Fiscal multipliers in India: A macro-model linking human development, growth and distribution

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Abstract: A macroeconomic framework integrating growth, distribution and human development with social spending as a crucial link provides an alternative view for conceptualizing fiscal policy for India. In policy formulation, the growth potential of social spending is ignored while concerns about fiscal implications of social spending are overstated. Using a demand-side macro model incorporating necessary supply side features for the Indian economy, the growth implications of social spending is demonstrated. The social spending multiplier in India, estimated over 1990 to 2022 stands at 1.67, with implications for growth and human development following across several years. The results indicate that a combination of policies on social sector expenditure, along with policies on income redistribution are both growth-promoting and self-financing in nature.

Key Words: Human Development, Growth, Aggregate Demand, Social spending, Fiscal multiplier, Debt Sustainability, structural, policy simulation, distribution.

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Section 1: Introduction

India's performance in accelerating human development (HD) has been less impressive than its growth performance, a structural feature considering how long it has persisted. Public spending on the social sector is the critical variable connecting growth to HD. The trends across the last thirty years indicate a near stagnant HD spending to GDP in India. The normative distances, international comparisons, and lack of progress vis-a-vis past positions, indicate underperformance in social spending in India and the need for greater public investments (Bose and Banerjee, 2025).

The *divergent* macroeconomic and HD performance underlies an ascendancy of macroeconomic policy over social development policies and a lack of appreciation of the connection between the two. Building on the critique of the fiscal policy framework, its objectives, and targets vis-à-vis the imperatives of HD presented in our earlier work (Bose and Banerjee, 2025), this paper explores the relationships and feedback between social spending, growth, distribution and human development in an integrated macroeconomic-framework in the heterodox tradition. Adequate financing to meet the SDGs by 2030, and other normative targets that India has set for itself presents the immediate need to explore the issue, since meeting the SDGs requires a major fiscal push. The Finance Commission of India, a statutory body, will soon lay down a fiscal roadmap (along with vertical and horizontal distribution formula) for the next five-year period (2026-2030). A macroeconomic framework integrating growth, distribution and human development with social spending as a crucial link provides an alternative view for conceptualizing fiscal policy for India. As we shall see, the existing literature already offers answers to the divergent performance; the task is to harness these insights and translate them into policy.

The rest of the paper is organized into five sections. Section 2 outlines the conceptual framework to explore the relationships and feedback between social spending, growth, distribution and human development. Section 3 presents a macro-policy simulation model for the Indian economy, which is then estimated using data from 1990 to 2022. Section 4 details the methodology with its limitations and presents the baseline case. Section 5 discusses the results of the policy simulation focusing on expansion of social spending and its implications for the major macroeconomic variables. Section 6 summarizes the policy recommendations.

A key message emerging from the analysis is that human development objectives must be integrated into the macro-fiscal framework, explicitly recognizing the interconnections between growth, distribution, and development. This represents a major shift from the prevailing approach, where social services are often viewed as a "sink" absorbing resources, toward a view where human development and growth form a mutually reinforcing cycle. Accordingly, normative targets should serve as the

starting point for fiscal policy design. Furthermore, rather than the revenue–capital expenditure hierarchy institutionalized in the FRBM framework, the paper advocates a functional distribution of expenditure with explicit focus on the social sector.

Using a macro-econometric model for the Indian economy in the heterodox tradition, the paper demonstrates the potential of raising aggregate demand and economic growth through social spending, emphasizing its reinforcing role in driving growth and improving development outcomes through multiple channels. The empirical findings confirm the growth-promoting potential of social spending: the estimated multiplier is 1.67, with even larger long-term effects via improvements in social determinants of investment, underscoring the self-financing character of such expenditures. Simulations suggest that expanding social spending by 3% of GDP by 2030 not only avoids deterioration in the debt burden but improves debt dynamics, satisfying the Domar condition. The paper also argues that pre-distributive policies—such as strengthening labour's bargaining power, improving employment conditions, and ensuring fairer wage distribution—are necessary complements to investments in human capabilities.

Section 2. Integrating Human development, distribution and growth: Need for a broader macro-fiscal framework

The discussion below examines how social spending interacts with key macroeconomic variables, drawing on theoretical frameworks, empirical evidence, and policy debates. It attempts to locate the present work within the broader debates on theoretical frameworks in macroeconomics.

Growth and HD

The starting point is the workhorse model by Ranis et al. (2000) connecting economic growth to human development and vice versa. Ranis et al. (2000) present an analytical framework of the links between human development (HD) and growth. HD improvements raise the capacities of economic agents who make critical contributions to economic growth. The link from HD is forged not only via higher productivity of labour and technological innovations but also necessarily the institutions it helps build and the capacities to run these institutions well: schools, hospitals, legal, administrative and economic institutions. On the other hand, economic growth provides the resources to permit sustained improvements in HD. HD and growth form a mutually reinforcing cycle of causation, with success in one tending to promote success in the other. In the words of Drèze and Sen (2002) "In the growth mediated social progress, public education can be both favourable to economic growth through expanding the opportunities of economic expansion and favoured by economic growth through generating more resources for such support"

No automatic mechanism, however, exists to translate growth into expanding human choices: *the link between economic growth and human welfare must be created consciously*. The accumulated evidence indicates that the *link from economic growth to HD is stronger, with a higher allocation of GDP to the social sectors (and social priorities within them) and a more equal income distribution,* among other things. Provision of basic social services has been found as an important instrument for

enhancing human functioning and reduction in income poverty through accelerating growth in Indian states (Mehrotra and Parida, 2021). Similarly, the link from HD to economic growth would depend on the investment rate and income distribution. These factors can enhance or diminish the link between growth and HD. High economic growth may not bring about expected levels of HD if, for example, there are such weak linkages as a low social expenditure ratio. Conversely, good HD performance may not generate high growth if there is a shortage of complementary resources because of low investment rates. Where linkages are weak, cases of lopsided development may occur – HD-lopsided or economic growth lopsided (Ranis et al., 2000).

Social spending, connecting growth with HD then is a key variable of interest. HD must be explicitly integrated in the macro-economy both as a determinant of growth as well as being determined by fiscal policy choices and growth outcome.

Demand-determined growth model

The basic structure of the Indian economy can be stylized in a Keynesian demand determined model (Dasgupta, 2003; Patnaik, 2001; Mundle et al, 2011). The characterization of the economy is demand-deficient, working at less than full employment level of output. Effective demand is a problem and output is demand determined. In addition, supply bottlenecks due to under investment are an important problem in the context of developing countries. One of the supply side constraints is the lack of human development. As Nayyar succinctly puts it: *"Human development, which imparts capabilities to people, can both mobilize and create resources. It constitutes resource mobilization beyond financial resources, which are the usual concern of macroeconomics, in as much as it mobilizes the most abundant yet underutilized resource— people—for development. The absorption of surplus labour in employment, then, is an important source of economic growth." (Nayyar, 2012: 17)* The same people who constitute resources on the supply side provide markets on the demand side.

