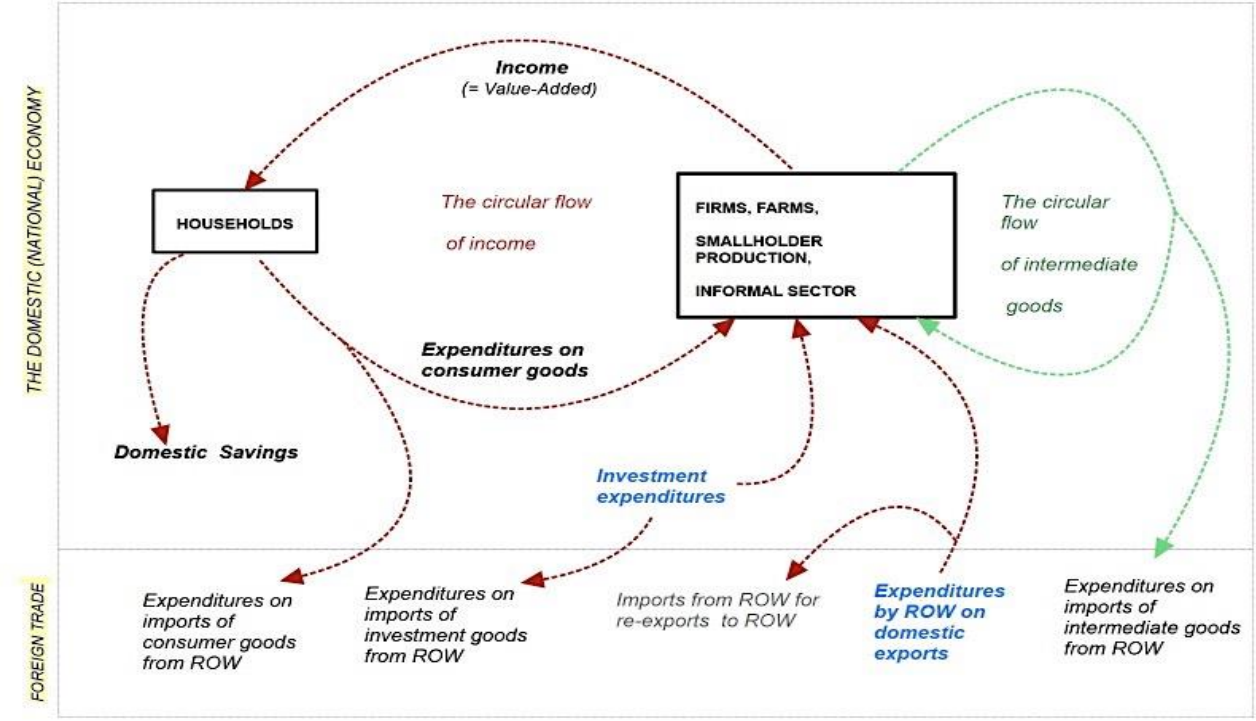
In the circular flow of intermediate goods, the value of the total output produced in any productive activity consists of two components: the value of intermediate consumption and the value added produced. The latter finds its way into the circuit of income while the former remains within the circuit of intermediate consumption.

Each cycle of production, therefore, has to renew itself continuously by replenishing the intermediate goods and services needed for production. The renewal of intermediate goods and services takes place via the network of supply chains that together define the industrial structure of an economy. This is what sets in motion working of the input-output multiplier process. An initial increase in output in one sector leads to an increase in demand and production for intermediate goods and services from its immediate suppliers, who, in turn, also need to replenish the intermediate goods and services they need from their own suppliers, and so on.

The consumption and input-output multipliers are interdependent because the production of value added inevitably implies the consumption of intermediate goods and services. Or, as Miyazawa put it, *underlying* and *preceding* the consumption multiplier process is a *sub-multiplier process involving production* (1960: 34). The interaction between the circular flow of income with the circular flow of intermediate consumption, therefore, is akin to the operation of two cogwheels: one cannot turn without the other also turning. Figure 3 present a close-up schematic of this process of interaction.

[4] Households derive incomes from two main primary sources that originate from the value added generated in productive sectors of the economy: income obtained through the supply of labour of household members to the productive sectors and income derived from ownership of means of production within the productive sector. The division between these two sources of income, however, is by no means clear cut in Tanzania, particularly given the size of employment in small-holder agricultural production and in large informal sector. For further reading, see also: Wuyts (2001) 'Informal economy, Wage Goods and Accumulation under Structural Adjustment: Theoretical Reflections based on the Tanzanian Experience', 417-438, in Cambridge Journal of Economics 25(3), May. Rizzo, M., Kilama, B. & Wuyts, M. (2014) "Invisibility of Wage Employment in Statistics on the Informal Economy in Africa: Causes and Consequences". The Journal of Development Studies http://dx.doi.org/10.1080/00220388.2014.96813

*Figure 3: The interdependence between the consumption and input-output multipliers*




*Note: The arrows indicate the direction of expenditures*

The important point to see here is that rapid and significant increases in investment inevitably set both multiplier processes in motion within the economy. Once investment is set in motion, part of its expenditures will be spent on domestic production and the remainder on imports. The part spent on the domestic production will increase income in the economy. Investment, therefore, is a prime mover that sets the consumption (and employment) multipliers in motion, and thus bring about an increase in aggregate demand that is much larger than the actual size of the initial increase in investment. Put differently, an increase in investment (or other autonomous expenditures such as exports or government consumption) inevitably brings in its wake an increase in consumption – both household consumption and intermediate consumption in production.

If the economy is capable to meet this increased demand – either by increasing domestic output or by increasing imports – all is well. But if the total supply of goods and services cannot meet the increased demand propelled by these multiplier effects, the economy will be put under strain with possible adverse outcomes in employment, inflation, and in living standards because the working of the multiplier processes are constrained by supply constraints.

Multiplier analysis is most commonly used within a short run perspective and seen to be particularly relevant when excess capacity prevails within the economy. Indeed, in the short run, the potential expansion of total output or of imports is limited by existing productive capacity constraints as well as by foreign exchange constraints in the economy. However, multiplier analysis also matters within a long run perspective because the expansion of productive capacities in the future are the outcome of investment decisions taken in the present. This is particularly important in an economy like Tanzania characterised by surplus labour and a rapidly growing labour force. The smooth operation of multipliers in the future, depends on whether the future expansion of consumption and employment remain in tune with the pace and the patterns of investment today.

## *3. Accounting for the circular flow of income in Tanzania 2001 to 2021: 3 stylised facts*

The empirical analysis in this section focuses on the evolution of the interplay between aggregate investment, household consumption and the import surplus of the economy during this period. The aim is to identify what this tells us about how the emphasis of the Tanzanian Development Vision 2025 and ensuing economic policy during this period shaped actual outcomes.

The fundamental macroeconomic accounting identity that underscores the expenditure side of the circular flow of income (see Figure 2) is given by the following *definitional* equation:

**GDP = HH CONSUMPTION + GOVERNMENT CONSUMPTION + INVESTMENT + EXPORTS – IMPORTS** [1]

*Domestic savings* is then defined as the surplus of income over consumption, as follows:

**DOMESTIC SAVINGS = GDP – [ HH CONSUMPTION + GOVERNMENT CONSUMPTION ]** [2]

Combining these two definitional equations yields the following result:

**INVESTMENT = DOMESTIC SAVINGS - ( EXPORTS - IMPORTS** ) [3]

**= DOMESTIC SAVINGS + IMPORT SURPLUS** [3']

This is called the *saving-investment equality* of an open economy.

This equation shows that the production of investment in any given year *of necessity* generates its own savings, either from the domestic sources (domestic savings) or from abroad by running a surplus of imports over exports.[5]

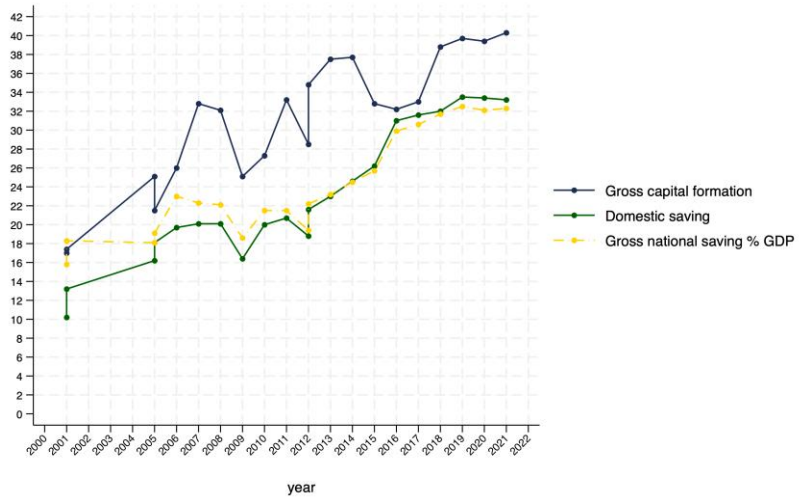
The expenditure side of the national income accounts of Tanzania for the period from 2001 to 2021 reveals three distinctive patterns (stylised facts) that are particularly important for the argument developed in this paper.[6]

1. The share of investment (measured as total capital formation in Figure 4) to GDP rose steeply, from 17.4% in 2001 to 21.5% in 2005, and then up to 40.3% in 2021.

[5] Box 2 in appendix 1 gives a detailed specification of how to derive the saving-investment equality in Tanzania's national accounts. Appendix 1 also features the national accounts data for selected years over the period 1976 to 2021.

[6] In this section, all macroeconomic aggregates are expressed as shares of GDP at market prices.

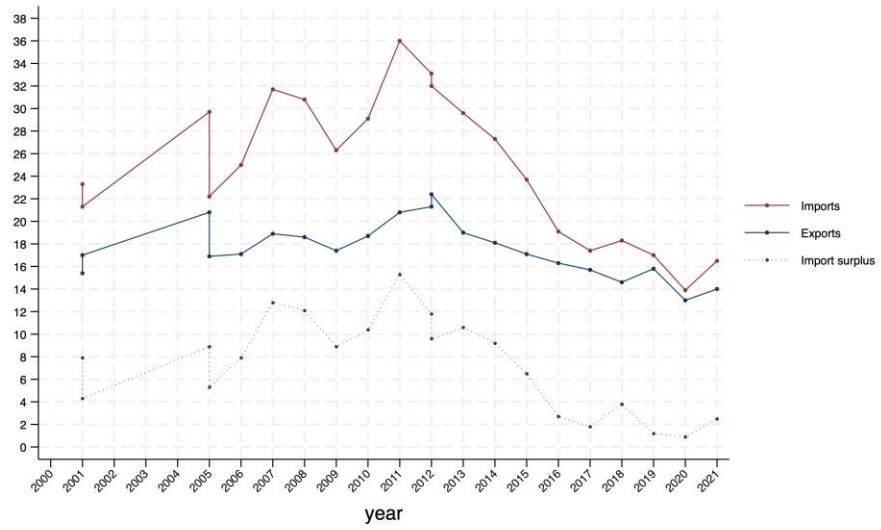
*Figure 4 The shares of Investment, gross domestic savings and gross national savings as % of GDP*




In real terms, investment grew at a (compounded) average of 10.5% per annum from 2012 to 2021, while GDP grew at 6.3% per annum. [7]

2. The share of imports in GDP declined sharply: from 36% in 2012 down to 18% in 2021 (Figure 5).

*Figure 5 Imports, exports and the import surplus as % of GDP*




The share of exports in GDP declined from about 22% in 2012 down to 14% in 2021.

Most of these steep declines took place *prior* to the years of the Covid-19 epidemic. Consequently, the share of the import surplus in GDP at first widened significantly up to 2011 and then fell dramatically afterwards. Furthermore, in real terms, during the 2012 to 2021 period, imports (at constant prices) grew at 1.4% and exports grew at 1.9% per annum.

[7] Moreover, a peculiar feature of the growth of investment during this period was that gross *fixed* capital formation grew at an average rate of 11.7% per annum and, hence, exceeded the average annual growth rate of gross *total* capital formation. The reason is that from 2015 onwards the change in inventories in the economy turned significantly negative implying that the economy has been running down its inventories during these last years.

3. From 2012 onwards, the share of household consumption in GDP declined significantly from 68% down to 59% in 2021

*Figure 6 The evolution of investment and HH consumption as % of GDP*

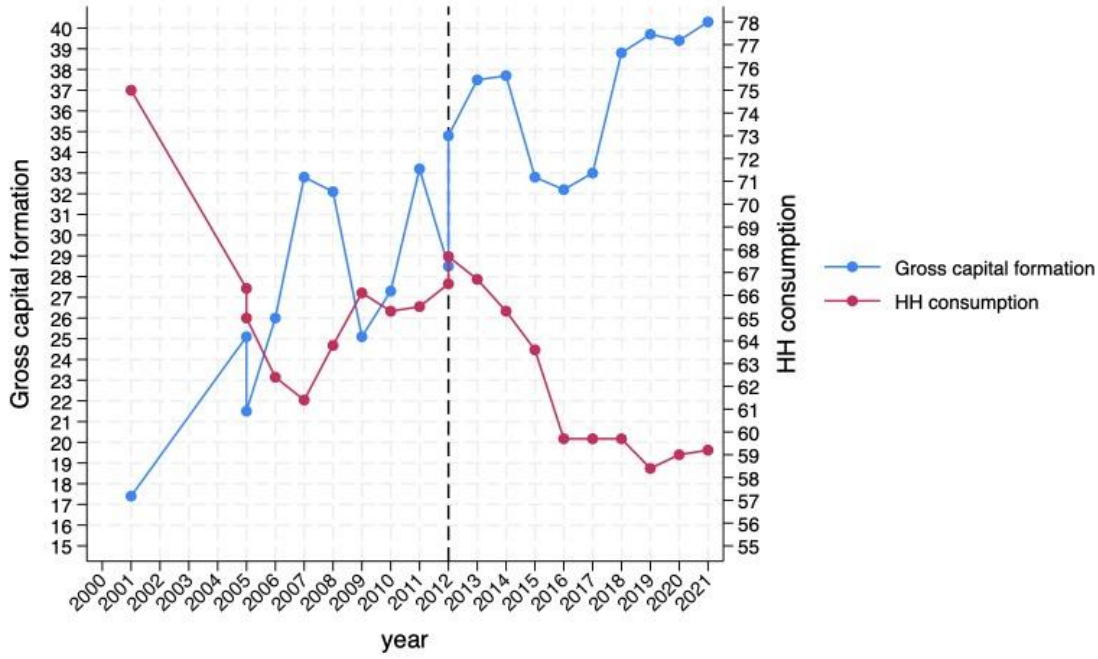



Figure 6 shows that the increase in the share of investment went at the expense of a falling share of HH consumption in GDP. During the period 2012 to 2021 HH consumption grew at 4.8% per annum, while population grew at an annual average rate of 3.17%. Consequently, the growth rate of HH consumption *per capita* was approximately 1.6% *per annum*, about half of the 3.2% *per annum* average GDP growth per capita during this period.

In sum, these three graphs taken together tell a story about where the emphasis in economic policy was put during the period of Tanzania Vision 2025. Economic policy focused on maintaining a high rate of growth achieved by continuously stepping up the investment ratio of the economy, in particular via large scale infrastructural construction projects with long gestation periods.

Moreover, remarkably, the investment ratio of the economy continued to rise in the last 15 years notwithstanding the fall in the share of the import surplus in GDP. This steep rise in the investment ratio in the economy, however, did not bring about any corresponding increase in the growth rate of the economy.[8] The falling share of HH consumption, therefore, was the adjusting factor that made this sustained rise in the investment ratio possible.

## *4. The anomaly of the high volatility of the consumption to income ratio in Tanzania*

The volatility in the share of HH consumption witnessed in the recent past is not a new phenomenon in Tanzania (see Table 1 in Appendix 1). By design, default or historical circumstance, HH consumption appears to have always been a residual by-product of changing emphases in domestic policy and international economic circumstances, including changes in foreign aid policies. However, the *Macmod* model – a macroeconomic model for the Tanzania economy used for planning purposes during the 1990s and 2000s –used the following simple consumption function:

$$C_{HH} = c \ GDP \qquad [4]$$

[8] A possible reason for this is that the bulk of investments during this period mainly consisted of large infrastructural projects with long gestation periods.

Where $C_{HH}$ is household consumption and is defined as proportional to income.[9] The data show that this assumption is invalid for modelling the Tanzanian context.

In this respect, it is useful to revisit the history of the concept of the consumption function and the related concept of the consumption multiplier in economic theory. It was Richard Kahn who in 1931 published the theory of the *employment multiplier* which depicted the relation between an increase in employment in the investment goods sectors of the economy and the total increase in employment that resulted from this initial increase of employment in investment (Kahn, 1972). An increase in investment in public works, Kahn argued, increases employment and, hence, wage incomes in the investment goods sector, which in turn leads to increased expenditures out of wage incomes on consumption goods. Production and employment in the consumer goods sectors will then increase as a result of this increase in demand thus leading to a further round of income and employment generation.

Kahn referred to this multiplier process as the working of the employment multiplier, while Keynes referred to it as the consumption multiplier. Both Kahn and Keynes saw the consumption and employment multipliers therefore as two sides of the same coin. Keynes, however, specified the consumption function directly as function of income and thus somewhat obscured the employment-wage-income nexus that was central to both Kahn's and his own argument. The Polish economics Michal Kalecki, working independently from both Kahn and Keynes, developed the same theory which he derived from Marx's schemes of reproduction and framed this process succinctly as "workers spend what they earn, capitalists earn what they spend".[10]

The early econometricians took over Kahn's and Kalecki's idea and specified the consumption function as a function of wages and profits, thus maintaining the focus on the importance of the nexus between employment, wage incomes and consumption of wage goods.

*Let,*

$$Y = W + P \quad [\text{ Total value added (GDP) = Labour incomes (W) + Profits (P) }] \qquad [5]$$

A simple modified version of the consumption function can then be modelled as follows:

$$C_{HH} = c_w W + c_p P \qquad [6]$$

where, $c_w$ = the marginal propensity to consume out of wages (labour incomes),
$c_p$ = marginal propensity to consume out of profits.

The most prominent example of this approach was Laurence Klein's six- equation econometric model of the US economy during the interwar period. This model played a key role in providing an empirical exemplar for the development of the Cowles Foundation approach to econometrics.

Klein specified the consumption function as a linear function of wages and profits. His estimations showed that the marginal propensity to consume out of wages was much larger than the marginal propensity to consume out of profits. In other words, wage earners spend most of their incomes on consumption, while profit earners save a much larger share of their income and, hence, their marginal propensity to consume out of income is much lower than that of wage earners.
Rewriting Equation [6] as

$$C_{HH} = [\alpha\, c_w + (1 - \alpha)\, c_p\,] Y \qquad [7]$$

[9] Hildegunn Kyvik Nordas with Arild Angelsen (1998) Macmod, a macroeconomic model for the Tanzanian economy. R1998: 5 Chr. Michelsen Institute Development Studies and Human Rights.
[10] M. Kalecki (1969) *Studies in the Theory of Business Cycles: 1933-39*. London: Blackwell, and Wuyts (2021) See also Kalecki (1954) and (1963) in Osiatynsky, J. [ed.] (1993) The Collected Works of Michal Kalecki: Volume V Developing Economies. Oxford: Clarendon Press.

where $\alpha$ = W/Y *the share of labour incomes in total income* [8]

and $(1 - \alpha)$ = P/Y is the share of profits in total income [9]

We see that the share of consumption in income not only depends on the respective marginal propensities to consume $c_w$ and $c_p$ but also on $\alpha$, the share of labour in total income.[11]

This simple equation provides a plausible hypothesis about the nature of the volatility of the share of consumption in GDP in the Tanzanian economic development. It is indeed not very plausible to assume that workers decide to spend less of their incomes on consumption goods (wage goods) merely because the overall investment ratio in the economy is increasing. Instead it is more plausible to assume that it is the rise in the investment ratio that brings about a fall in the share of labour incomes in GDP and thus causes a rise in the saving ratio and, by implication, dampens the size of the consumption multiplier in the economy.[12]

The next section develops a macroeconomic accounting framework which describes the linkages (or lack of) between investment and consumption. Section 6 will use Input / Output Tables data and show why consumption is not growing despite enormous injections of investment funds in the economy since the early 2000s.

## 5. *Accounting for the circular flow of intermediate consumption in Tanzania: the 2015 input-output table*

Using the 2015 Tanzanian Input / Output tables required reconciling and adjusting the conceptual framework of Section 2 with the available data and how it is measured. There were two main empirical challenges.

The first challenge is the fact that national income accounts focus on GDP and its composition across three different dimensions: the production side (the production of value added by productive sector), the income side (labour earnings and profits (the operating surplus), and the expenditure side (household consumption, government consumption, capital formation and change in inventories (investment), exports and imports. Total output and the domestic production for intermediate consumption, therefore, do not feature in the national income accounts. And as I will argue, this is one reason why the practice of policy and planning tends to deflect attention away from the industrial structure of an economy and its reliance on the continual renewal of intermediate goods required for the production of GDP.

To add domestic production for intermediate goods and total output to macroeconomic accounting frameworks,

let, Y = GDP C = Household consumption
G = Government consumption I = Investment
E = Exports M = Imports

then,

$$Y = C + G + I + E - M \qquad [1']$$

or, alternatively,

[11] Empirically, modelling and estimating this type of consumption function is quite a daunting task when using Tanzanian data. The operating surplus as depicted in the national accounts not only include actual profits (including the surplus of government expenditures over recurrent government expenditures), but also incomes of small-holder producers and of employment in the informal sector (often referred to as self-employment). Therefore, any modelling exercise may well require the judicious use of social accounting matrices to unpack the components that make up the operating surplus as listed in the national accounts. This also requires unpacking the broad definition of self-employment which not only include those working for own account but also a myriad of insecure and often erratic forms of wage labour that exist within the informal sector.

[12] See Wuyts (2021). Note that government revenue policies can also play a major role in mobilizing resources for investment and, hence, in redistributing income from consumption towards saving. Indeed, indirect taxes and the tax on value-added in particular provide a major vehicle to restrict consumption because they are taxes on expenditures, consumption expenditures in particular. Indirect taxes are likely to have a greater impact on labour incomes given that the share of consumption expenditures out of labour incomes tends to be higher than that out of profits.

$$Y + M = C + G + I + E \qquad [1']$$

In this equation, Y stands for the total value added and, hence, does not include the value of intermediate goods used in the production of GDP, while M stands for total imports and, hence, includes the value of *imported intermediate goods.* National income accounting, therefore, *only includes intermediate goods that are imported, but not those that are domestically produced*.

To broaden the accounting framework to include total output and total intermediate consumption we proceed as follows:

Let: Z = Total supply of goods and services (domestically produced or imported) in the economy, for the production of intermediate goods as well as of products for final use

X = Total output: the domestically produced goods and services in the economy, for the production of intermediate goods as well as of products for final use.

and, hence, $Z = X + M \qquad [10]$

Furthermore, let:

R = The total value of intermediate goods and services (domestically produced or imported) used in the production of X

The fundamental identity equation of this broader accounting framework can then be defined as follows:

$$Z = R + C + G + I + E \qquad [11]$$

*which is the basic equation that underscores input-output analysis.*

This equation depicts the accounting balance between sources and uses of goods and services in the economy. It shows that the total supply of goods and services are used either for intermediate goods consumption (R) or for final use (C + G + I +E).

Alternatively, equation 11 can also be expressed more compactly as follows:

$$Z = R + F \qquad [11']$$

where, F = expenditures on goods and services for final use

Note that equation 11 does *not* differentiate between whether these goods and services are domestically produced or imported. For planning purposes, however, it is important to make a clear distinction with respect to the origin of these resources: that is, whether they are domestically produced or imported.

To do this, recall that:

$$X = Z - M$$

And, hence,

$$X = R + [C + G + I + E - M] \qquad [12]$$

$$X = R + F - M \qquad [12']$$

Furthermore, total imports can be broken down by use as follows:

$$M = M_r + M_c + M_g + M_i + M_e \qquad [13]$$

where, $M_r$ = imports of intermediate goods
$M_c$ = imports of consumer goods
$M_g$ = imports of goods consumed within the government sector
$M_i$ = imports of investment goods
$M_e$ = re-exports of imported goods

Or, alternatively, more compactly,

$$M = M_r + M_f \quad [14]$$

where, $M_f$ = imports of goods for final use

And, hence, equation 12 can also be rewritten as follows:

$$X = [R - M_r] + [(C - M_c) + (G - M_g) + (I - M_i) + (E - M_e)] \quad [15]$$

Or,

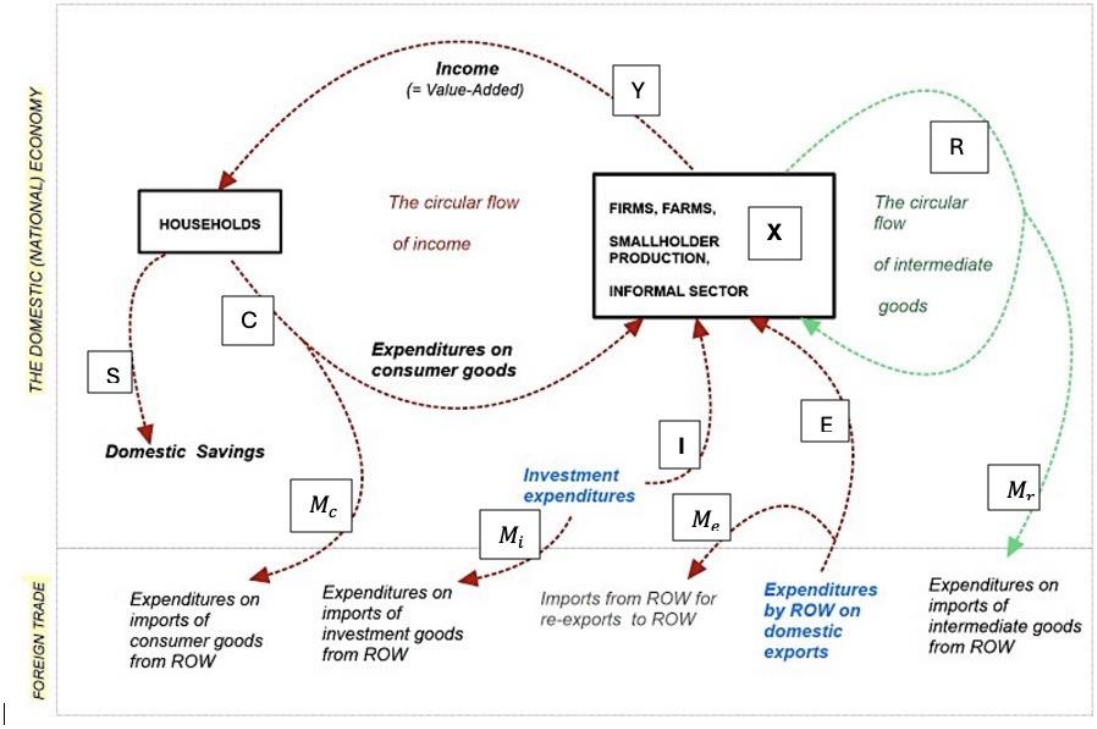
$$X = [R - M_r] + [F - M_f] \quad [15']$$

What appears to be missing from equation 15 (or from equation 12) is income itself. However, substituting equation 1 into equation 15 yields the following alternative expression:

$$X = R + Y \quad [16]$$

which is the familiar breakdown of gross total domestic output into its two constituent components: intermediate goods consumption and GDP. Figure 7 shows where the macro-aggregates that feature in equation 10 to 16 are located in the schematic of the interaction between the circular flows of income and of intermediate consumption.

*Figure 7 Schematic presentation of macroaggregates in the input-output accounting framework*




The second challenge relates to how national accounts (the main source of data in Tanzania for the components in the circular flow of income) and input output tables (the main source of data in Tanzania for the components of

the circular flow of intermediate goods and services and of its connections with the circular flow of income) measure these components.

Most (but not all) of the data tables that feature in the national income accounts of Tanzania measure macro aggregates *at market prices*. In contrast, the 2015 input-output table features macro aggregates *at basic prices* with exception of imports which are valuated *at c.i.f (cost, insurance and freight) values*, which means that imports are valuated at their costs on arrival at the Tanzanian borders.

The difference between valuating at market prices or at basic prices has to do with whether indirect taxes and subsidies on products are included or not in the measurement of macroeconomic aggregates. GDP *at market prices* focuses on *the expenditure side* of the economy. It measures the total value added of an economy at purchaser's prices which include all indirect taxes and subsidies. These are the prices that producers, consumers and investors actually have to pay to obtain the goods and services they require. This explains why most of the tables that feature in the national income accounts mainly feature macro aggregates at market prices (either at current or at constant prices).

In contrast, the *basic* price of a good is *the amount of money actually received and kept by the producer*. The basic price, therefore, does not include indirect taxes or subsidies on a product because these do not accrue to its producer. GDP *at basic prices* is then defined as the total output valued at basic prices less intermediate consumption valued at purchaser' prices. This means that indirect taxes and subsidies on intermediate goods and services are included in the cost of intermediate consumption because this is what producers effectively have to pay for these goods and services. Taxes and subsidies of goods and services on goods and services for final use, however, are not included in GDP valued at basic prices because they are not received and kept by the producers.

The important distinction here is that: "the "natural" valuation of the *production* measure of GDP is basic prices, while the "natural' valuation of the *expenditure* measure of GDP is market prices".[13] Input-output tables use basic prices because they describe the industrial structure and the role of the circuit of intermediate goods in the process of production, and, hence, are primarily concerned with the production side of an economy.

The NBS 2015 (industry X industry) Input-Output tables for Mainland Tanzania consist of 3 tables: table 1 shows sources and uses of total supplies (Z), table 2 shows sources and uses of domestic production only (X), and table 3 show the sources and uses of imports (M). These input-output tables show the inter-industry transactions of intermediate goods and services between 67 industries of the Tanzanian economy. Tables 1a and 1b below provide a summary overview of the structure of these three 2015 input-output tables at the aggregate level only. These tables, therefore, only show the total aggregate value of intermediate consumption and final use and, hence, do not yet give any breakdown of these aggregate values by the various industries / productive sectors of the economy.