Mainstream macroeconomists have emphasized supply-side expenditures, most notably on education, in growth theoretical literature. The problem with this approach is that it assumes Say's law – that supply will create its own demand. More education will automatically result in more employment and/ or wage increases, which is not true as the high levels of involuntary unemployment indicate. Heterodox approaches, in contrast, leave out human capabilities from their framework, but integrate distribution as central to the demand problem (Seguino, 2012).

Integrating distribution

The interrelationship between economic growth and distribution has been one of the oldest and debated problems in economics. In classical economics, distribution determines growth. Ricardo conceives regulating laws of production and distribution as the principal problem of political economy (Ricardo, 1821). This tradition was debunked with the advent of neoclassical economics, where growth is determined independent of distribution. In neoclassical economics, distribution is determined by technical conditions after growth and thus makes no room for feedback from

distribution to growth. In the last few decades, however, this approach has been critiqued even by prominent mainstream economists (Atkinson, 2009 & 2015; Piketty and Zucman, 2014; Stiglitz, 2015; Bharti et al, 2024). In advanced capitalist countries, the declining trend in labour share of income and economic growth has been an important stylized fact in post liberal era. The interrelationship between growth and distribution resurfaces with Atkinson's (2015) quest for factor share as a principal problem echoing Ricardo's concern, while Piketty and Zucman (2014) attempt to bring distribution back to the heart of mainstream economics debates. The findings from a series of papers both by individual researchers and international organizations emphasize the harmful effects of inequality on economic growth (Ostry et al, 2014; Cingano, 2014; Berg and Ostry, 2011). Economic growth in India in the neoliberal era has been accompanied by considerable inequality, reflected in the worsening functional distribution and rise in inequalities in personal income. The labour share of income has shown a decline, while a skewed personal income distribution is reported in a series of studies on concentration of top incomes.[3] It suggests both pre-distributive policies and redistributive policies did not address the distributional concern adequately.

Rising inequality has obvious implications for human development. The principle of universalism, a core aspect of human development, demands both intergenerational and intragenerational equity. Any development path and corresponding consumption pattern that perpetuates present inequality are neither sustainable nor worth sustaining (UNDP,1998, p.38). The expansion of functioning/ capabilities, reduction of poverty and enhancement of economic growth are complementary and mutually reinforcing through various feedback loops. A better distribution in favor of labour has a potential to reduce absolute deprivation and poverty. A fall in poverty can be HD-enhancing. An improvement in labour share of income can lead to higher consumption of social goods. It also increases freedom to choose and thus can be HD improving. Integration of growth, distribution and human development within a macroeconomic framework is hence called for.

The fiscal question

A demand side approach is useful for another reason. It accords a central place to fiscal policy. Fiscal policy determines the scope of social policy and HD outcomes through its control over fiscal space. Fiscal space in turn can be seen as an outcome of a complex of global, national and subnational influences.

The ascendancy of macroeconomic policies over social policy, with social expenditure typically treated as residual, was experienced in a variety of ways in India, argue Bose and Banerjee (2025). There were pressures to cutback social expenditure as part of fiscal adjustment since the 1990s, a tendency reinforced by the fiscal rules enacted through Fiscal Responsibility and Budget Management Act, 2003 (FRBM). The scope of raising spending was restricted as fiscal policy treated HD investments as consumption expenditure and therefore inferior to other forms of investment, for example physical infrastructure creation. By clubbing HD expenditures with current

[3] See Bhaduri (2009), Patnaik (2007), Ghosh and Chandrasekhar (2007) and Sen and Himanshu (2004).

ones, the public finance orthodoxy not only neglected these investments, rather the fiscal targets were to be met through slowdown in social spending (Rakshit, 2005). The medium-term fiscal framework was unsuitable to accommodate the needs of the social sector with returns stretching over a long-term horizon. Fiscal rules implemented in an overall situation of stagnant tax ratios, further restricted the scope for expansionary fiscal policies. Revenue shortfall and expenditure adjustment were routinely passed on to social expenditure. The periodic exogenous shocks and the ensuing macroeconomic instability implied that the social sector repeatedly absorbed the costs of fiscal adjustments. The contractionary tendency built into the design of fiscal rules and the fiscal policy framework affected the behaviour of the sub-national governments, as even the poorest States ran up revenue surpluses to uphold the golden rule of FRBM rather than spending. The golden rule requires governments to have zero balance in the revenue account, whereas there is more room for capital expenditure financed through borrowing.

At the core of fiscal rules is the view that fiscal deficit hurts savings, investment and growth. Since savings determine investment in this paradigm, and savings rates are assumed to be constant, an increase in fiscal deficit beyond 6% of GDP would crowd out other forms of investments and lower the growth rate (GoI, 2004). A related concern is the nervousness of markets around deficit and debt levels, which can lead to a run in the financial markets. Thus, fiscal policy should focus on restraining expenditure and/or raising revenues, and countercyclical fiscal policies have little role in affecting the full employment growth path. Essentially, fiscal rules are embedded in new consensus macroeconomics where solvency and intertemporal equity are in focus. The government's stabilization role is confined to stabilizing the debt stock through fiscal instruments (Arestis, 2009; Tscherneva, 2008). [4] In this paradigm, discretionary fiscal policy is particularly problematic because it is more likely to lead to ever-increasing deficits and debts.

The heterodox challenge to new consensus macroeconomics points out that in a demand-deficient economy, attempts to reduce the deficit through compression of public expenditures might result in a fall in income and aggregate savings and investments (Rakshit, 2005, 2010; Bhaduri, 1986). *The purpose of macro-stabilisation should be to keep the economy close to full employment with a tolerable inflation rate.*[5] A higher fiscal deficit – financed by domestic borrowing – does not necessarily crowd out private investment; the fiscal deficit always finances itself and the investment always generates an equal amount of ex-post savings (Das, 2010). Exclusive focus on reducing deficit without regard to the demand and supply side consequences in the real economy is a major factor behind the prolonged slack, growth slowdown, and fiscal stress in the Indian economy (Rakshit, 2005).

[4] The major policy implication of the new consensus macroeconomics is that monetary policy is upgraded in the form of interest rate policy to maintain inflation. Fiscal policy by contrast should only be concerned with balancing government expenditure and taxation, effectively downgrading its importance as an active instrument of economic policy.