[13] As the following quotation shows, the difference between valuation of GDP (and of other macro aggregates) at basic prices versus market prices is a key issue of discussion in national income accounting: *The "natural" valuation of the production measure of GDP is basic prices, while the "natural' valuation of the expenditure measure of GDP is market prices. In the SNA it is the production measure that is adjusted (by adding taxes less subsidies on products) to achieve consistency. Implicit in this is the idea that taxes less subsidies on products are a form of income and not just a form of redistribution of income. If it were decided to value GDP at basic prices then the sequence of accounts would need to be modified, and there are various possibilities as to how this might be done. This might lead to showing the two primary functions of government, production of non-market services and redistribution of national income, separately.* https://unstats.un.org/unsd/nationalaccount/issue11.asp

*Table 1a: Aggregate summary of 2015 Input-Output Table of Tanzania (at basic prices in Million Tshs )*

AGGREGATE SOURCES AND USES OF GOODS AND SERVICES IN TANZANIA 2015 (Million Tsh)

| | TOTAL INTERMEDIATE CONSUMPTION | MAIN CATEGORIES OF FINAL USES | | | | TOTAL FINAL USE | TOTAL USE AT BASIC PRICES |
|---|---|---|---|---|---|---|---|
| | | HH CONSUMPTION | GOVERNMENT CONSUMPTION | INVESTMENT | EXPORTS | | |
| Total (all industries ) | 58,553,929 | 56,097,834 | 9,366,230 | 30,398,474 | 12,259,469 | 108,328,153 | 166,882,083 |
| Taxes less subsidies on products | 1,915,081 | 5,377,655 | 103 | 502,058 | 73,295 | 5,953,113 | 7,868,195 |
| Total | 60,469,011 | 61,475,489 | 9,366,333 | 30,900,532 | 12,332,764 | 114,281,267 | 174,750,278 |
| Value added at basic prices | 86,484,736 | | | | | | |
| Output at basic prices | 146,953,747 | | | | | | |
| Imports cif | 19,928,336 | | | | | | |
| Total supply | 166,882,083 | | | | | | |

*Source: Author's aggregate summary of Table 1 of the 2015 Input-Output Tables of Tanzania, National Bureau of Statistics*

*Table 1b: Aggregate summary (continued): Breakdown by domestic production and use of import components*

DOMESTIC PRODUCTION AND IMPORT COMPONENTS OF AGGREGATE SUPPLY (Million Tshs)

| | INTERMEDIATE CONSUMPTION | FINAL USES | | | | TOTAL FINAL USE | TOTAL USE (at basic prices) |
|---|---|---|---|---|---|---|---|
| | | HH CONSUMPTION | GOVERNMENT CONSUMPTION | INVESTMENT | EXPORTS | | |
| Total | 47 590 086 | 51 445 752 | 9 251 414 | 26 694 851 | 11 765 532 | 99 363 661 | 146 953 747 |
| Use of imported products, cif (M) | 10 963 844 | 4 652 081 | 114 816 | 3 703 623 | 493 937 | 8 964 492 | 19 928 336 |
| Taxes less subsidies on products | 1 915 081 | 5 366 969 | 104 | 509 128 | 73 295 | 5 949 498 | 7 864 580 |
| Total | 60 469 011 | 61 464 802 | 9 366 334 | 30 907 602 | 12 332 764 | 114 277 651 | 174 746 662 |
| Value added at basic prices | 86 484 736 | | | | | | |
| Output at basic prices | 146 953 747 | | | | | | |

*Source: Author's aggregate summary of Tables 2 and 3 of the 2015 Input-Output Tables of Tanzania, National Bureau of Statistics*

We can now look at the aggregate structure of the input-output table (as depicted in Tables 1a and 1b) using the identity equations 10 to 16.

To start with: recall that the total supply of goods and services is equal to the sum of the total (domestically produced) output and total imports.[14]

| Z | = | X | + | M |
|---|---|---|---|---|
| 166,882 billion Tshs | = | 146,953 billion Tshs | + | 19,928 billion Tshs |

Total output, therefore, accounted for 88% and imports for 12% of the total supply of goods and services.

And, furthermore,

| Z | = | R | + | F |
|---|---|---|---|---|
| 166,882 billion Tshs | = | 56,098 billion Tshs | + | 108,328 billion Tshs |

Hence, intermediate consumption accounted for 35% of the total supply of goods and services and, hence, goods and services for final use for 65%.

[14] A billion is here defined as 1,000 million (= $10^9$). Historically, a billion was also defined as a million million ($10^{12}$).

Combining both equations yields:

$$X + M = R + F$$

In input-output analysis, *the technical input-output coefficient* is then defined as follows:

$$a = \frac{R}{X} \qquad a < 1 \qquad [17]$$

$$= 0.398$$

In Tanzania, intermediate consumption (R), therefore, accounted for approximately 40% of the total domestically produced output (X) of the economy.

Intermediate consumption, however, also includes an import component. Miyazawa (1960: 54) defined the *self-sufficiency ratio of materials* ( $\gamma$) as the share of domestically produced intermediate goods in the total value of intermediate goods.[15]

To obtain this ratio, recall that:

$$X = (R - M_r) + (F - M_f)$$

And, define the import coefficient of intermediate consumption as follows:

$$m_r = \frac{M_r}{R} \qquad [18]$$

$$= 0.187$$

and, hence, $$\gamma = (1 - m_r) \qquad 0 \leq \gamma \leq 1 \qquad [19]$$

$$= 0.813$$

Hence, the value of imports of intermediate goods (valuated at c.i.f values) accounted for 18.7% of total intermediate consumption. As table 1b also shows, these imports made up 55% of all imports in 2015.

Changes in the relative price between a product that is both domestically produced and imported can lead to changes in $\gamma$. Similarly, if the increase in domestic demand for an intermediate good cannot be met due to capacity constraints of local industry, $\gamma$ may adjust downwards as a result of increased import needs for this commodity. Finally, the evolution of $\gamma$ in a longer run perspective depends on present-day investment policies towards domestic industry.

The technical input-output coefficient a and the self-sufficiency ratio $\gamma$ play a central role in multiplier analysis within the circular flow of intermediate consumption. So does their product a$\gamma$ which denotes the fraction of domestically produced intermediate goods and services in the total output of a country. Furthermore, as will be shown further in this paper, both these coefficients vary significantly across the different industries of a country and, hence, so will the multiplier effects within the economy differ depending on which industries are most effected by specific changes in autonomous expenditures. For example, an investment portfolio that is heavily focused on the construction of infrastructural projects will have different multiplier effects than a portfolio that is more focused on agriculture, manufacturing or informal sector development.

[15] Note that $\gamma$ = 1 would mean complete self-sufficiency of materials, and $\gamma$ = 0 would mean that all materials are imported. Both situations are highly unlikely in any country at the aggregate level, but at the level of specific industries or productive sectors values closer to 1 or to 0 are more likely.

So far, these measurements were at basic prices (or in the case of imports cif prices). To bring in GDP into the picture, we need to take into account that the measurement of GDP *at basic prices* requires that intermediate consumption is evaluated *at purchaser 's prices* and, hence, includes the indirect taxes and subsidies on intermediate goods and services.

Table 1a shows that the difference between aggregate intermediate consumption at purchaser's prices Tshs and intermediate consumption valuated at basic prices was equal to 1,915 billion Tshs are the indirect taxes and subsidies on intermediate goods. This also explains why the input-output table features two totals for intermediate consumption, the former valuated at basic prices, the latter at purchasing prices.

Define, $T_r$ = total indirect taxes and subsidies on intermediate consumption
= 1,915 billion Tshs

And define the markup of indirect taxes and subsidies on intermediate consumption as follows:

$$t_r = 1 + \frac{T_r}{R} \quad [20]$$

where $t_r$ < 1 *if indirect taxes net of subsidies are negative*
*= 1 if net indirect taxes = 0*
> 1 *if indirect taxes net of subsidies are positive*

The total value of intermediate consumption at purchaser's prices can then be defined as follows:

$$R^* = t_r R \quad [21]$$

And, hence,

$$X = R^* + Y \quad [22]$$

146,953 billion Tshs = 60,469 billion Tshs + 86.486 billion Tshs

Following Miyazawa, let us now define the material coefficient $\lambda$ as the ratio of intermediate consumption *(valuated at purchaser's prices)* to GDP *(valuated at basic prices),* as follows:

$$\lambda = \frac{R^*}{Y} \quad [23]$$

$$= 0.699$$

It follows that:

$$X = (1+\lambda)\, Y \quad [24]$$

and,

$$\frac{R}{Y} = a(1+\lambda) \quad [25]$$

We can then define *the input coefficient* and *the value-added ratio* as follows (Miyazawa: 1960: 54):

$$a^* = \frac{R^*}{X} \quad a^* < 1 \quad [26]$$

$$= \frac{\lambda}{1+\lambda}$$

$$= 0.411$$

and,

$$(1- a^*) = \frac{Y}{X} \quad [27]$$

$$= \frac{1}{1+\lambda}$$

$$= 0.589$$

To obtain the Imports coefficient with respect to intermediate goods at purchaser's prices it is important to ensure that imports continue to be valuated at c.i.f values.

Therefore, let,

$$m_r^* = \frac{M_r}{R^*}$$ *the import coefficient of intermediate goods (at purchasing prices)* [28]

$$= \frac{m_r}{t_r} = \frac{1-\gamma}{t_r}$$

$$= 0.181$$

Note that, $m_r^* < m_r$ if $t_r > 1$.[16]

Indirect taxes and subsidies on intermediate consumption are the product of domestic fiscal policy. Hence, all indirect taxes and subsidies on intermediate goods and services – whether domestically produced or imported – are part of the domestic component of intermediate consumption when measured at purchaser's prices.

Therefore, define:

$H^* = R^* - M_r$ *the domestic production component of R**

$= (\gamma + t_r - 1) R$ [29]

= 47.6 billion Tshs + 1.9 billion Tshs = 49.5 billion Tshs

The structural parameters developed in this section provided an aggregate description of the interconnection between the circular flows of income and of intermediate consumption. These parameters are also the key ingredients that go into modelling input-output multipliers.

## *6. Modelling the input-output multiplier at the aggregate level*

The purpose of this section to model the sub-multiplier process that operates within the circuit of intermediate consumption. More specifically, my aim here is to model the input-output multiplier which show the multiplicative effect of an increase in the expenditures on domestically produced goods and services for final use on the total output of an economy.

To do this, recall that:

$$X = [R - M_r] + [F - M_f]$$

And, hence,

$$\Delta X = \Delta (R - M_r) + \Delta (F - M_f)]$$

[16] Note that if $t_r < 1$ then $m_r^* > m_r$. This situation only occurs if subsidies exceed indirect taxes on intermediate consumption. At the aggregate level of an economy, this situation is highly unlikely to prevail.

Let us now assume that the structural coefficients defined in the previous sectors remain constant (at least in the short-run), and, hence, equations [17] to [19] can be substituted in the equation above to yield the following equation (after rearranging terms),

$$\Delta X = a\,\gamma\,\Delta X + \Delta\,(F - M_f)$$

It follows that,

$$\Delta X = \frac{1}{1-a\gamma}\;\Delta\,[\,F - M_f\,] \qquad [30]$$

The slope coefficient of this equation is *the input-output multiplier*: It shows by how much total output will increase as a result of an initial increase in expenditures for final use.

Define, $\mu_x = \frac{\Delta X}{\Delta\,[\,F - M_f\,]}$

$$= \frac{1}{1-a\gamma} \qquad [31]$$

= 1.48 for the Tanzanian economy in 2015.

The *input-output multiplier* $\mu_x$, therefore, is a multiplicative factor that shows by how much total output will expand in response to increased expenditures on domestic goods and services for final use.

The input-output multiplier depends on two structural parameters: the total input coefficient (a) and the self-sufficiency ratio of materials ($\gamma$). The higher the self-sufficiency ratio of materials, therefore, the larger the value of $\mu_x$, and, hence, the stronger its effect will be on total output of the economy. Similarly, a larger input coefficient implies a larger value of $\mu_x$.

Table 2 shows the decomposition of $\mu_x$into the sum of two constituent parts: the total increase in the domestic production of intermediate consumption and the total increase in the domestic production of goods for final use.

*Table 2: The decomposition of the total input-output multiplier by production for intermediate consumption and for final use*

| ***Decomposition*** | ***Multiplier*** | ***Estimated values for Tanzanian economy 2015 **** |
|---|---|---|
| *1- Intermediate consumption* | $\frac{a}{1-a\gamma}$ [32] | 0.89 |
| 2- *Final use* | $\frac{1-a}{1-a\gamma}$ [33] | 0.59 |
| 3- Total input-output multiplier | $\frac{1}{1-a\gamma}$ [34] | 1.48 |

Equation [33] tells us that only if $\gamma$ = 1 will the increase in the domestic production of final goods and services exactly match the value of the increased expenditures on goods and services for final use. And, similarly, the increase in the domestic production of intermediate goods will then also exactly match the increase in its demand.

If $\gamma < 1$, however, part of the increased expenditures on for goods and services for final use will be syphoned off into imports of intermediate goods and services required for its domestic production.

To complete the picture, therefore, the effect of the input-output multiplier on the increased demand for imports also needs to be modelled explicitly. To do this, the increased demand for imports of intermediate goods (at c.i.f values) can be derived as follows:

$$\Delta M_r = (1-\gamma)\, a\, \Delta X \qquad \text{since } m_r = 1-\gamma \qquad [35]$$

Substituting equation [32] in the import equation and rearranging terms then yields the effect of the multiplier $\mu_x$ on the demand for imports for intermediate consumption in production.

$$\frac{\Delta M_r}{\Delta [\, F - M_f \,]} = \frac{a(1-\gamma)}{1-a\gamma} \qquad [36]$$

$$= 0.11 \qquad \textit{in the case of the Tanzanian economy.}$$

Miyazawa defined this coefficient as "*the leakage coefficient in the sub-multiplier process dealing with productive activities*" (1960:54).

Table 3 further shows how the total input-output multiplier $\mu_x$ can also be decomposed into its effect on aggregate income and its effect on intermediate consumption (valued at purchaser's prices). Note, however, that to do this requires us to switch from the valuation of intermediate goods at basic prices to its valuation at purchaser's prices.

*Table 3: The decomposition of the total input-output multiplier by its effects on income and on intermediate consumption*

| ***Input-output multipliers*** | ***Multiplier*** | ***Estimated values for Tanzania 2015*** |
|---|---|---|
| *4- Income multiplier effect* | $\frac{\Delta Y}{\Delta(F-M_f)} = \frac{1-a*}{1-a\gamma}$ [37] | 0.87 |
| *5- Intermediate consumption multiplier effect* | $\frac{\Delta R^*}{\Delta(F-M_f)} = \frac{a*}{1-a\gamma}$ [38] | 0.61 |
| 6- Total multiplier | $\frac{\Delta X}{\Delta(F-M_f)} = \frac{1}{1-a\gamma}$ [39] | 1.48 |

*Note: recall that:* $a^* = at_r$ ; $t_r \geq 1$ ; and $a < a^* < 1$

The first component in table 3 - *the income multiplier effect* – measures the increase in aggregate income resulting from a unit increase in the demand for domestically produced goods and services for final use. The second component – the *intermediate consumption component* – measures the increase in the domestic production of intermediate goods and services *valuated at purchaser's prices* resulting from a unit increase in the demand for domestically produced goods and services for final use.

Note, furthermore, that if $t_r = 1$ and, hence, there are no indirect taxes and subsidies on intermediate goods, both sets of decompositions will yields the same result (depicted in table 2).

The import function for intermediate goods and services as derived in equation [35] can then also be expressed as a function of income, as follows:

$\Delta M_r$ = $(1-\gamma)\ \lambda\ \Delta Y$ since a $X = \lambda Y$ [40]

This section showed how the multiplier process operates within the circular flow of intermediate consumption can be modelled at the aggregate level. The key point is that an increase in expenditures on final goods will lead to a larger increase in total output because intermediate goods and services used up in the production of these goods and services need to be continuously replenished. The multiplier is the multiplicand that translates an increase in total expenditures for final use in the required expansion of total output.

The input-output multiplier analysis presented in this section, however, did not as yet involve any disaggregation by productive sectors / industries in the economy. This is what the next section turns to.

## 7. *Intersectoral input-output analysis: structural features, backward and forward linkages, and input-output multipliers* [17]

Box 1 below provides a summary of the key structural coefficients and ratios derived in Sections 5 and 6 to depict the input-output structure of the Tanzanian economy at the aggregate level. In this section I shall extend the analysis of the input-output table at the disaggregate level by different sectors of production.

**Box 1** ***Key structural coefficients and ratios of the circular flow of intermediate consumption***

Tanzania 2015 input-output tables

*Aggregate level only*

1- ***The total input coefficient*** (a ) $= \frac{R}{X} = \frac{intermediate\ consumption}{total\ output} = 0.396\ (= 39.6\%)$

2- ***The self-sufficiency ratio of materials*** $(\gamma) = \frac{R - M_r}{R} = \frac{domestically\ produced\ intermediate\ goods}{total\ intermediate\ goods}$

$= 0.813\ = (81.3\%)$

3- ***The material coefficient*** $(\lambda) = \frac{R^*}{Y} = \frac{intermediate\ consumption\ (basic\ prices)}{income} = 0.669\ (= 66.9\%)$

$\therefore$ ***The (aggregate) input-output multiplier*** $= \frac{\Delta X}{\Delta(F - M_f)} = \frac{1}{1 - a\gamma} = 1.48$

The 2015 input-output table featured sources and uses of goods and services for 67 industries. In this paper, however, for clarity of exposition of the patterns inherent in the input-output data I shall group these 67 industries into a smaller set of 14 sectors of production. Appendix 2 explains how the 14 x 14 input-output tables were obtained from the 2015 67 x 67 input-output tables.

Table 4 compares the structural features of the different sectors of the economy using the structural coefficients and ratios defined at the aggregate level of the Tanzania economy in section 5.

[17] This section is more technical in nature because it requires the use of matrix algebra. The tables featured in this section, however, are accessible for readers unfamiliar with matrix notation and algebra.

*Table 4 Structural features of total output and value-added by sector of productive activities in Tanzania (at basic prices)*

| No | Production sectors | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| | | % Total Output | % Value Added | Value-added ratio | Total input coefficient (%) | Self-sufficiency ratio of materials (%) | Material coefficient % |
| | | X | Y | Y/X | R/X | $\gamma$ | $\lambda$ |
| 1 | Agriculture and forestry | 20.9 | 29.2 | 82.0 | 17.6 | 77.2 | 21.9 |
| 2 | Mining | 3.9 | 4.7 | 71.4 | 26.2 | 65.2 | 40.0 |
| 3 | Agro-processing / Manufacturing | 8.6 | 4.3 | 29.6 | 68.6 | 85.7 | 237.6 |
| 4 | Other Manufacturing | 6.6 | 4.3 | 38.1 | 60.4 | 68.1 | 162.6 |
| 5 | Utilities | 1.4 | 1.4 | 57.9 | 41.7 | 89.1 | 72.9 |
| 6 | Construction | 17.7 | 12.1 | 40.2 | 58.1 | 83.8 | 148.5 |
| 7 | Trade Services | 9.7 | 10.1 | 61.2 | 38.0 | 88.0 | 63.4 |
| 8 | Transport | 8.8 | 8.0 | 53.5 | 41.7 | 67.6 | 86.8 |
| 9 | Hotels and Restaurants | 2.3 | 1.6 | 42.9 | 56.4 | 94.7 | 133.2 |
| 10 | Telecommunications / computing | 2.0 | 1.9 | 56.8 | 42.8 | 87.6 | 76.2 |
| 11 | Financial Services | 3.7 | 4.8 | 77.3 | 22.6 | 96.3 | 29.4 |
| 12 | Real estate and business services | 5.5 | 6.5 | 69.5 | 30.0 | 90.7 | 43.9 |
| 13 | Public administration / services | 7.8 | 9.7 | 73.4 | 26.2 | 80.3 | 36.2 |
| 14 | Other Services | 1.2 | 1.3 | 65.2 | 34.5 | 91.4 | 53.5 |
| | All sectors | 100.0 | 100.0 | 58.9 | 39.8 | 81.3 | 69.9 |

*Note; for ease of reading all coefficients and ratios are expressed in percentages (and not in fractions).*

Table 4 shows that the sectoral composition of the total output of the economy differs markedly from that of value-added. Agriculture and forestry, for example, accounted for 29.2% of value-added but only for 20.9% of total output. Conversely, construction accounted for 12.1% of value added but for 17.7% of total output. Similarly, manufacturing (sectors 2 and 3) accounted for 9.0% of value added but for 12.5% of total output. There is, furthermore, an interesting distinction between the two manufacturing sectors. Sector 3 contains manufacturing activities with strong backward linkages to agriculture and forestry, while sector 4 features all other manufacturing activities. Both account for similar shares of total value-added, but the former accounts for a larger share of total output. Hence, agro-processing and agro-linked industries are bulkier in size, but with lower value-added relatively to its total output.

Column 3 shows that the *value-added ratio* (= $1/(1+\lambda)$) varies significantly across the different sectors: ranging from 29.6% in agro-processing / manufacturing to 82% in agriculture. And, conversely, the *technical input coefficient* (a) ranges from 17.6% in agriculture to 68.6% in agro-processing / manufacturing (see column 4).

The variation across the different sectors in the self-sufficiency ratio of materials ($\gamma$) shows that three sectors in particular have the largest import dependency on the supply of intermediate goods and services: 34.8% for mining, 31.9% for other manufacturing and 32.4% for transport (see column 5).

Finally, column 6 shows the variation across sectors of the material coefficient ($\lambda$). This variation may appear to be somewhat harder to interpret but it does in fact have a relatively easy interpretation. When the material coefficient equals 100% and, hence, $\lambda = 1$, the value of intermediate consumption will be equal to the value-added. Values below 100% mean that the value of intermediate consumption is below that of value-added produced and values above 100% imply that the value of intermediate consumption is above that of value-added. Agriculture and forestry have the lowest material coefficient (21.9 %) among all sectors, and agro-processing / manufacturing the highest (237.6%).

In what follows I shall use matrix algebra which is the most convenient tool to extend the accounting framework developed in section 5 to the analysis of an input-output table with several productive sectors / industries. Box 3 explains the notation used to depict matrices and vectors in input-output analysis.

***A note on matrix notation***

*Matrices* are denoted by upper-case bold letters: for example, **R** denotes the 14 x 14 *square* matrix featuring the pairwise transactions of intermediate goods and services between the different sectors of the economy.

Hence, **R** $= \begin{pmatrix} R_{1\,1} & \cdots & R_{1\,14} \\ \vdots & \ddots & \vdots \\ R_{14\,1} & \cdots & R_{14\,14} \end{pmatrix}$ where, $R_{i\,j}$ = inputs from sector i to sector j ;

or,

= $[R_{i\,j}]$ or all i = 1 … 14; j = 1 … 14. ( = a more compact notation for denoting matrix **R**)

*Vectors* are denoted by lower-case bold letters: for example, **z**, **x** and **f** are the 14 x 1 vectors of total supplies, total output and expenditures on final use.

Hence, **x** $= \begin{pmatrix} x_1 \\ \vdots \\ x_{14} \end{pmatrix}$ where $x_i$ is the total output of sector i : i = 1 … 14

All vectors are defined as column vectors. Hence, the transpose of a vector yields a row vector: **x**' = $(x_1 \ \ldots \ x_{14})$.

*Scalars* are denoted by lower-case or upper-case letters: for example, a = the total input coefficient and X = total output of an economy.

Furthermore,

- The *identity matrix* **I** denotes a matrix where $i_{i\,j} = 1$ if i= j and $i_{i\,j} = 0$ otherwise; i = 1 … 14; j = 1 … 14

  **I** = $\begin{pmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1 \end{pmatrix}$

- The *addition vector* denotes the vector **i** = $\begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix}$ ; $i_i = 1$ for all i = 1 … 14.

Using matrix algebra the first 14 rows of the input-output table of total supplies across sectors can then be written more compactly as follows:

$$\mathbf{z} = \mathbf{Ri} + \mathbf{f} \qquad [41]$$

As explained before, in the 2015 input-output table of Tanzania, **R** can be decomposed into two separate matrices: one for domestic production and the other for imports of intermediate goods.

Define: $\boldsymbol{R}^d$ = input-output matrix for domestic production (net of imports)

$\boldsymbol{R}^m$ = input-output matrix for imports of intermediate goods and services

hence, $\mathbf{R} = \boldsymbol{R}^d + \boldsymbol{R}^m$ [42]

It follows that the accounting identity for total output across sectors can then be written as follows:

$$\mathbf{x} = (\mathbf{R} - \boldsymbol{R}^m)\,\mathbf{i} + (\mathbf{f} - \mathbf{m}_f) \qquad [43]$$

where $\mathbf{m}_f$ is the vector of expenditures on imports for final use.

Let us now define the matrix of input coefficients $\mathbf{A} = [a_{ij}]$ , i = 1 … 14, j = 1 … 14 ;

$$\text{where: } a_{ij} = \frac{R_{ij}}{x_j} \qquad [44]$$

= the ratio of inputs from sector i to sector j to total output of sector i.

Note that: $\sum_i a_{ij}$ = total input coefficient of sector j

column 4 of Table 4 lists the specific values of the input coefficients by sector of production.

Let us further define the matrix of imported intermediate goods and services $\mathbf{M} = [m_{ij}]$ , i = 1 … 14, j = 1 … 14 ;

where: $m_{ij} = \frac{R^m{}_{ij}}{x_j}$ = the ratio of imports of intermediate goods from sector i to sector j to total output of sector j.

It follows that:

$$\mathbf{x} = [\mathbf{A} - \mathbf{M}]\,\mathbf{x} + (\mathbf{f} - \mathbf{m}_f) \qquad [45]$$

This is the fundamental equation for input-output analysis which can be used to derive of input-output multipliers within the domestic economy.[18]

The matrix [**A** – **M**] plays a pivotal role in input-output analysis. For this reason it is useful to take a closer look at these two matrices. As shown in section 5, at the aggregate level the picture is rather simple. The input coefficient

[18] Note that the respective import coefficients are expressed as a ratio of the total output of the importing sector. Alternatively, it is also possible, however, to express this equation using self-sufficiency ratios of materials instead (as was done in the analysis at the aggregate level). To see this,

define: $\gamma_{ij} = 1 - \frac{R^m{}_{ij}}{R_{ij}}$ = the self-sufficiency ratio of inputs from sector i to sector j.

It follows that the elements of the matrix [**A** – **M**] can also be written as $[a_{ij}\,\gamma_{ij}]$ for all i = 1 … 14 and j = 1 … 14. Hence, the product term a$\gamma$that was used earlier in the derivation of the input-output multiplier at the aggregate level, now appears again as a matrix of coefficients $a_{ij}\,\gamma_{ij}$ at the disaggregated level by sectors of production.

a is a scalar that measures the total consumption of intermediate goods and services as a fraction of total output of the economy. Obviously, as table 1a shows, the total supply of intermediate goods and services equals the total demand for these goods. Hence, the coefficient a can be interpreted and defined as the input coefficient but it could just as well be defined as an output coefficient.

At sectoral level, however, the picture is quite different. The value of total inputs for intermediate consumption required by a sector of production is *not* the same as the value of the outputs of intermediate goods and services this sector supplies to other sectors. At sectoral level, therefore, the demand and supply sides of intermediate goods and services do not balance and input coefficients (the demand side) should not be confused with output coefficients (the supply side).

The coefficients that feature in the columns of the matrices **A** and **M** depict the *demand side* for the deliveries of intermediate goods and services from other sectors required as inputs of a sector. This explains why input coefficients are calculated as fractions of the total output of the sector that requires these inputs for the production of its own output. Each column in the **A** matrix, therefore, is like a recipe of ingredients for intermediate consumption in the production of the output of the corresponding sector. Similarly, the coefficients in the corresponding column in the **M** matrix specifies the import needs for its production.

The columns of the [**A** – **M**]**,** in particular, show the *backward linkages* of each domestic productive sector to the other domestic production sectors: the extent to which a sector relies on domestically produced inputs from other sectors. This explains why the matrix [**A** – **M**] plays a pivotal role in the analysis of *input-output demand* multipliers that operate within the domestic economy.

But what about the supply side? Indeed, domestic sectors of production are also suppliers of intermediate goods and services to other sectors in the economy that require these inputs for their production. Hence, each production sector does not only have backward linkages to other sectors on which it depends, but also *forward linkages* to sectors that depend on its output for their own intermediate consumption.

To depict the supply side, therefore, requires the use of output coefficients rather than input coefficients. To do this, define the matrix of output coefficients **B** follows:

**B** = $[b_{ij}]$ for all i = 1 … 14, and j = 1 … 14

And, define, $b_{ij} = \frac{R_{ij}}{x_i}$

= output from sector i supplied to sector j as a fraction of to total output of sector i.

define, $\boldsymbol{M^f}$ = $[m_{ij}^f]$ , i = 1 … 14, j = 1 … 14

where: $m_{ij}^f = \frac{R^{m}{}_{ij}}{x_i}$

is the ratio of imports of intermediate goods from sector i to sector j to total output of sector i.

Note that the difference between matrices **A** and **B** is that in the coefficients in the former are calculated as fractions of *column* totals, and in the latter as fractions of the row totals. The same applies for the calculation of the coefficients of the **M** and $\boldsymbol{M^f}$ matrices. This simple change in denominator changes the focus of analysis from the demand to the supply side, and similarly, from demand to supply multipliers.

The analysis of the supply side (and of supply multipliers) is particularly important when an economy is confronted with capacity constraints in domestic production (such as failure of a harvest, interruption of electricity supplies, etc.) or in import capacity due to foreign exchange constraints. In such cases, supply multipliers ripple through an economy in successive rounds: contraction of output in one or more productive sectors provoke output contractions in other sectors that depend on its supplies of intermediate goods or services. [19]

Table 5 shows the backward and forward linkages (net of imports) for each of the 14 production sectors of the Tanzanian economy in 2015. The domestic backward linkages are obtained by summing the columns of the (**A –** M) matrix and the domestic forward linkages by summing the rows of the (**B -** $\boldsymbol{M^f}$) matrix for each sector of production.

*Table 5 Backward and forward linkages (net of imports) by sector of production for the Tanzanian economy in 2015 (percentages of sector totals)*

| No | Production sectors | 1 | 2 |
|---|---|---|---|
| | | *Backward linkages* | *Forward linkages* |
| | | $\sum_i(a_{ij} - m_{ij})$ | $\sum_j(b_{ij}-m_{ij}^f)$ |
| 1 | *Agriculture and forestry* | *13.6* | *26.8* |
| 2 | *Mining* | *17.1* | *40.7* |
| 3 | *Agro-processing / Manufacturing* | *58.7* | *19.2* |
| 4 | *Other Manufacturing* | *41.1* | *65.8* |
| 5 | *Utilities* | *37.1* | *50.5* |
| 6 | *Construction* | *48.7* | *12.2* |
| 7 | *Trade Services* | *33.4* | *38.4* |
| 8 | *Transport* | *28.2* | *44.7* |
| 9 | *Hotels and Restaurants* | *53.4* | *43.5* |
| 10 | *Telecommunications / compu* | *37.5* | *52.6* |
| 11 | *Financial Services* | *21.8* | *81.8* |
| 12 | *Real estate and business ser* | *27.2* | *52.2* |
| 13 | *Public administration / service* | *21.1* | *4.3* |
| 14 | *Other Services* | *31.5* | *33.8* |

*Note; for ease of reading all coefficients and ratios are expressed in percentages.*

The primary sectors of the economy (agriculture, forestry and mining) have weak backward linkages, but stronger forward linkages. Mining, in particular, delivers about 40.7% of its output – mainly quarrying products, but also

[19] For an example of the working of supply multipliers, see Lipumba, N., B. Ndulu, S. Horton and A. Plourde. 1988. 'A Supply Constrained Macroeconometric Model of Tanzania', Economic Modelling, October, pp. 354-375. The core idea underlying this model was based on Wangwe, S. M. (1983). Industrialization and Resource Allocation in a Developing Country, The Case of Recent Experiences Tanzania. World Development 11(16): 483–492. Both articles addressed the question that towards the end of the 1970s the drive towards capacity creation as a result of the industrialisation strategy increasingly went at the expense of capacity utilisation, particularly when the price of oil increased sharply during the late 1970s and into the early 1980s (Wangwe, 1983; Lipumba, Ndulu, Horton and Plourde, 1987). The reason was that project aid as well as suppliers' credit approved by BOT during 1979 and 1980-81 continued to fuel imports for investment, while export earnings fell, leading to severe import compression on recurrent imports, which meant that "industries were operating well below their rated capacity – about 33 per cent of capacity by 1981" (BOT 1982:228).

metal ores and natural gas – to other domestic industries, while the remainder is exported. Other manufacturing, utilities, telecommunications, financial Services and real estate are the sectors with domestic forward linkage coefficients above 50%.