[5] For a broad view of macroeconomic stability, see Ocampo (2005)

The empirical support for this argument comes from fiscal multipliers. Fiscal multipliers, which measure the response of GDP to change in government expenditure, are high in India. Expansionary fiscal consolidation is not a developing country reality; there is no evidence of negative expenditure multipliers. Based on a structural macroeconomic model of the Indian economy and applied to the period 1990-2012, the estimated multiplier for capital expenditure is 2.45 and revenue expenditure is unity (Bose and Bhanumurthy, 2015).[6] There is no reason why India cannot pursue an expansionary fiscal policy with well-targeted investments in human development.

Underlying the fiscal rules is the solvency condition which requires public budget, like their private counterpart, must satisfy intertemporal budget constraint. The present discounted value of public revenue should not fall short of the present discounted value of public expenditure. This has been conceived as an essential requirement in public debt literature (GoI, 2018; Buiter and Patel 1992, 2010; Seguino, 2012). The objection to the idea that the public budget should be treated from the same perspective of a private entity is not new. Hansen (1941) objected to any analogy between the two. According to him success and failure of public debt should not be evaluated from the balance sheet of the government.[7] The success or failure of public policy can be determined only by noting the effect of expenditures, taxes, and loans on the total national income and on how that national income is distributed and functioning of the economy. The crucial idea here is that the problem of public debt needs to be evaluated with respect to national income and when national income is growing public debt will be automatically confined to its manageable limit. Hansen's argument is further developed by Domar (1944) when he calls "public debt burden as a problem of expanding national income". In Domar's analysis, the question of public debt boils down to identifying policies to achieving higher growth in national income. This can come through supply- side driven productivity growth as proposed in 'pre-Keynesian' paradigm or through Keynesian multiplier. Domar strongly advocates public investment both human and non-human factors. Since the government is absorbing a part of savings, it is of course desirable that its expenditures be productive. This productivity has nothing to do, however, with such questions as whether the assets constructed make a direct contribution to the federal treasury. As per Domar, the term "*investment expenditures*" may be misleading, because it is too closely associated with steel and concrete. If healthier people are more productive, expenditure on public health is justified. The same holds true for expenditures on education, research, flood control, resource development and so on. Essentially, a rising income solves the most important aspects of the problem of the debt. The famous Domar condition where the stability of public debt requires the nominal growth rate to be just higher than nominal rate of interest, popularly known

[6] Estimates of fiscal multipliers vary across studies (Tapsoba, 2013: Jain and Kumar, 2013), but all of them report positive and reasonably high multiplier values.

[7] Hansen (1941) and others writing at the time argue that many of the principles which one finds in the literature on public finance are based on reasoning derived from private finance. The discussion of the problems of public finance will continue to be confused as long as it is not clearly recognized that this analogy is false and erroneous.

as g> i, is a less stringent condition than high growth. Many of these arguments have received a shot in the arm in the recent years in the context of developed countries' debt burden and fall in growth due to fall in productivity (Blanchard, 2019; Phelps, 2022)

The model that will be presented in Section 3 addresses the concern about growth directly by addressing the demand problem as well as through improvements in productivity following a rise in social sector expenditure. Among other things, the model relies on self-financing nature of public debt with rising national income as envisaged in Domar (1944).

Interlinkages vis-à-vis social spending in the model structure

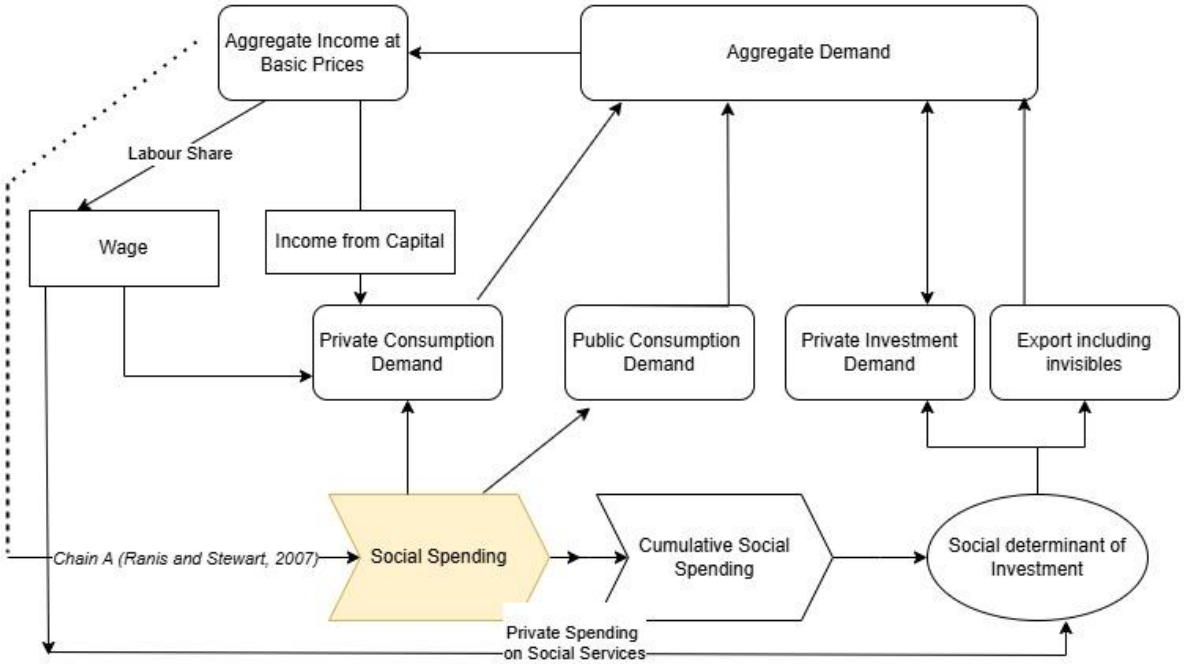
The discussion on macroeconomic framework with its links between human development, growth and its distribution and fiscal policy sets the broad context to map social spending, the key fiscal policy instrument, from an alternate perspective. Figure 1 presents a schematic diagram of the links between social spending and the other macro-variables. Human development is integrated in the macro-economy both as a determinant of growth as well as being determined by fiscal policy choices and growth outcome. Multiple channels connect HD to macroeconomic variables.