Let me now turn to the main question of interest in input-output analysis which is by how much does total (domestic) output and its distribution across sectors of production change in response to a change in expenditure on final use such as, for example, an increase in expenditures of infrastructural investments in the economy? Put differently, the task here is to assess the *multiplicative effect* an exogenous stimulus via an increase in one or more components of final expenditures has on different sectors of the domestic economy.

The matrix of input-output multipliers can easily be derived as follows.

$$\Delta\mathbf{x} = \Delta[\mathbf{A} - \mathbf{M}]\,\Delta\mathbf{x} + \Delta(\mathbf{f} - \mathbf{m}_f) \qquad \textit{see equation 45}$$

Rearranging terms to express **x** as a function of $(\mathbf{f} - \mathbf{m}_f)$ yields:

$$(\mathbf{I} - \mathbf{A} + \mathbf{M})\,\Delta\mathbf{x} = \Delta\,(\mathbf{f} - \mathbf{m}_f)$$

hence,

$$\Delta\mathbf{x} = [\mathbf{I} - \mathbf{A} + \mathbf{M}]^{-1}\,\Delta\,(\mathbf{f} - \mathbf{m}_f) \qquad [46]$$

Define:

$$\mathbf{K} = (\mathbf{I} - \mathbf{A} + \mathbf{M})^{-1} \qquad [47]$$

$$= \textit{the matrix of input-output multipliers}$$

The matrix **K** is similar in structure to the multiplier $\mu_x$ $(=\frac{1}{1-a\gamma})$ derived in section 6.[20] The latter, however, applies to the aggregate level where all sectors of production are grouped together into one sector, while the former applies to the disaggregated level featuring multiple sectors of production.

Table 6 shows the 14x14 matrix of input-output multipliers (**K)** for the Tanzanian economy in 2015.

[20] To see this, define:

$$\mathbf{\Gamma} = [\gamma_{IJ}] = 1 - \frac{M_{ij}}{R_{ij}}$$

= ratio of matrix of domestically produced intermediate inputs from sector i to sector j to the total intermediate inputs from sector i to sector j.

It follows that:

$$\mathbf{\Gamma} \odot \mathbf{A} = \mathbf{A} - \mathbf{M}$$

Where the symbol ⊙ denotes the element-wise multiplication of two matrices (also called the Hadamar product or, alternatively, the Shur product).

*Table 6 The 2015 Tanzanian domestic requirements matrix: the input-output multipliers*

| No | Production sectors | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Agriculture and forestry | 1.081 | 0.011 | 0.416 | 0.033 | 0.012 | 0.033 | 0.016 | 0.013 | 0.336 | 0.012 | 0.004 | 0.016 | 0.027 | 0.013 |
| 2 | Mining | 0.002 | 1.031 | 0.006 | 0.144 | 0.136 | 0.055 | 0.008 | 0.005 | 0.005 | 0.009 | 0.002 | 0.007 | 0.007 | 0.006 |
| 3 | Agro-processing / Manufacturing | 0.010 | 0.003 | 1.105 | 0.024 | 0.006 | 0.009 | 0.008 | 0.007 | 0.175 | 0.006 | 0.002 | 0.007 | 0.030 | 0.007 |
| 4 | Other Manufacturing | 0.014 | 0.018 | 0.034 | 1.135 | 0.045 | 0.172 | 0.037 | 0.030 | 0.023 | 0.046 | 0.011 | 0.035 | 0.038 | 0.025 |
| 5 | Utilities | 0.002 | 0.009 | 0.011 | 0.021 | 1.022 | 0.011 | 0.019 | 0.009 | 0.018 | 0.020 | 0.004 | 0.013 | 0.012 | 0.019 |
| 6 | Construction | 0.010 | 0.008 | 0.008 | 0.011 | 0.008 | 1.092 | 0.023 | 0.014 | 0.010 | 0.017 | 0.005 | 0.045 | 0.012 | 0.024 |
| 7 | Trade Services | 0.017 | 0.036 | 0.078 | 0.072 | 0.061 | 0.078 | 1.043 | 0.102 | 0.073 | 0.151 | 0.009 | 0.052 | 0.039 | 0.022 |
| 8 | Transport | 0.018 | 0.030 | 0.047 | 0.059 | 0.077 | 0.107 | 0.087 | 1.101 | 0.038 | 0.036 | 0.013 | 0.030 | 0.028 | 0.033 |
| 9 | Hotels and Restaurants | 0.002 | 0.009 | 0.006 | 0.007 | 0.024 | 0.012 | 0.037 | 0.032 | 1.006 | 0.024 | 0.008 | 0.026 | 0.024 | 0.021 |
| 10 | Telecommunications / computing | 0.004 | 0.023 | 0.008 | 0.013 | 0.017 | 0.017 | 0.026 | 0.010 | 0.010 | 1.145 | 0.020 | 0.020 | 0.021 | 0.018 |
| 11 | Financial Services | 0.015 | 0.039 | 0.029 | 0.029 | 0.048 | 0.086 | 0.056 | 0.043 | 0.030 | 0.037 | 1.176 | 0.037 | 0.028 | 0.025 |
| 12 | Real estate and business services | 0.006 | 0.022 | 0.040 | 0.038 | 0.051 | 0.049 | 0.112 | 0.037 | 0.026 | 0.051 | 0.038 | 1.103 | 0.039 | 0.091 |
| 13 | Public administration / services | 0.001 | 0.002 | 0.003 | 0.003 | 0.007 | 0.005 | 0.013 | 0.006 | 0.003 | 0.008 | 0.002 | 0.007 | 1.010 | 0.005 |
| 14 | Other Services | 0.000 | 0.001 | 0.002 | 0.002 | 0.006 | 0.003 | 0.008 | 0.009 | 0.013 | 0.009 | 0.002 | 0.013 | 0.007 | 1.157 |
| **Column totals** | | 1.18 | 1.24 | 1.79 | 1.59 | 1.52 | 1.73 | 1.49 | 1.42 | 1.76 | 1.57 | 1.30 | 1.41 | 1.32 | 1.47 |

*Note*: *The highlighted cells trace the main diagonal of matrix* ***K***

Each coefficient $k_{ij}$ (i = 1 … 14; j = 1 … 14) measures the multiplicative effect on total output of sector i as a result of a unit increase in the expenditures on final use of sector j after the multiplier process within the circuit of intermediate consumption has come to a halt.[21]

[21] The workings of this multiplier process can also be formulated mathematically as a power series approximation as follows:

$$\mathbf{K} = [\mathbf{I} - (\mathbf{A} - \mathbf{M})]^{-1} = (\mathbf{I} + (\mathbf{A\text{-}M}) + (\mathbf{A} - \mathbf{M})^2 + (\mathbf{A} - \mathbf{M})^3 + \ldots + (\mathbf{A} - \mathbf{M})^n \ldots)$$

The last term depicts a power series approximation of **K** in which each successive terms in the expression on the right hand side becomes smaller and smaller as n becomes larger. The sequence of terms in the expansion $(\mathbf{I} + (\mathbf{A\text{-}M}) + (\mathbf{A} - \mathbf{M})^2 + (\mathbf{A} - \mathbf{M})^3 + \ldots + (\mathbf{A} - \mathbf{M})^n \ldots)$ depict the successive rounds of multiplicative impacts on total output of an initial increase in expenditures on final use.

- *Round 1* depicts the *initial effects (* ***I*** *) : the actual production of goods and services for final use in response to the increased demand.*
- *Round 2 depicts the direct effects (* ***A-M*** *) : the production of intermediate goods and services to replace the materials consumed in round 1. The sum of each of the columns of A depicts the backward linkages for each sector).*
- *Round 3, 4 … depict the dwindling succession of indirect effects* $(\mathbf{A} - \mathbf{M})^2 + (\mathbf{A} - \mathbf{M})^3 + \ldots + (\mathbf{A} - \mathbf{M})^n \ldots$ *as the derived demands for replenishments of intermediate goods and services works its way down the backward linkages of successive supply chains.*

  See Miller and Blair (2022: 33-35).

Hence, $k_{ij} = \frac{\Delta x_i}{\Delta(f_j - m_j)}$ i = 1 … 14 ; j = 1 … 14 [48]

The main diagonal of this matrix contains the $k_{ii}$ values which yield the multiplicative effect on total output of sector i as a result of an increase in expenditures on final use of sector i. Note that $k_{ii} \geq 1$ for all i. The reason is that the immediate multiplicative impact of an increase in demand for domestic output from sector i is the expansion of production in this sector in response to this demand.[22]

Summing each of the columns of the matrix **K** over all sectors yields the multiplicative effect on total output X as a result of a unit increase in the expenditures on final use of sector j.

$$\sum_i k_{ij} = \frac{\sum_i \Delta x_i}{\Delta(f_j - m_j)} = \frac{\Delta X}{\Delta(f_j - m_j)} \quad [49]$$

The total multiplier effects (as shown in the last row of table 6) vary quite considerably "depending on the nature of the industries entering into the propagation process" (Miyazawa, 1960: 57). An increase in final expenditure on agricultural or forestry products has the lowest total multiplier effect (= 1.18). So does expenditures on mining products (1.24). In contrast, the multiplier effects are highest for Increased final expenditures on products from agro-processing / manufacturing (1.79), construction (1.73) and hotels and restaurants (1.76).

Consider, for example, the effect on total output of an investment of 1,000 billion Tshs in a construction project. Column 6 of Table 6 shows the impact of this increased expenditure on construction on the total output across the different sectors of the economy as a result of the operation of the input-output multipliers. Output will expand in the construction sector itself in response to the increased expenditures as well as to subsequent multiplier effects that feed back to construction. Since $k_{66}$ = 1.092, total output in construction will therefore increase by 1,092 billion Tshs.

Furthermore, the multiplier of investment in construction on total output in other sectors is strongest in other manufacturing and in transport: output of other manufacturing will increase by 172 million Tshs and that of transport by 107 million Tshs. Finally, the total increase in total output across all sectors as a result of this investment in construction, therefore, will be equal to 1.73 billion Tshs.

However, the increase in total output is not the only effect of these input-output multiplier processes. Imports of intermediate goods and services will also increase depending on the self-sufficiency ratios of the different sectors.

To see this, define,

$\boldsymbol{r}^m$ = vector of imports for intermediate consumption by sector of production

**m** = vector of import coefficients for intermediate consumption by sector of production.

Then, $\Delta \boldsymbol{r}^m = \mathbf{M}\,\Delta\mathbf{x}$

$= \mathbf{M}\,\mathbf{K}\,\Delta\,(\mathbf{f} - \mathbf{m}_f)$ (50)

Table 7 summarises the import coefficients ($m_i = a_i(1 - \gamma_i)$ of intermediate goods and services by sector of production vary significantly across sectors (see also the earlier discussion on Table 4).

[22] As shown in footnote 30, the *first t*erm on the power approximation of **K** is the identity matrix **I** where $i_{i\,i} = 1$.

*Table 7 Import coefficients of intermediate goods and services by sector of production*

| No | Production sectors | Import coefficient $\mathbf{m}_i = a_i(1-\gamma_i)$ |
|---|---|---|
| 1 | Agriculture and forestry | 4.0 |
| 2 | Mining | 9.1 |
| 3 | Agro-processing / Manufacturing | 9.8 |
| 4 | Other Manufacturing | 19.3 |
| 5 | Utilities | 4.5 |
| 6 | Construction | 9.4 |
| 7 | Trade Services | 4.6 |
| 8 | Transport | 13.5 |
| 9 | Hotels and Restaurants | 3.0 |
| 10 | Telecommunications / computing | 5.3 |
| 11 | Financial Services | 0.8 |
| 12 | Real estate and business services | 2.8 |
| 13 | Public administration / services | 5.2 |
| 14 | Other Services | 3.0 |

What then are the lessons that can be learned from the empirical input-output analysis presented in this section for the practice of economic planning and modelling in Tanzania?

The practice of economic planning in Tanzania consists of a mixture of investment planning within a long and medium term perspective and macroeconomic stabilisation policies for short term management of the economy. The former is inspired by the goals of the longer term Development Vision and the latter by the day-to-day realities that occur along the way. Investment planning, however, appears to be very focused on *'projectizing'* investment: that is, setting out a coherent set of investment projects which taken together are meant to achieve the desired rate of growth of GDP along with the projected pattern of socioeconomic transformation of the Tanzanian economy within the planning horizon.

Projectizing investment, however, contains the inherent danger that investment projects are planned without consideration of the multiplier effects the production of investment itself has on the economy at large. The multiplier effects of investment operate in the succession of short terms along the duration of an investment project, each time propelling further expansion in total output and in import needs beyond the production of the investment itself. Moreover, as total output expands in the wake of investment, so does the value added generated in the process. Part of this increase in income will be spend on consumption, thus setting the consumption multiplier in motion in tandem with the input-output multipliers, thus amplifying the increase in total output and income.

These multiplier effects of investment, therefore, inevitably link the longer term perspective with the short term impacts of these investment on the economy at large. As noted earlier, all is well if the consumption and input-output can operate without hitting industrial capacity constraints or import constraints due to foreign exchange shortages. But this cannot be taken for granted. Economic planning, therefore, must take into account that the pace of investment should itself be constrained by the requirement that its multiplier effects can operate smoothly without investment going at the expense of consumption and employment.

Short-term macroeconomic management, however, tends to rely mainly on modelling the economy at the aggregate level. But this section shows that the same aggregate level of expenditures on final use can have very different multiplier effects within the wider economy. Table 8 shows that the sectoral composition of expenditures on the domestic production for final use differ considerably depending on the category of expenditure (HH consumption, fixed investment or exports.

*Table 8 The sectoral distribution of the main categories of expenditures on domestic production for final use*

| No | Production sectors | 1 | 3 | 5 | 7 |
|---|---|---|---|---|---|
| | | % Final Use | % HH Consumption | % GFCF | % Exports |
| | | F | C | I | E |
| 1 | Agriculture and forestry | 22.7 | 39.2 | 1.3 | 17.4 |
| 2 | Mining | 3.4 | 0.0 | 0.1 | 21.1 |
| 3 | Agro-processing / Manufacturing | 10.2 | 15.8 | 1.0 | 16.2 |
| 4 | Other Manufacturing | 3.3 | 3.2 | 3.8 | 6.7 |
| 5 | Utilities | 1.0 | 1.9 | 0.0 | 0.2 |
| 6 | Construction | 22.9 | 0.0 | 87.4 | 0.0 |
| 7 | Trade Services | 8.9 | 14.3 | 2.6 | 6.2 |
| 8 | Transport | 7.2 | 8.1 | 0.8 | 23.6 |
| 9 | Hotels and Restaurants | 1.9 | 3.6 | 0.0 | 0.0 |
| 10 | Telecommunications / computing | 1.4 | 2.5 | 0.0 | 1.1 |
| 11 | Financial Services | 1.0 | 1.4 | 0.0 | 1.0 |
| 12 | Real estate and business services | 3.9 | 4.7 | 3.0 | 5.6 |
| 13 | Public administration / services | 11.0 | 3.2 | 0.0 | 0.8 |
| 14 | Other Services | 1.2 | 2.0 | 0.0 | 0.1 |
| All sectors | | **100.0** | **100.0** | **100** | **100** |

Agriculture and agro-processing / manufacturing together accounted for 55% of HH expenditures on the domestic production of consumer goods and services. The share of domestically produced 'other manufacturing' products is small, but this is because there is a greater reliance on imports of these products for household consumption. Construction alone accounts for 87.4% of the investment expenditures on domestically produced investment goods. Other manufacturing is important as well for investment, but mainly procured through imports from abroad. Transport services account for nearly one quarter of total exports, followed by mining, agriculture and aggro-processing / manufacturing products.