(1) Social spending gives rise to public and private consumption demand. Public consumption demand would be reflected directly in compensation to employees, among other things. There are at least three channels through which social spending impacts private consumption. First, a significant part of social expenditure is in the form of transfers - pensions and other social security transfers, scholarships etc. which would raise disposable income. Second, there is crowding-in effect of public expenditure. For instance, higher public expenditure on elementary schooling would generate demand for high school and higher education, which means higher private consumption demand for goods and services. These can also be seen as backward and forward linkages of public expenditure from aggregate demand and employment growth to expanding opportunities for acquiring complementary skills as the economy moves up on the technological ladder (Seguino, 2012) Third, higher public expenditure including public health, education and social security by reducing future uncertainty about old age and disease burden releases purchasing power for present consumption. The direct demand side impact of social spending through private and public consumption channel can thus be significant.

(2) The link from growth to human development occurs via government expenditure and social allocation ratio. The expenditure on human development and corresponding attainment of human development is not immediate, however. Rather the relationship exhibits considerable lag effects (UNESCO, 2010). The impact of social expenditure on social outcomes will play out over an extended period of time, from a few years to a decade or more. Alternatively, the cumulative

government social expenditure is what would determine the level of HD. As the cumulative social spending increases, outcomes improve (Figure 1).[8]

Figure 1



Satellite Model of the Economy integrating social expenditure and distributional aspects

Note: Chain A links economic growth to human development progress in Ranis and Stewart, 2007.

Here social services are considered together rather than sub-parts of education, health etc. There are complementarities through reciprocal positive externalities between policies and expenditures geared towards different development goals such as health and schooling or access to water and health. For instance, better access to water, sanitation, health facilities and transportation can significantly lower child mortality rates and malnutrition and promote schooling and gender equality. Such *complementarities* make a strong case for scaling up multi-sectoral public expenditure programmes, given that the payback from an integrated package focusing on several development goals (MDGs and SDGs) is higher than the sum of the paybacks of its components taken separately (Roy and Heuty, 2009).

[8] Effectiveness of spending is another important consideration, but difficult to capture in a macroeconomic framework.

(3) The positive effect of releasing human development bottlenecks can be realized in higher investments and exports. That is, besides the direct demand side effect, by impacting human development and labour quality, social spending has positive feedback on investment and exports (supply side). The strands of this argument can be found in Hirschman (1958), Chang and Grabel (2014), Nayyar (2012), Ranis and Stewart (2005), Seguino (2012), Bhaduri (2006), among others. Hirschman (1958) conceptualised social overhead capital as those basic devices without which primary, secondary and tertiary sectors (directly productive activities) cannot function. Investments in directly productive activities would increase as social overhead capital increases. That is social overhead capital would give rise to more private demand for directly productive activities and therefore the corresponding private investments. Similarly, Chang and Grabel (2014) reason that, instead of crowding out, public investment will have a 'crowding in' or encouraging effect on private investment. Public investment in education, health, infrastructure, technology and communications are clear corequisites for private investment.[9]

The logic extends to exports. The nature of education and skill is a determinant of the composition of trade in a country. The need for education has particularly expanded in the world of globalised trade and commerce. The success of economies like China has been based substantially on the ability of a reasonably well-educated workforce to meet the demands of quality control and skill formation involved in producing goods and services for the world at large (Dreze and Sen, 2012, Stewart et al.,2018).

We coin the term **social determinant of investment (SDI)** to capture *the impact of broad-based human development and improvement in labour quality on private investment and exports*. Higher SDI raises the expected profits of private business. This is an important innovation in the model.

(4) A substantial part of health and education spending in India is met through out-of-pocket expenditure in India. Any boost to aggregate demand and aggregate incomes, through fiscal expansion, would raise wage incomes. More equal the distribution of income, higher would be the wage share and therefore incomes that can finance private spending on social goods.

(5) Finally, as argued, higher revenues from higher incomes may render the fiscal expansion wholly/partly self-sustainable in the Domar sense.

The next section presents the complete macro-model for the Indian economy integrating the links between social spending, growth, distribution and human development, which can be empirically tested.

[9] Islam (2018) finds that according to World enterprise survey (2009-2014) global overview conducted across 100 countries and including 1.35 lakh firms perceived inadequately educated workforce as a major constraint to business operations.

Departure from previous NIPFP macro-models

The present model departs in important ways from the previous NIPFP macro-modelling exercises which aimed to chart a pathway to higher prosperity without compromising fiscal consolidation, with prosperity largely conceptualized as higher growth anchored in the FRBM Act, 2003 (Mundle et al., 2011, 2013; Bose & Bhanumurthy, 2015; Bhanumurthy et al., 2017, 2019). These studies advocated expenditure-switching —raising capital expenditure at the expense of revenue expenditure—justified by the higher capital expenditure multiplier (2.45 as estimated by Bose & Bhanumurthy, 2015). While this approach reconciles growth with fiscal discipline, it sidelines social sector spending, particularly in health and education, which is largely revenue intensive. As a result, previous models risked achieving growth at the expense of human development, reinforcing the well-documented divergence between the two in India (Bose & Banerjee, 2025). Moreover, these works remain largely silent on the equity and distributional implications of such fiscal strategies.

The present framework departs substantially from these earlier approaches by seeking to enhance both growth and human development while not disregarding the fiscal implications. Unlike previous fiscal rule–based approaches, the present framework begins with normative targets for social service expenditure, derived from universally accepted development goals that place people—"the real wealth of nations"—at their core. India, like many other countries, has committed to these goals while addressing its own diverse development challenges. The recommended public expenditure levels are drawn from the proposals of various commissions and committees over time, which are adopted here as normative benchmarks.

In a demand-constrained economy, the framework highlights the growth potential of public expenditure on both social and physical infrastructure. Beyond the traditional growth effects of capital spending, it emphasizes the reinforcing role of social sector expenditure in driving growth and improving development outcomes through several channels: (i) Social spending boosts private consumption and aggregate demand. (ii) Public investment in education and social services improves social determinants of investment (SDI), positively influencing private investment and export demand. (iii) A more equitable income distribution raises consumption (given the higher marginal propensity to consume among wage earners) and further enhances SDI. (iv) Revenue buoyancy from growth expands fiscal space. These combined effects lead to higher growth, which, in turn, exerts a downward pressure on the fiscal deficit–GDP ratio and stabilizes the debt–GDP ratio, consistent with the Domar condition. Thus, unlike earlier models where fiscal consolidation defined the growth trajectory, this framework starts with normative development targets and arrives at fiscal sustainability as an outcome, rather than as a prior constraint.

Section 3: A macroeconomic model of the Indian economy featuring HD, growth and its distribution

The proposed alternative framework is used to construct a structural macro-econometric model of the Indian economy, which lends itself to empirical exploration.

The aggregate (nominal) demand in the economy in period t is given by

$$Y_t \equiv C_t + I_t^P + G_t + B_t + L_t \qquad (1)$$

Where C_t is aggregate private final consumption expenditure, I_t^P is aggregate private investment demand, G_t is aggregate government expenditure, B_t is aggregate balance of trade in goods and services and L_t is net inflow of invisibles (remittance etc.).