Stepping up the pace of investment in the economy implies changing the patterns of expenditures on the domestic production for final use which will inevitably alter the strength and the sectoral distribution of the operation of the input-output multipliers within the economy. Accounting for such changes needs to be part and parcel of the focus of economic planning.

The disconnect in economic planning and policy making between its focus on investment planning for economic growth without much explicit attention to the recurrent implications of these investments in terms of its multiplier effects on the wider economy might explain why the consumption coefficient (= the share of consumption in GDP) has been so volatile over time in Tanzania. It is the argument of this paper that the consequences of this disconnect is that consumption and employment become residual (adjusting) factors in matters of economic planning.

## *8 The structure of employment: the shift from agriculture to informal employment*

The main purpose of this section is to triangulate the employment structure in Tanzania with the production structure of the economy as depicted in the 2015 input-output table of Tanzania. To do this, I shall make use of the analytical report of the Integrated Labour Force Survey (ILFS) 2020/21 of Tanzania.

The ILFS 2020/21 shows that the working age population (15 years and above) of mainland Tanzania was about 54.8% of its total population. Children (0-14 years of age), therefore, accounted for 45.2% of its total population. Moreover, the 15-24 age group accounted for 32.2% of the working age population, the 25-35 age group for 24.8%, the 35-64 age group for 35.1%, and the 65+ age group for 7.9%.

Tanzania (like other SADC countries) defines youth as a person of age 15 to 35 years (unlike ILO which defines a youth as a person between 15 to 24 years). The youth population, therefore, accounted for 57% of the total working age population of Tanzania in 2020/21. It is this generation and the present generation of children which together will account for the large majority of the working population over the period of Tanzania Vision 2050.

For mainland Tanzania, the *employment to population ratio* for persons aged 15 years or above was 75.8%: 81.4% for men and 70.7% for women (ILFS 2020/21: table 5:3).

The employment to population ratio differed by gender and by age cohort:

- *Male employment:* 63.2% for the 15-24 age group, 92.6% for the 25-35 age group, 93.1% for the 36-64 age group and 67.4% for the 63+ age group;

- *Female employment*, 56.6% for the 15-24 age group, 77.2% for the 25-35 age group, 83.6% for the 36-64 age group and 52.3% for the 63+ age group.

The ILFS 2020/21 (table 6.1) classifies employed persons into three broad "sectors" of employment: agriculture, the formal sector and the informal sector of the economy. According to this classification, agriculture accounted for *61.7%* of total employment of mainland Tanzania*,* the formal sector for *9.6%,* and the informal sector for *28.7%*.

The ILFS also includes the notion of informal employment which refers to "those jobs that generally lack basic social and legal protections or employment benefits and may be found in informal sector, formal sector enterprises or households" (ILFS 2020/21: 6). Hence, while the concept of informal sector emphases the 'enterprise side' of informality, the concept of informal employment puts the emphasis on the labour side.[23,24]

Table 9 gives the breakdown of the structure of total and informal employment by industry and by gender in Tanzania (ILFS 2020/21: tables 5.6 and 6.6). The percentage distributions in this table relate to headcounts of persons employed and, hence, to avoid double counting, people were classified according to their main (but not necessarily exclusive) employment activity only.

[23] The ILFS 2020/21 is a household survey and not an enterprise survey. In total, 11,520 households were sampled in mainland Tanzania and individual questionnaires were administered to all persons aged 5+ within this sample of households. The distinction between 'informal sector" and 'informal employment' is not always made clear in the discussion of the tables presented in the analytical report. However, since the data were obtained from households and individuals it seems reasonable to assume that data reported on employment by industry effectively relate to informal employment by industry.

[24] There has only been one comprehensive informal sector survey for mainland Tanzania: The Planning Commission and the Ministry of Labour and Youth Development (with assistance of UNDP/ILO URT/91/028) (19921) *Tanzania. The Informal Sector 1991.*

*Table 9 % Employed persons aged 15+ by industry and gender: total and informal employment (main activity only)*

| EMPLOYMENT BY INDUSTRY 2020/2021 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| | TOTAL | | | INFORMAL SECTOR | | | % SHARE INFORMAL SECTOR IN TOTAL EMPLOYMENT BY SECTOR |
| | Male | Female | Total | Male | Female | Total | Total |
| Agriculture, forestry and fishing | 64.4 | 67.0 | 65.6 | 19.3 | 15.4 | 17.4 | 7.6 |
| Mining and quarrying | 1.5 | 0.4 | 0.9 | 3.9 | 1.1 | 2.5 | 79.7 |
| Manufacturing | 5.0 | 3.8 | 4.4 | 12.6 | 11.1 | 11.8 | 77.0 |
| Electricity, gas, steam and air conditioning supply | 0.2 | 0.0 | 0.1 | 0.1 | 0.0 | 0.1 | 28.7 |
| Water supply; sewerage, waste management and remediation activities | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 28.7 |
| Construction | 4.6 | 0.2 | 2.4 | 14.3 | 0.4 | 7.4 | 88.5 |
| Wholesale and retail trade; repair of motor vehicles and motorcycles | 9.4 | 15.0 | 12.2 | 23.8 | 41.4 | 32.6 | 76.7 |
| Transportation and storage | 5.7 | 0.2 | 3.0 | 12.0 | 0.3 | 6.1 | 58.4 |
| Accommodation and food service activities | 1.0 | 4.9 | 2.9 | 2.3 | 14.6 | 8.4 | 83.1 |
| Information and communication | 0.3 | 0.1 | 0.2 | 0.5 | 0.1 | 0.3 | 43.1 |
| Financial and insurance activities | 0.4 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 28.7 |
| Real estate activities | 0.1 | 0.0 | 0.1 | 0.3 | 0.1 | 0.2 | 57.4 |
| Professional, scientific and technical activities | 0.4 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 | 28.7 |
| Administrative and support service activities | 2.0 | 1.3 | 1.6 | 3.6 | 2.9 | 3.3 | 59.2 |
| Public administration and defence; compulsory social security | 0.7 | 0.2 | 0.5 | | | | |
| Education | 1.7 | 1.5 | 1.6 | 0.6 | 0.7 | 0.7 | 12.6 |
| Human health and social work activities | 0.6 | 0.8 | 0.7 | 0.5 | 0.4 | 0.5 | 20.5 |
| Arts, entertainment and recreation | | | | 0.5 | 0.1 | 0.3 | |
| Other | 2.1 | 4.1 | 3.1 | | | | |
| Other service activities | | | | 3.4 | 4.7 | 4.0 | |
| Activities of households as employers | | | | 1.3 | 6.1 | 3.7 | |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 28.7 |
| Number | 12,058,782 | 11,477,354 | 23,536,135 | 3,390,549 | 3,365,776 | 6,756,325 | |
| % OF TOTAL EMPLOYMENT | 51.2 | 48.8 | 100.0 | 14.4 | 14.3 | 28.7 | |

*Note: The classification of service industries for total employment differs slightly from that for informal employment.*

Agriculture remains the main employment sector of the Tanzanian economy accounting for 65.6% of total employment (male and female): 64.4% of male employment and 67% of female employment. In comparison, the 2006 ILFS showed that agriculture accounted for 76% of total employment: 72.3% for male employment and 80.0% for female employment.[25] Hence, the share of employment in agriculture in total employment declined by 10.4% over the period 2006 to 2020/21.

For male employment, other key sectors of significant employment numbers were trade and repair of motor vehicles and motorcycles (9.4%), transport (5.7%), manufacturing (5.0%) and construction (4.6%). For female employment, other key sectors of employment numbers were trade (15%), accommodation and food service activities (4.9%) and manufacturing (3.8%) [columns 1, 2 and 3 in table 9].

Informal employment accounted for 28.7% of total employment in 2020/21. In comparison, the 2006 ILFS showed that the informal sector accounted for 10.1% of total employment (Wuyts and Kilama, 2015: 37). This suggests

[25] See Marc Wuyts and Blandina Kilama (2014) *The Changing Economy of Tanzania: Patterns of Accumulation and Structural Change*. Repoa Working Paper 14/3, pp. 31-40. See also Wuyts, M & B. Kilama (2016) "Planning for Agricultural Change and Economic Transformation in Tanzania?" Journal of Agrarian Change, Vol 16 (2), April, pp. 318-341.

that the relative decline in the share of agricultural employment in total employment during the period 2006 to 2020/21 went towards the increase in the share of informal employment in the Tanzanian economy.

For male employment, the key sectors of significant informal employment numbers were trade and repair of motor vehicles and motorcycles (23.8%), agriculture, forestry and fishing (19.3%), construction (14.3%), manufacturing (12.6%) and transport (12.0%). For female employment, the key sectors of employment numbers were trade (41.4%), agriculture, forestry and fishing (15.4%), accommodation and food service activities (14.6%) and manufacturing (11.1%) [columns 4, 5 and 6 in table 9].

A distinctive feature of the process of economic transformation in Tanzania since the turn of the century, therefore, has been the rapid growth of informal employment. The resulting patterns of the share of informal employment in total employment, however, differ markedly by industry (as shown in column 7 in table 9). The sectors where the share of informal employment in total employment is larger than 75% are construction (88.5%), accommodation and food services (83.1%), mining and quarrying (79.7%), manufacturing (77.0%), and trade and repair services (76.7%).[26]

A caveat is necessary here. Table 9 classifies employment by main activity only and, hence, is based on headcounts rather than on measurements of labour time spent on different activities. However, the 2020/21 ILFS (table 5.15) showed that 24.7% of those employment were also involved in secondary activities. Most of those involved in secondary activities belonged to two occupational categories of employment in particular: 'skilled agricultural and fisheries workers', on the one hand, and 'elementary' occupations, on the other.

According to the ILFS classification by occupation, skilled agricultural and fisheries workers accounted for 60.8% of total employment: 58.6% of male employment and 63.3% of female employment (2020/21 ILFS, table 5.3) These skilled agricultural and fisheries workers accounted for 46.8% of persons involved in secondary activities: 49.7% of male workers and 42.75% of female workers (table 5.15). Those engaged in 'elementary occupations' accounted for 13.4% of total employment: 13.4% of male employment and 13.5% of female employment. Among these persons in 'elementary occupations', 23.9% were involved in secondary activities: 24.2% for male employment and 22.5% for female employment.

The implication of this caveat is that the share of agricultural employment in total employment as reported in table 9 tends to *overestimate* the share of agricultural labour in total employment in terms of *actual labour time* spent in agricultural activities. Hence, half of male employment in agriculture is also involved in secondary activities versus 43% of female employment in agriculture.

Regrouping the categories of the employment data in table 9 then allows us to match them with the input-output data by industry. My focus here is on comparing the distribution of value added with that of employment by industry.
To do this,

define, $V_i = \frac{Y_i/Y}{L_i/L}$ where i = 1 … 14

$$= \frac{share\ of\ value\ added\ in\ sector\ i\ in\ total\ value\ added}{share\ of\ employment\ in\ sector\ i\ in\ total\ employment}$$

The V ratio is a (fairly crude) relative productivity ratio that relates the share in total value added of a sector to its share in total employment for different sectors of an economy. V = 1 if the share of a sector in total value added equals its share in total employment.[27] Table 10 shows the V-ratios across the 14 sectors of the input-output tables from previous sections.

[26] In ILO statistics, smallholder agriculture is not defined as part of the informal sector although it shares many of the characteristics of own-account informal sector activities (but not wage labour-services informal activities). This explains why the share of informal employment in agriculture is the lowest with 7.6%.
[27] See M. Karshenas (2001) "Agriculture and Economic Development in Sub-Saharan Africa and Asia", *Cambridge Journal of Economics* 25(3): 315-342.

*Table 10 Shares in total value added and in total employment and V-ratios by sector of productive activity*

| No | Production sectors | 1 | 2 | 3 |
|---|---|---|---|---|
| | | % *Value Added* | % Employment | V-Ratio |
| | | *Y* | L | V |
| *1* | *Agriculture and forestry* | *29.2* | 65.6 | 0.4 |
| *2* | *Mining* | *4.7* | 0.9 | 5.2 |
| *3* | *Agro-processing / Manufacturing* | *4.3* | 4.4 | 1.9 |
| *4* | *Other Manufacturing* | *4.3* | | |
| *5* | *Utilities* | *1.4* | 0.2 | 6.9 |
| *6* | *Construction* | *12.1* | 2.4 | 5.0 |
| *7* | *Trade Services* | *10.1* | 12.2 | 0.8 |
| *8* | *Transport* | *8.0* | 3.0 | 2.7 |
| *9* | *Hotels and Restaurants* | *1.6* | 2.9 | 0.6 |
| *10* | *Telecommunications / computing* | *1.9* | 0.2 | 9.7 |
| *11* | *Financial Services* | *4.8* | 0.3 | 16.1 |
| *12* | *Real estate and business services* | *6.5* | 2.0 | 3.3 |
| *13* | *Public administration / services* | *9.7* | 2.8 | 3.5 |
| *14* | *Other Services* | *1.3* | 3.1 | 0.4 |
| | All sectors | 100.0 | 100.0 | 1.0 |

The V-ratio for agriculture is low (0.4) given that its share in total employment is much larger than its share in total value added. In terms of labour time, however, the V-ratio is likely to be larger (but less than 1) because skilled agricultural and fisheries workers accounted for 46.8% of persons involved in secondary activities. Other productive sectors with a V ratio below 1 are trade services (0.8), hotels and restaurants (0.6) and other services (0.4). A distinctive feature of these three sectors is their much larger share of female employment in total employment, and when data available, some of the largest shares of informal employment (see Table 9).

The mining sector has a relatively large V-ratio (5.2). This should be interpreted with care though. The 2006 ILFS shows that this sector also attracts a significant inflow of labour involved in secondary activities (see Wuyts and Kilama, 2015: p. 37). Unfortunately, the 2020/21 ILFS does not give a similar breakdown of secondary activities by industry.

The V-ratio of manufacturing is above 1 but relatively low (1.9) compared to other sectors. Unfortunately, the labour force statistics do not make the distinction between agro-processing / manufacturing and other manufacturing. The input-output data, however, show that these two sub-groups within manufacturing have quite different structural characteristics: the value added ratio is agriculture and forestry related manufacturing is significantly lower than in other manufacturing, and the former also is bulkier in nature (its share in total output is much larger than that of other manufacturing while their shares in value added are the same). This suggests that their respective V-ratios may well be quite different. It is probably reasonable to hypothesize that the V-ratio in the former is lower than that in the latter, but better data on labour would be required to verify this hypothesis.

The V-ratio in construction is higher (5.0). The 2006 ILFS, however, suggests that this is another sector with a large inflow of labour derived from secondary activities, and, hence, the V-ratio may well be somewhat lower.

Telecommunications and computing has a large V-ratio (9.7). This is a growing sector with a relatively smaller labour force where technological productivity and innovation is most pronounced. Finally, in a world characterised by rapid processes of financialization over recent decades the large V-ratio (16.1) should not come as a surprise.

What lessons can be learned for economic planning from this brief excursion in the structure of employment in Tanzania? In terms of employment, the planning projections that underscored the recent three five-year development planning envisaged a steep decline in the share of employment in agriculture in the process of

socioeconomic transformation and industrialisation. There was indeed a significant decline in the share of agricultural employment in total employment, but not as steep as projected in planning. However, as shown above, this shift was predominantly towards *informal employment* outside agriculture, and in sectors with low V-ratios.