The gross value added is divided into labour income and capital income, with the latter being an aggregation of profit income, interest income and rental income.

$$Y_t^f = f(Y_t) \equiv W_t + \Pi_t \qquad (2)$$

Where Y^f is nominal gross value added at factor cost.[10]

Distribution can be conceptualised at two levels (i) primary distributions (prior to fiscal interventions) and (ii) secondary distributions (post-redistribution). It is assumed that primary distributions of income are affected by pre-distributive policies like minimum wage, bargaining while secondary distribution is affected by redistributive policies like, subsidy, tax and transfers – fiscal instruments. In the present model it is assumed that primary distribution is defined by exogenously determined labour share of income.

$$\frac{W_t}{Y_t^f} \equiv \bar{m}_t \qquad (3)$$

Where $\bar{m}_t$ is exogenously determined labour share of income.

Functional income distribution of income has a crucial bearing on consumption demand (Hein and Vogel, 2008; Stockhammer et al, 2009). This is because there are differences in propensities to consume across different sources/types of factor income. Consumption behavior varies with the type of factor income and the level of government's social spending.

$$C_t = f(W_t - T_t^w, \Pi_t - T_t^\pi - U_t^\pi, E_t^S) \qquad (4)$$

Where W_t *is* labour income and Π_t is gross capital income which includes profit, interest income and rental income, T_t^w is personal income tax on labour income and T_t^π sum of corporate profit tax and share of personal income tax accruing from capital income.[11] U_t^π is undistributed profit or corporate savings. E_t^S is social expenditure of the government. Higher social expenditure will raise private consumption as argued in the previous section.

Corporate savings depend on capital income.

[10] This is same as nominal Gross value added at basic prices.
[11] The personal income tax is apportioned between labour and non-labour income.

$$U_t^{\pi} = f(\Pi_t) \qquad (5)$$

There is an accelerator type private investment function where private investment is assumed to depend on capacity utilization capturing demand condition and profit share, following Bhaduri and Marglin (1990). Public investment has a complementary effect on private investment. The cost of capital is captured through interest rate on bank lending. All the above factors affect expected profitability. Along with economic factors, expected profitability has social determinants like education and health of overall population and workforce. As discussed in section 2, human development may be conceptualised as the *social determinant of investment (SDI).* SDI can be proxied by labour quality in the narrow sense and human development index (non-income components) in the broader sense. This paper uses labour quality index to measure SDI.

$$I_t^P = f(\frac{Y_t^f}{Y_t^{f*}}, 1 - \bar{m}_t, I_t^G\ ,\ i_{t,}\ SDI_t) \qquad (6)$$

Where Y_t^f is nominal output at factor cost and Y_t^{f*} full capacity output. $\frac{Y_t^f}{Y_t^{f*}}$ is capacity utilization. Investment rises with capacity utilization and profit share (1-$\bar{m}_t$). The average cost of domestic borrowing, i_t is another determinant. I_t^G, government's investment demand is expected to affect private investment positively.

Human development (human capital, in a more limited sense) is a stock concept and would depend on social investment across time. SDI, measured by labour quality index, and cumulative social expenditure, $\sum_t E_t^s$, its key determinant are both stock variables. Besides public spending, private (household) expenditure on social services will improve SDI. The higher the labour share ($\bar{m}_t$), the higher the SDI.

$$SDI_t = f(\sum_t E_t^s\ , \bar{m}_t) \qquad (7)$$

Estimation of potential output is necessary for estimation of capacity utilization. Instead of using Hodrick-Prescott (HP) filter, which has several limitations, potential output is estimated simply from average capital output ratio and net capital stock.[12] The average capital output ratio is calculated as a moving average of actual capital output ratio in the past, with the full capacity output determined as follows

$$Y_t^{f*} \equiv \frac{1}{\frac{1}{t}\sum_t \vartheta_t} * K_{t-1} \qquad (8)$$

Where ϑ_t is average capital output ratio and K_{t-1} is net capital stock at current prices at the end of the period.

[12] One important limitation of HP filter approach is that it incorporates past values as well as future values of the variable. It smoothens the series by attaching equal weights to both past and future observations (Skott, 2012). It considers values of the actual utilization rate that are yet to occur, while estimating normal capacity utilization. Botte (2020) points out that this implies firms with their "remarkable forecasting ability" reduce their normal level of productive capacity utilization much ahead. HP filter is found to be misleading in capturing firms' behavior in a radically uncertain environment.

Public investment, I_t^G, a determinant of private investment in equation (6) is a fraction γ_t of G_t government final expenditure; it is function of E_t^P expenditure devoted to physical infrastructure creation in the government budget (see Fiscal Block below).

$$I_t^G \equiv \gamma_t G_t = f(E_t^P) \qquad \gamma_t \epsilon [0,1] \qquad (9)$$

Investments, public and private, add to the capital stock.

$$K_t \equiv K_{t-1} + I_t^P + I_t^G \qquad (10)$$

where K_t is net capital stock at current prices.

Fiscal Block

Aggregate government final expenditure, G_t, is a function of the overall budgetary expenditure, E_t, and is given by

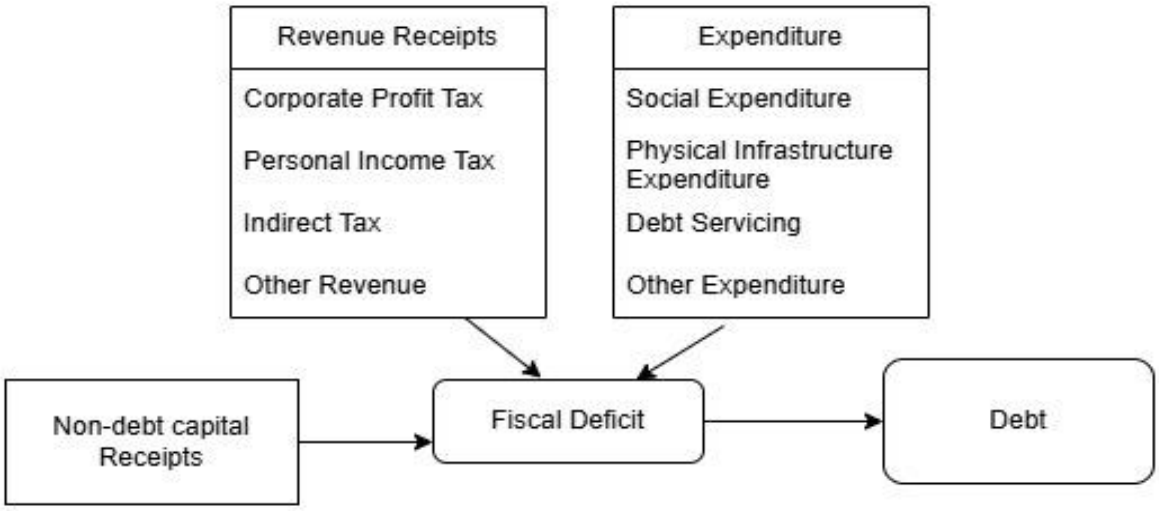
$$G_t = f(E_t) \qquad (11)$$

Where, E_t, is the overall budgetary expenditure. This is a linking equation connecting government final expenditure to government's budgetary spending.