The formal sector, therefore, appears to be largely characterised by *jobless growth in formal employment*. It would be wrong, however, to interpret this shift out of agricultural employment solely as a manifestation of the growth of the informal sector in Tanzania. Part of this shift also reflects *the increased informalisation of labour arrangements within the formal sector itself* because of an increase in sub-contracting of informal employment by the formal sector in which the informal sector assumes the role of supplier of labour power through 'labour contracting arrangements', a practice that is very prevalent in sectors such as mining, construction and others in Tanzania (Rizzo, Kilama & Wuyts, 2014: pp. 151-152).[28]

The stunted growth in formal sector employment presents a major challenge for youth employment in a context where surplus labour is already prevalent in the economy and the labour force is rapidly expanding. The prime concern for young people entering the labour force is to obtain decent work opportunities. The 2020/21 ILFS gives further evidence about the dimensions of this challenge young people face (which I shall not review here further). In this respect, it is important not to confuse the abundance of labour with the availability of cheap labour in a country. The key determinant of cheap labour is the cost of living, particularly, the cost of wage goods, rather than the availability of surplus labour. To ensure that growth does not go at the expense of worsening wages and labour conditions (and consumption) but instead seeks to mobilise labour for development, therefore, would require an investment portfolio that combines slow-yielding infrastructural investments with the compounding effect of quick-yielding broad-based investment focused on increasing production and productivity of basic consumer goods for the domestic market.[29]

### *9 Conclusions, summary of argument and implications for planning from a long run perspective*

This paper argued that planning from a long term perspective in Tanzania cannot just solely focus on setting a high target rate of growth and a high pace of investment (which also implies a high savings ratio) without considering how the planned patterns of investment impact on the trajectory of growth in consumption and employment over the planning horizon. The reason is that in an economy characterized by the prevalence of surplus labour and a rapidly growing labour force, investment and consumption need to go hand in hand rather than one at the expense of the other because securing the rapid growth in employment requires the steady expansion of the production of consumer goods (and of wage goods, in particular) along the trajectory of economic growth. What this means is that consumption should be seen as an important variable in its own right and not as something to be squeezed, because the role of consumption in the process of industrialization and socioeconomic transformation is intimately linked with the question of securing full employment as the key objective of economic policy.

Any process of industrialization and rapid socioeconomic transformation will inevitably require some degree of shifting resources towards savings along the trajectory of growth. The key issue raised here, however, is that this relative shift from consumption to investment and savings should not be done in a way that impedes the steady and continued expansion of employment needed to enable the absorption of a rapidly growing labour force and of existing surplus labour in the economy. This is particularly important given the pressing challenge of youth unemployment that is currently facing the country. This requires a trajectory of inclusive development that ensures that the majority of working people participate in the growth process both as consumers and as producers.

Employment spans across both consumption and production: incomes derived from employment secure living standards and, hence, constitute a major source of the aggregate demand for consumer goods, on the one hand, and labour incomes derived from the supply of labour in production also have effects on the aggregate supply of

[28] See also, in a different context, Jan Breman's (2024: 533) point that: "Casualisation and contractualisation of wage work indicated that labour has become thoroughly commodified in a state of footlooseness".
[29] See M. Wuyts (2019) 'Effective Demand, Surplus Labour and the Pace of Development: Rereading Kalecki and Kahn', pp. 131-146 in Murat Arsel, Anirban Dasgupta and Servaas Storm (eds.) *Reclaiming Development Studies: Essays for Ashwani Saith*: London: Anthem Press.

goods and services since they effect (via costs) the profitability and viability of productive activities, on the other hand (Ghose, 2011: 281). As this paper shows, both dimensions matter and need to be incorporated in the formulation of macroeconomic and employment policies and planning.

The conceptual framework (developed in section 2) that underscores the macroeconomic analysis of this paper uses circular flow analysis to depict the macro linkages between the circular flow of income (the expenditure side) and the circular flow of intermediate goods (the production side). The former focuses on the production of value added and the ensuing formation and spending of money incomes in the domestic economy. It shows how the aggregate value added originates the country's income that in turn will be spent on goods produced in the economy or abroad. The latter focuses on the production side of the economy and, more specifically, on its industrial structure. It shows how the interconnectedness of supply chains within an economy and through foreign trade underscores the production of value added in the economy.

Section 2 shows how each of these two circular flows is characterised by a macroeconomic feedback mechanism – which, in technical jargon, is called a multiplier process. Both these multiplier processes are essentially consumption multipliers: the former for household consumption (the consumption multiplier) and the latter for intermediate consumption (the input-output multipliers). Both multipliers interact because each successive round of the production of value added requires the constant renewal of the intermediate goods that enter into its production.

The analysis of both circuits is necessary to locate the question of securing full employment at the macro level of the economy. Labour derives its income out of the value added produced in the production and secures its living standards through the feedback mechanism from labour income to expenditures on consumer goods and thus back to production, thereby setting in motion the consumption (and employment) multiplier and its interaction with input-output multipliers.

This paper argued that these multiplier processes matter for economic planning from a long run perspective. Investment planning in Tanzania appears to be very focused on *'projectizing'* investment by setting out a coherent set of investment projects which taken together are meant to achieve the desired rate of growth of GDP along with the projected pattern of socioeconomic transformation of the Tanzanian economy. Projectizing investment, however, contains the inherent danger that investment projects are planned without consideration of the multiplier effects the production of investment itself has on the economy at large.

More specifically, this paper argues that economic planning must take into account that the pace of investment should itself be constrained by the requirement that the consumption and input-output multiplier effects can operate smoothly over the planning horizon without investment going at the expense of consumption and employment.

Section 3 argued that this smooth operation of the multiplier processes over time cannot be taken for granted as an implicit assumption in the design of economic planning. Indeed, the empirical analysis based on recent national income accounts statistics illustrates that, in the last 15 years, the steep increase in the share of investment in GDP went at the expense of a pronounced decline in the share of household consumption in GDP. Put differently, this decline in the share of household consumption is GDP was the adjusting factor – the residual – of an economic policy that prioritized stepping up the rate of investment in the economy to maximise the rate of growth of GDP. In section 4, I argued that this volatility in the share of consumption in GDP is most likely due to the fact that the rise in the investment ratio of the economy brought about a fall in the share of labour incomes, thus leading to a relative shift from consumption to savings in the economy. This entails a real danger, however, of a built-in trade off between growth and employment policies, which may also lead to a lopsided demand and expenditure structure within the domestic economy.

Section 5 argued that the data that are mainly used for the practice of macroeconomic planning in Tanzania – the national income accounts, in particular – focus only on the circular flow of income within the economy: the production of value added across different productive activities, the generation and distribution of income to which it gives rise and the structure of expenditures. The focus of planning from a long run perspective, however, is to propel a process of industrialisation and socioeconomic transformation of the economy. National income data, however, only yield partial insights into the industrial structure of the Tanzanian economy and of its import

dependency because its focus is solely on aggregate value-added and its composition across productive sectors. What is left out of the picture, however, is the total output of the economy and the production and exchange of intermediate goods and services through the network of supply chains (internal as well as from abroad) that make up the whole fabric of the production structure of an economy.

For purposes of long run planning, however, it is important to come to grips with industrial structure of the economy and its networks of supply chains, which together also determine the structure of employment. This is necessary not only for linking macroeconomic policy and planning with industrial and trade policies, but also for gaining insights into the nature of the potential constraints on the operation of the consumption and input-output multipliers that may arise along the trajectory of growth. Section 5 sets out an extended accounting framework that includes the structure of total output and of the production of intermediate goods along with the macroeconomic aggregates that feature in the circular flow of income. It shows how this accounting framework underscores the structure of the 2015 input-output table of Tanzania and thus allows for a more comprehensive macroeconomic analysis of the Tanzanian economy and its industrial structure.

This section also derived and calculated some key structural coefficients and ratios that characterise the industrial structure of the economy and its import dependency at the aggregate level: the total input coefficient (= the share of total intermediate consumption in total output) which was equal to 39.6%; the self-sufficiency ratio of materials (the ratio of domestically produced intermediate goods and services to total intermediate consumption) equal to 81.3%; and the material coefficient (= the ratio of intermediate consumption to total output) equal to 66.9%). Section 6 then derived the aggregate input-output multiplier which is a multiplicative factor that shows by how much total output in the economy will expand in response to increased expenditure of domestically produced goods and services within the economy. For 2015, the aggregate input-output multiplier was estimated to be 1.49.

At present, these structural coefficients and ratios hardly (if at all) featured in Tanzanian policy and planning documents or reports, nor did they feature in the development of planning models from a longer term perspective. It is the contention of this paper, however, that these structural parameters, particularly when disaggregated at the level of different sectors of production, provide valuable insights in the structure of the Tanzanian economy.

Section 7 used a compact version of the 2015 Input-Output table featuring 14 sectors of production to show how this analytical framework can be put to use for policy analysis and planning. It shows that the values of these structural parameters differ significantly across the different sectors of production. The same change in the total value of aggregate output, therefore, can have very different effects (including different multiplier effects) on the economy depending on in which sectors these changes take place. This is because different sectors have different backward (upstream) and forwards (downstream) linkages in terms of their insertion within the networks of supply chains within the economy. Moreover, import dependency on intermediate goods and services varied significantly across different sectors of production. This is important for the formulation of import-substituting strategies given that imports of intermediate goods and services accounted for 55% of total imports in 2015.

Finally, section 8 looked at the structure of employment in Tanzania using the 2021/2 integrated labour force survey of Tanzania. The recent three Five Year Development Plans envisaged a process of structural transformation where employment would shift from agriculture to industry and services. The share of employment in agriculture in total employment declined by 10.4% over the period 2006 to 2020/21: from 76% down to 65.6% of total employment. But, as shown in this section, this relative decline in the share of agricultural employment in total employment during the period 2006 to 2020/21 went towards the increase in the share of *informal employment* in the Tanzanian economy.

The share of informal employment in total employment, however, differs markedly by sector of production. The sectors where the share of informal employment in total employment is larger than 75% are construction (88.5%), accommodation and food services (83.1%), mining and quarrying (79.7%), manufacturing (77.0%), and trade and repair services (76.7%).

The implication of the analysis in section 8 is that the growth in formal sector production appears to be largely characterised by *jobless growth in formal employment*. It would be wrong, however, to interpret this shift out of agricultural employment solely as a manifestation of the growth of the informal sector in Tanzania. Part of this shift

also reflects *the increased informalisation of labour arrangements within the formal sector itself* because of an increase in sub-contracting of informal employment by the formal sector in which the informal sector assumes the role of supplier of labour power through myriad forms of 'labour contracting arrangements'.

This question of the informalisation of labour in Tanzania still leaves many questions to be answered which would require more research and more data. Tentatively, however, in the context of the argument of this paper, I would venture to argue that it is this state of what Jan Breman (2024: 533) referred to as the "increased footlooseness of labour" as a result of informalisation processes both within the informal and formal sectors that may account for the volatility of the consumption coefficient in the Tanzanian economy. The danger here is that growth policies have been disconnected from employment policies.

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## *APPENDIX 1: OVERVIEW OF THE SAVING-INVESTMENT EQUALITY IN TANZANIA 1976 – 2021*

**NATIONAL ACCOUNTING AND THE INVESTMENT - SAVING EQUALITY**

To derive the savings-investment equality from national account data – from Tanzanian national accounts, in particular – we start with the following now familiar identity that holds between macroeconomic aggregates on the expenditure side of the national income accounts:

**GDP = HH CONSUMPTION + GOVERNMENT CONSUMPTION + INVESTMENT + (EXPORTS – IMPORTS)** **(A1)**

where HH consumption refers to household consumption. In national accounts tables, investment is referred to as gross capital formation.

Gross domestic savings is then defined as the excess of domestic output over domestic consumption, as follows:

**DOMESTIC SAVINGS = GDP – (HH CONSUMPTION + GOVERNMENT CONSUMPTION)** **(A2)**

From equations 1 and 2 it follows that

**INVESTMENT = DOMESTIC SAVINGS + (IMPORTS – EXPORTS)** **(A3)**

This yields the *savings-investment equality*, also referred to (in traditional political economy) as the *accumulation balance* of an economy.

However, part of the income derived from domestic output (GDP) accrues to residents of other countries, and conversely, domestic residents also derive part of their income from output produced abroad. To account for the net inflow of such primary incomes, the gross national income (GNI) of a country (as distinct from its GDP) is defined as follows:

**GROSS NATIONAL INCOME (GNI) = GDP + NET PRIMARY INCOME FROM ROW** **(A4)**

where 'ROW' equals 'rest of the world'.

Further account needs to be taken of the net balance of current transfer payments from and to the rest of the world, which leads us to the definition of gross national disposable income (GNDI) as follows:

**GROSS NATIONAL DISPOSABLE INCOME = GNI + NET CURRENT TRANSFERS FROM ROW** **(A5)**

Historically net primary income flows (which include repayment of interests on loans and profit repatriation) in Tanzania have tended to be negative, while net current transfers (which include the inflow of foreign aid grants) have tended to be positive.
Based on these definitions, gross national savings is defined as follows:

**GROSS NATIONAL SAVINGS = GNDI – (HH CONSUMPTION + GOVERNMENT CONSUMPTION)** **(A6)**

Therefore, gross national savings differs from gross domestic savings inasmuch as the former also takes account of the sum of net income flows and net transfers from the rest of the world, as follows:

**GROSS NATIONAL SAVINGS = GROSS DOMESTIC SAVINGS** **(A7)**
**+ NET PRIMARY INCOMES FROM ROW**
**+ NET CURRENT TRANSFERS FROM ROW**

Similarly, the current account *deficit* of a country's balance of payments differs from its trade deficit (the surplus of imports over exports) as follows:

**CURRENT ACCOUNT DEFICIT = IMPORTS – EXPORTS** **(A8)**
**– NET PRIMARY INCOMES FROM ROW**
**– NET CURRENT TRANSFERS FROM ROW.**

This allows us to derive a second alternative expression for the accumulation balance using *national* rather than *domestic* savings, as follows:

**GROSS INVESTMENT = GROSS NATIONAL SAVINGS + CURRENT ACCOUNT DEFICIT** **(A9)**

In empirical analyses it is useful to look at the savings-investment equality from the perspectives of both domestic savings (equation 3) and national savings (equation 9). Each yields different insights. Equation 3 reveals how investment in a country is financed by the sum of the surplus of domestic production over and above domestic consumption *plus* the excess of imports over exports (= foreign savings). This equation throws light on the nature of resource mobilisation for accumulation: the production side of financing investment.

In contrast, equation 9 looks at the income side by taking into account that part of the income derived from domestic output (GDP) accrues to residents of other countries, and conversely, domestic residents also derive part of their income from output produced abroad. Each tells a different story, particularly because domestic savings and national savings do not always go hand in hand in terms of their movements over time, as will be shown in our empirical analysis.

*Table 1: The Evolution of the Saving-Investment Equality on Tanzania 1976 to 2021*

| YEAR | FINAL CONSUMPTION | | | GROSS CAPITAL FORMATION | DOMESTIC SAVINGS | IMPORT SURPLUS | *NATIONAL ACCOUNT SERIES BASE YEAR* |
|---|---|---|---|---|---|---|---|
| | HH CONSUMPTION | GOVERNMENT CONSUMPTION | TOTAL CONSUMPTION | | | | |
| 1976 | 58.3 | 16.0 | 74.3 | 28.2 | 25.7 | 2.5 | *1976* |
| 1980 | 68.5 | 13.0 | 81.5 | 30.8 | 18.5 | 12.4 | *1976* |
| 1983 | 76.2 | 13.6 | 89.8 | 16.3 | 10.2 | 6.1 | *1976* |
| 1985 | 74.9 | 16.5 | 91.4 | 18.6 | 8.6 | 10.0 | *1976* |
| 1987 | 86.1 | 12.5 | 98.1 | 27.7 | 1.5 | 26.2 | *1976* |
| 1987 | 81.7 | 16.9 | 98.6 | 22.1 | 1.4 | 17.3 | *1992** |
| 1992 | 82.7 | 19.6 | 102.4 | 27.2 | -2.4 | 26.9 | *1992** |
| 1996 | 83.1 | 11.6 | 94.6 | 16.6 | 5.4 | 12.0 | *1992** |
| 2001 | 83.6 | 6.2 | 89.8 | 17.0 | 10.2 | 7.9 | *1992** |
| 2001 | 75.0 | 11.9 | 86.8 | 17.4 | 13.2 | 4.3 | *2001* |
| 2005 | 66.3 | 17.6 | 83.8 | 25.1 | 16.2 | 8.9 | *2001* |
| 2005 | 65.0 | 17.0 | 81.9 | 21.5 | 18.1 | 5.3 | 2007* |
| 2006 | 62.4 | 17.8 | 80.3 | 26.0 | 19.7 | 7.9 | 2007* |
| 2007 | 61.4 | 18.6 | 79.9 | 32.8 | 20.1 | 12.8 | 2007* |
| 2008 | 63.8 | 16.1 | 79.9 | 32.1 | 20.1 | 12.1 | 2007* |
| 2009 | 66.1 | 17.5 | 83.6 | 25.1 | 16.4 | 8.9 | 2007* |
| 2010 | 65.3 | 14.7 | 80.0 | 27.3 | 20.0 | 10.4 | 2007* |
| 2011 | 65.5 | 13.8 | 79.3 | 33.2 | 20.7 | 15.3 | 2007* |
| 2012 | 66.5 | 14.7 | 81.2 | 28.5 | 18.8 | 11.8 | 2007* |
| 2012 | 67.7 | 10.4 | 78.4 | 34.8 | 21.6 | 9.6 | 2015* |
| 2013 | 66.7 | 10.0 | 77.0 | 37.5 | 23.0 | 10.6 | 2015* |
| 2014 | 65.3 | 9.9 | 75.4 | 37.7 | 24.6 | 9.2 | 2015* |
| 2015 | 63.6 | 9.9 | 73.8 | 32.8 | 26.2 | 6.5 | 2015* |
| 2016 | 59.7 | 9.1 | 69.0 | 32.2 | 31.0 | 2.7 | 2015* |
| 2017 | 59.7 | 8.5 | 68.4 | 33.0 | 31.6 | 1.8 | 2015* |
| 2018 | 59.7 | 8.1 | 68.0 | 38.8 | 32.0 | 3.8 | 2015* |
| 2019 | 58.4 | 7.9 | 66.5 | 39.7 | 33.5 | 1.2 | 2015* |
| 2020 | 59.0 | 7.4 | 66.6 | 39.4 | 33.4 | 0.9 | 2015* |
| 2021 | 59.2 | 7.3 | 66.8 | 40.3 | 33.2 | 2.5 | 2015* |

Source: NBS (various national income account series 1976 to 2021)

*Notes:*

1. *The base years of the national income accounts are listed in the last column of the table.*
2. *All macroeconomic aggregates are expressed as percentages of GDP*

*Table 2 The evolution of Gross National Disposable Income and Gross National Savings in Tanzania 1976 to 2021*

| Year | 4. Net primary income from ROW %GDP | 9. Net current Transfers from ROW %GDP | Gross National Disposable Income at m.p. %GDP | Gross National Savings %GNDI | Gross National Savings %GDP | Base Year National Accounts Series: |
|---|---|---|---|---|---|---|
| 1976 | -0.6 | 1.8 | 101.3 | 26.6 | 26.9 | 1976 |
| 1980 | -0.3 | 2.5 | 102.2 | 20.3 | 20.7 | 1976 |
| 1983 | -0.4 | 1.7 | 101.2 | 11.3 | 11.4 | 1976 |
| 1985 | -1.5 | 5.7 | 104.2 | 12.3 | 12.8 | 1976 |
| 1987 | -3.0 | 18.8 | 115.7 | 14.9 | 17.2 | 1976 |
| 1987 | -3.8 | 11.3 | 107.5 | 8.3 | 8.9 | 1992 |
| 1992 | -4.9 | 19.7 | 114.8 | 10.8 | 12.4 | 1992 |
| 1996 | -1.0 | 5.2 | 104.2 | 9.2 | 9.6 | 1992 |
| 2001 | 0.5 | 6.2 | 105.7 | 15.0 | 15.8 | 1992 |
| 2001 | -0.4 | 5.6 | 105.2 | 17.4 | 18.3 | 2001 |
| 2005 | -1.3 | 3.3 | 102.0 | 17.8 | 18.1 | 2001 |
| 2005 | -2.0 | 3.1 | 101.1 | 18.9 | 19.1 | 2007 |
| 2006 | 0.0 | 3.4 | 103.2 | 22.2 | 23.0 | 2007 |
| 2007 | -1.3 | 3.7 | 102.2 | 21.8 | 22.3 | 2007 |
| 2008 | -1.1 | 3.3 | 102.0 | 21.6 | 22.1 | 2007 |
| 2009 | -1.0 | 3.3 | 102.2 | 18.2 | 18.6 | 2007 |
| 2010 | -2.0 | 3.6 | 101.6 | 21.2 | 21.5 | 2007 |
| 2011 | -2.0 | 2.9 | 100.8 | 21.3 | 21.5 | 2007 |
| 2012 | -1.6 | 2.2 | 100.6 | 19.3 | 19.4 | 2007 |
| 2012 | -1.4 | 2.0 | 100.6 | 22.1 | 22.2 | 2015 |
| 2013 | -1.5 | 1.7 | 100.2 | 23.1 | 23.2 | 2015 |
| 2014 | -1.1 | 1.0 | 99.9 | 24.5 | 24.5 | 2015 |
| 2015 | -1.5 | 1.0 | 99.5 | 25.8 | 25.7 | 2015 |
| 2016 | -1.9 | 0.8 | 98.9 | 30.2 | 29.9 | 2015 |
| 2017 | -1.8 | 0.8 | 99.0 | 30.9 | 30.6 | 2015 |
| 2018 | -1.1 | 0.8 | 99.7 | 31.7 | 31.7 | 2015 |
| 2019 | -1.7 | 0.7 | 99.0 | 32.9 | 32.5 | 2015 |
| 2020 | -1.9 | 0.6 | 98.7 | 32.6 | 32.1 | 2015 |
| 2021 | -1.7 | 0.8 | 99.0 | 32.6 | 32.3 | 2015 |

*Source: Various NBS National Accounts series of Tanzania 1976 to 2021 (selected years from 1976 to 2005; annual data from 2005 to 2021.*

***APPENDIX 2: Constructing the 14 x 14 Input Output matrix***

The 2015 Input-Output tables of Tanzania can be downloaded from the website of the National Bureau of Statistics (Dodoma, Tanzania) using the following link:

https://www.nbs.go.tz/uploads/statistics/documents/en-1705429386-Tanzania%20-%20Input-Output_Tables_2015.xls

The analysis of this paper is based on the Input Output (industry x industry) tables 1, 2 and 3. : table 1 show sources and uses of total supplies (Z), table 2 show sources and uses of domestic production only (X), and table 3 show the sources and uses of imports (M).

The 2015 input-output tables show the inter-industry transactions of intermediate goods and services between 67 industries of the Tanzanian economy.

For the sake of ease of exposition, in this paper, the industries featuring in the 2015 Input-Output matrix were grouped into a smaller number of 14 sectors. The table below shows how these grouping were obtained from the original 2015 Input Output tables:

| No | ***PRODUCTION SECTOR*** | ***INDUSTRIES*** |
|---|---|---|
| 1 | *Agriculture, Forestry and Fishing* | Products of agriculture, hunting and related services<br>Products of forestry, logging and related services<br>Fish and other fishing products; aquaculture products; support services to fishing |
| 2 | *Mining* | Coal and lignite<br>Crude petroleum and natural gas<br>Metal ores<br>Other mining and quarrying products |
| 3 | *Agricultural processing / Manufacturing* | Manufacture of food products<br>Manufacture of beverages<br>Manufacture of tobacco products<br>Manufacture of textiles<br>Manufacture of wearing apparel<br>Manufacture of leather and footwear<br>Manufacture of wood and of products of wood and cork |
| 4 | *Other Manufacturing* | Manufacture of paper and paper products<br>Printing and reproduction of recorded media<br>Manufacture of coke and refined petroleum products<br>Manufacture of chemicals and chemical products<br>Manufacture of basic pharmaceutical products<br>Manufacture of rubber and plastics products<br>Manufacture of non-metallic mineral products<br>Manufacture of basic metals<br>Manufacture of fabricated metal products, except machines .& equipment<br>Manufacture of computer electronic and optical products<br>Manufacture of electrical equipment<br>Manufacture of machinery and equipment n.e.c.<br>Manufacture of motor vehicles, trailers and semi-trailers<br>Other transport equipments |

| | | |
|---|---|---|
| | | Furniture<br>Other manufactured articles n.e.c.<br>Repair and installation services of machinery and equipment |
| 5 | *Utilities* | Electricity, gas, steam and air conditioning<br>Natural water; water treatment and supply services<br>Sewerage services; waste collection, treatment and disposal services |
| 6 | *Construction* | Construction |
| 7 | *Trade Services* | Wholesale and retail trade, and repair services of motor vehicles and motorcycles<br>Wholesale trade services, except of motor vehicles and motorcycles<br>Retail trade services, except of motor vehicles and motorcycles |
| 8 | *Transport* | Land transport and transport via pipelines<br>Water transport<br>Air transport<br>Warehousing and support activities for transportation<br>Postal and courier activities |
| 9 | *Hotels and Restaurants* | Accommodation services<br>Food and beverage serving services |
| 10 | *Telecommunications / computing* | Publishing services<br>Motion picture, video and television programme production services, sound recording and music publishing<br>Programming and broadcasting services<br>Telecommunications<br>Computer programming, data processing and information services |
| 11 | *Financial Services* | Financial services (including FISIM), except insurance and pension funding<br>Insurance, reinsurance and pension funding services, except compulsory social security<br>Services auxiliary to financial services and insurance services |
| 12 | *Real estate and business services* | Real estate services and imputed rents of owner-occupied dwellings<br>Professional, scientific, technical and veterinary services<br>Rental, leasing and employment services<br>Travel agency, tour operator and other reservation services and related services<br>Other administrative and support services |
| 13 | *Public administration / services* | Public administration and defence services; compulsory social security services<br>Education services<br>Human health services<br>Social work services |
| 14 | *Other Services* | Arts, entertainment and recreation services<br>Services furnished by membership organisations<br>Repair of computers and personal and household goods<br>Other personal services<br>Domestic services |

*Matrix of technical input coefficients*: A = $\left[\frac{a_{ij}}{x_j}\right]$

| No | Sector | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | AGRICULTURE | 0.074 | 0.011 | 0.383 | 0.031 | 0.003 | 0.020 | 0.001 | 0.000 | 0.253 | 0.001 | 0.000 | 0.004 | 0.008 | 0.004 |
| 2 | MINING | 0.000 | 0.029 | 0.000 | 0.123 | 0.126 | 0.029 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | AGRO-PROCESSING /MANUFACURING | 0.010 | 0.004 | 0.114 | 0.034 | 0.002 | 0.004 | 0.001 | 0.001 | 0.170 | 0.001 | 0.000 | 0.001 | 0.024 | 0.004 |
| 4 | OTHER MANUFACTURING | 0.040 | 0.086 | 0.049 | 0.260 | 0.057 | 0.204 | 0.053 | 0.134 | 0.014 | 0.071 | 0.011 | 0.036 | 0.069 | 0.033 |
| 5 | UTILITIES | 0.001 | 0.007 | 0.007 | 0.015 | 0.017 | 0.005 | 0.015 | 0.005 | 0.014 | 0.014 | 0.003 | 0.009 | 0.009 | 0.014 |
| 6 | CONSTRUCTION | 0.008 | 0.005 | 0.000 | 0.005 | 0.002 | 0.079 | 0.015 | 0.009 | 0.003 | 0.009 | 0.002 | 0.036 | 0.008 | 0.016 |
| 7 | TRADE SERVICES | 0.012 | 0.026 | 0.056 | 0.049 | 0.041 | 0.047 | 0.021 | 0.084 | 0.049 | 0.119 | 0.002 | 0.035 | 0.025 | 0.007 |
| 8 | TRANSPORT | 0.016 | 0.026 | 0.033 | 0.044 | 0.066 | 0.093 | 0.079 | 0.098 | 0.022 | 0.016 | 0.008 | 0.017 | 0.021 | 0.023 |
| 9 | HOTELS AND RESTAURANTS | 0.001 | 0.005 | 0.000 | 0.001 | 0.018 | 0.004 | 0.030 | 0.024 | 0.001 | 0.015 | 0.006 | 0.021 | 0.020 | 0.014 |
| 10 | TELLCOMUNICATION AND COMPUTING | 0.002 | 0.019 | 0.003 | 0.006 | 0.010 | 0.008 | 0.019 | 0.005 | 0.005 | 0.129 | 0.015 | 0.014 | 0.018 | 0.012 |
| 11 | FINANCIAL SERVICES | 0.010 | 0.029 | 0.013 | 0.012 | 0.029 | 0.058 | 0.039 | 0.029 | 0.014 | 0.018 | 0.149 | 0.022 | 0.017 | 0.013 |
| 12 | REAL ESTATE AND BUSNES SERVICES | 0.002 | 0.014 | 0.026 | 0.023 | 0.037 | 0.028 | 0.092 | 0.019 | 0.009 | 0.025 | 0.028 | 0.090 | 0.028 | 0.067 |
| 13 | PUBLIC ADMINISTRATION SERVICES | 0.000 | 0.001 | 0.001 | 0.001 | 0.005 | 0.003 | 0.011 | 0.004 | 0.001 | 0.005 | 0.001 | 0.005 | 0.009 | 0.004 |
| 14 | OTHER SERVICES | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.001 | 0.004 | 0.006 | 0.010 | 0.005 | 0.001 | 0.010 | 0.004 | 0.135 |
| | ALL SECTORS | 0.176 | 0.262 | 0.686 | 0.604 | 0.417 | 0.581 | 0.380 | 0.417 | 0.564 | 0.428 | 0.226 | 0.300 | 0.262 | 0.345 |

*Matrix of import coefficients:* M = $\left[\frac{m_{ij}}{x_j}\right]$

| No | SECTOR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | AGRICULTURE | 0.003 | 0.005 | 0.035 | 0.014 | 0.003 | 0.000 | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 |
| 2 | MINING | 0.000 | 0.002 | 0.000 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | AGRO-PROCESSING /MANUFACURING | 0.002 | 0.003 | 0.023 | 0.016 | 0.002 | 0.002 | 0.000 | 0.000 | 0.015 | 0.000 | 0.000 | 0.000 | 0.002 | 0.001 |
| 4 | OTHER MANUFACTURING | 0.031 | 0.074 | 0.030 | 0.149 | 0.026 | 0.070 | 0.031 | 0.116 | 0.006 | 0.043 | 0.005 | 0.016 | 0.042 | 0.020 |
| 5 | UTILITIES | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6 | CONSTRUCTION | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7 | TRADE SERVICES | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | TRANSPORT | 0.003 | 0.005 | 0.006 | 0.007 | 0.008 | 0.017 | 0.010 | 0.017 | 0.004 | 0.002 | 0.001 | 0.003 | 0.004 | 0.003 |
| 9 | HOTELS AND RESTAURANTS | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 10 | TELLCOMUNICATION AND COMPUTING | 0.000 | 0.001 | 0.000 | 0.001 | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 | 0.007 | 0.001 | 0.001 | 0.002 | 0.001 |
| 11 | FINANCIAL SERVICES | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 | 0.001 | 0.002 | 0.001 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.001 |
| 12 | REAL ESTATE AND BUSNES SERVICES | 0.000 | 0.001 | 0.003 | 0.002 | 0.003 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.007 | 0.001 | 0.000 |
| 13 | PUBLIC ADMINISTRATION SERVICES | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 14 | OTHER SERVICES | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | ALL SECTORS | 0.040 | 0.091 | 0.098 | 0.193 | 0.045 | 0.094 | 0.046 | 0.135 | 0.030 | 0.053 | 0.008 | 0.028 | 0.052 | 0.030 |