Figure 2 presents the structure of government finances used in the model. It differs from the usual classification of expenditure into revenue and capital expenditure and taxes into direct and indirect taxes. Instead, government expenditure, E_t, is classified as per their functions into four categories, E_t^S government expenditure on social services, E_t^P government expenditure on physical infrastructure, E_t^I interest payment on government debt and E_t^O other government expenditure.

$$E_t \equiv E_t^S + E_t^P + E_t^I + E_t^O \qquad (12)$$

Figure 2: Classification of Expenditure and Revenue of the Combined Government



Fiscal space, made up of revenues and borrowing, determines public expenditure on social services. Two other dimensions of fiscal space – foreign aid/ loans and reallocation of expenditure towards social services - are not considered. Foreign aid has played a marginal role in social sector in India and prioritization of social services, while desirable, is unlikely to wrest substantial fiscal space, given the extent of all-round gaps. Under the institution of FRBM, targets for debt and deficit define the fiscal framework. Deviation of fiscal deficit from the policy determined targets will affect the government's ability to borrow and therefore incur expenditure. The sparse empirical literature on the subject finds fiscal deficit impacts public spending on the social sector, with higher fiscal deficit in the present year, impacting social spending negatively in the following year (Kaur and Misra, 2003; Khoja and Khan, 2020). Our recent analysis confirms a damping effect of fiscal deficit to GDP ratio on public spending on education and health in the long run for the post FRBM period (Bose and Banerjee, 2025).

In equation (13) social expenditure depends on the level of government revenues, $R_{t,}$ level of fiscal deficit, F_t, to GDP. To capture the effect of FRBM, a dummy variable has been introduced in equation (13) with DFRBM=1 for post FRBM period and 0 otherwise.

$$E_t^S = \text{f}\left(R_{t,} \frac{F_t}{Y_t}, \frac{F_t}{Y_t} \times DF\hat{R}BM\right) \qquad (13)$$

Public expenditure on physical infrastructure is determined by government revenue and fiscal deficit to GDP.

$$E_t^P = \text{f}\left(R_{t,} \frac{F_t}{Y_t}\right) \qquad (14)$$

Interest payment is on past year's debt and depends on the yield on government securities, i_t^G.

$$E_t^I = \text{f}\left(D_{t-1}, i_t^G\right) \qquad (15)$$

Other government expenditure, E_t^O depends on its past values in addition to having an autonomous component.

$$E_t^O = \text{f}\left(E_{t-1}^O\right) \qquad (16)$$

Besides revenue mobilization, direct taxes are one of the key instruments of redistribution and work by affecting secondary distributions, which in turn affects aggregate demand. Secondary distribution can mitigate distributional concerns arising out of primary distribution. Their role in affecting growth via controlling inequality has been extensively discussed in recent times (Atkinson, 2015; Piketty and Zucman, 2014; Bharti et al, 2024). Direct taxes comprise majorly of personal income tax, T^{PI} and corporate profit tax, T^{π}.

$$T_t^D \equiv T_t^{PI} + T_t^{\pi} \qquad (17)$$

The tax in period t is given by tax buoyancy and the corresponding tax base.

$$\Delta T_t^{PI} \equiv \hat{\beta}^{PI} \times \frac{\Delta Y_t}{Y_{t-1}} \times T_{t-1}^{PI} \quad (18)$$

$$\Delta T_t^{\pi} \equiv \hat{\beta}^{\pi} \times \frac{\Delta \Pi_t}{\Pi_{t-1}} \times T_{t-1}^{\pi} \quad (19)$$

Where $\hat{\beta}^{PI}$ denotes buoyancy of personal income tax and $\hat{\beta}^{\pi}$ denotes corporate profit tax buoyancy. Tax buoyancy is a policy variable, which the government can set through adjustments in tax rates and tax administrative effort.

Similarly, indirect tax revenue, T^{IN}, depends on the consumption base – private and public – and the corresponding tax buoyancy.

$$\Delta T_t^{IN} \equiv \hat{\beta}^{IN} \times \frac{\Delta(C_t+(1-\gamma_t)G_t)}{(C_{t-1}+\gamma_t G_{t-1})} \times T_{t-1}^{IN} \quad (20)$$

Non-tax revenue, T^{NT} is a function of nominal GDP.

$$T_t^{NT} = f(Y_t) \quad (21)$$

The total revenue or revenue (R_t) comprises direct, indirect and non-tax revenue,

$$R_t \equiv T_t^D + T_t^{IN} + T_t^{NT} \quad (22)$$

Fiscal Deficit (F_t) can be defined as excess to government expenditure over its revenue and, an exogenously given, non-debt capital receipt ($N\hat{D}CR$).

$$F_t \equiv E_t - R_t - N\hat{D}CR_t \equiv D_t - D_{t-1} \quad (23)$$

Fiscal deficit adds to public debt, represented by D_t.

External Block

The trade balances in terms of domestic currency (B_t) is given by

$$B_t \equiv X_t - M_t \quad (24)$$

Where X_t is the value of export (including services) and M_t is the value of import (including services).

Export of goods and services is determined by world demand. This is captured by income of the advanced countries accounting for the bulk of Indian exports. Higher domestic tariffs (a policy determined variable) are like export tax, affecting our exports adversely, through increases in import prices of raw materials. In addition, we assume that exports, like investments, would be positively dependent on SDI. For India, a significant part of export earnings is from export of services, which is directly dependent on education, training and skill upgradation leading to higher productivity, ceteris paribus.

$$X_t = f(\bar{Y}_t^A, \hat{Q}_t, SDI_t) \quad (25)$$

Where $\bar{Y}_t^A$ is aggregate output of advanced economies and $\hat{Q}_t$ is domestic tariff rate.

The net inflow of invisibles (L_t) is assumed to be a function of aggregate output of advanced economy, Y_t^A, and Middle East economy, Y_t^{ME}.

$$L_t = f(\bar{Y}_t^A + \bar{Y}_t^{ME}) \quad (26)$$

The value of import basket is dependent primarily on domestic income. International price of oil, $\bar{P}_t^{OIL}$, and exchange rate, $\bar{\theta}_t$, are the two other determinants (Bhanumurthy, Das and Bose, 2012).

$$M_t = f(Y_t, \bar{\theta}_t, \bar{P}_t^{OIL}) \quad (27)$$

Current account balance is given by, balance of trade and invisibles.

$$CAB_t = B_t + L_t \quad (28)$$

Interest rate, inflation and real Growth

Prime lending rate, i_t representing the cost of borrowing for firms and households is dependent on policy interest rate or repo rate, $\hat{r}_t$. Interest rate on sovereign borrowing is also determined by the policy interest rate.

$$i_t = f(\hat{r}_t) \quad (29)$$

$$i_t^G = f(\hat{r}_t) \quad (30)$$

Among the sources of inflation in the Indian economy, sector-specific cost-push factors such as price of fuel or adverse supply shocks in agricultural output play a crucial role (Rakshit, 2011; Bose, 2012). There is also a substantially large "fix price" segment in the Indian economy where prices are determined as a mark-up over cost (Mundle et al, 2011). Administered prices, like MSP, are a part of the fix-price segment. It implies that policy-induced compression in demand may cause the output to fall, while cost-push bears on prices and inflation. Inflation, in Equation (31), is determined by a combination of cost push factors, administrative price and capacity utilization rate presenting the demand conditions.

$$\dot{\Omega}_t = f(\bar{P}_t^{OIL}, \overline{RAIN_t}, \widehat{MSP_t}, \frac{Y_t^f}{Y_t^{f*}}) \quad (31)$$

Where, $\dot{\Omega}_t$ is the inflation rate.

Growth in real output ($\dot{Z}_t$) is obtained as a difference between growth in nominal output and inflation, closing the model.

$$\dot{Z}_t = \dot{Y}_t - \dot{\Omega}_t \quad (32)$$

Section 4. Methodology for estimation, limitations ad and model solution

The macroeconomic model estimation framework is rooted in Klein and Goldberger (1955) and Tinbergen (1967) tradition where a macroeconomic model is empirically estimated using individual relations and behavioural parameters. The inter-relationships and feedback then flow through a simultaneous equation system built on the individual equations. The approach generates the desired values of a vector of target variables from required values of a vector of policy (instrument) variables. It can address alternative policy simulations. The exercise is in the nature of 'if, then' conditional upon a set of exogenous conditions. The forecasts are conditional rather

unconditional. The approach can accommodate interchangeable targets and instruments. For instance, fiscal deficit can be a policy target as well as instrument.

The effectiveness of a model to be useful for policy simulation purposes should have the following features: (i) capable of meeting data challenges (ii) adjustable to address emerging policy concerns (iii) simple to the extent that the structure and chain of causal relationship can be easily understandable (Mundle et al., 2011). The Klein-Goldberger-Tinbergen framework has these features. The model, however, does not provide for economic agent's *ex ante* anticipation of policy actions that can influence such action, i.e., Lucas critique.[13]

For estimation of individual equations, suitable structural dummies are introduced to capture structural breaks, which are identified using Bai-Perron test. Autoregressive terms are introduced to correct for autocorrelations. In the estimated equations there are outliers in the errors, which may not be explained by the theoretical variables. To minimise such errors and derive robust parameters that can explain the underlying macroeconomic behaviour, outlier dummies are introduced. Such adjustments in outliers are largely like the Error Correction Mechanism models that help in deriving the underlying long-term behaviour after correcting the errors. (Bhanumurthy et al, 2018). Covid-19 pandemic affected all the macroeconomic variables. The impact varies at times across the two Covid years (2020-1 and 2021-2). Dummies have been used to take account of these and other shocks.

Using annual data for India the period 1990-1 to 2022-23, the behavioural equations in the model are estimated. Appendix 1 presents the definition of the variables and the data sources. Appendix 2 reports the estimated equations.

The macromodel comprises of 20 behavioural equations and 20 identities. The endogenous variables are 40 in number spanning fiscal block, external block and remaining macroeconomic relationships. There are a set of 16 exogenous variables, other than the dummy variables. The key *variables of interest* are: (i) nominal GDP, real GDP, investment rate, inflation; (ii) Fiscal deficit and debt GDP ratio; (iii) current account deficit as the external balance indicator; and (iv) SDI as the HD outcome variable.

Limitations of the study

Data availability remains a major challenge in carrying out any long-term macroeconomic exercise. (i) The Indian Public Finance Statistics (IPFS) has been an important source on public finance statistics in India. The special characteristic of IPFS is the reporting of data on combined government after netting out inter-governmental transactions. This publication was discontinued after 2018. The data for combined general government expenditure on social services thus had to be taken from the GoI's Economic Survey, which reports data only in terms of broad categories of education, health and other social services and excludes components such as employment guarantee programmes. (ii) In the new National Accounts Statistics

[13] Refer to Mundle et al, 2011 for a detailed discussion

(2011-12), some of the data series such as net capital stock at constant prices are no longer reported. The net capital stock series thus had to be is used, at current prices rather than at constant prices, which would be more appropriate conceptually. (iii) In the income tax data, the share of personal income tax arising out of labour income is not available publicly and had to be imputed, and a constant value assumed over the estimation period. These and many other data related limitations affect the estimates presented.

Then there are limitations related to suitability of estimation methods and model specification. At times, the underlying assumption on linearity in relationship among model variables breaks down and the variables tend to be nonlinearly related over time. In such a scenario using linear model may be too restrictive. Adding nonlinearity to a relationship, however, also implies estimation of additional parameters thus resulting in loss of degrees of freedom. Given the limitations on data points, the present study chooses linear framework over nonlinearity. Another feature of the model is that most of the estimated equations contain AR(1) terms. This is a standard practice in time series econometrics as it is believed that the data generating processes are better captured through lagged dependent variables. This practice comes at a cost. In the presence of frequent shocks and high volatility in a series, errors may get reinforced due to autoregressive terms thus making forecasting more difficult.

The use of certain simplifying assumptions is part of any model building. To keep the model tractable, the exchange rate is assumed to be exogenously determined. Feedback from the fiscal sector to monetary variables is suppressed. While we have explicitly introduced human development among the target variables, the different development paybacks with long-term horizons cannot be captured (Bose and Banerjee 2025: Section 1). Unemployment, a major variable, with a direct link to human development, growth and inequality, is absent in the model. An extension, integrating employment is part of the future research agenda.

Robustness

The estimated single equations along with identities are solved together by using Gauss–Seidel algorithm for the latest period, i.e., for 2018–2022 to assess the forecast performance of the whole model. The estimated model tracks the movements in the variables including the turning points (Figure 3). Table 1 presents the root mean percentage square error (RMPSE) for a set of endogenous variables. RMPSE falls within an acceptable range, except for the trade deficit.

Figure 3: Robustness (model validation: 2018-19 to 2022-23)

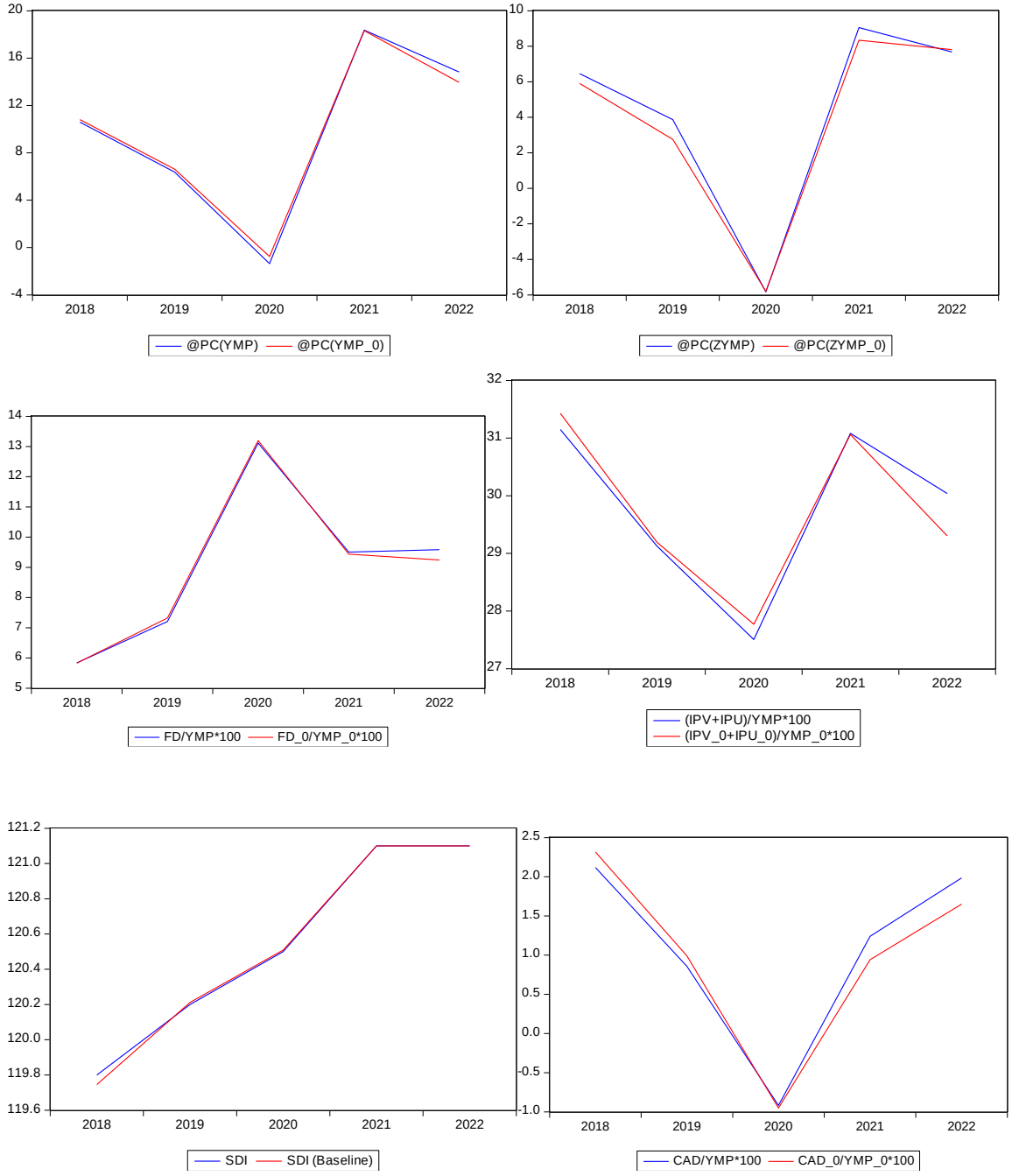


Table 1: Root mean square percentage error (2018-19 to 2022-23)

Private consumption (CPR)	0.44
Private Investment (IPV)	1.14
Primary Deficit (PD)	4.83
Undistributed Profit	1.17
Social expenditure cumulative (EPUBSOC_CUM)	0.07
Fiscal deficit (FD)	1.93
Fiscal deficit-GDP (FDG)	1.84
Public investment (IPU)	4.37
Import (IMPORT)	0.52
Export (EXPORT)	1.24
Invisibles	1.20
Disposable wages (DISPW)	0.71
Disposable capital income (DISCAPY)	1.19
Nominal income (YMP)	0.69
Real income (ZYMP)	1.72
WPI	0.27
GDP Deflator	2.30
Government expenditure (GENEX)	0.63
Social Determinant of Investment (SDI)	0.02
Trade deficit (TD)	**10.11**

Table 2: Baseline assumption for exogenous variable

	Variable Name	Baseline assumption
1	Growth of Middle East Economies' GDP and Advanced Economies' GDP	As per IMF projections
2	Minimum support prices	Assumed to change at an average growth rate of 2015-2019 (6% pa)
3	Duty (import weighted)	To remain at the present level i.e.12%
4	Buoyancy of Corporate tax, PIT and indirect tax	Assumed to be 1
5	Labour share in personal income tax	Assumed to be constant at 76%
6	NDCR	Rate of growth at 5% per annum
7	Nominal exchange rate	Assumed to depreciate at decadal trend rate of 4% per annum
8	International oil price	Assumed to be constant at 542$/MT (Median Value of 2018 to 2022)
9	Repo	6%
10	Output-capital ratio	Assumed to be constant at 0.32 (2019 level)
11	Labour share in GVA (LABSH)	Assumed at 0.56 (2019 level)

Baseline Case

The business-as-usual outcomes or the baseline case covering the period 2025-6 to 2030-1 is defined by the following assumptions for the exogenous variables.

In the baseline scenario (Table 3), the average growth of nominal income stands at 10.2%, with nominal income growth rising from 10.1% to 10.5% over the six-year period. With inflation standing at about 3.6%, real growth is at 6.4% on average. Growth rises from 5.8% to 6.7% over the forecast period, whereas inflation moderates. Growth acceleration is investment led. Public investment acts as a growth spur, with a slight uptick in private investment. External balance (CAD) averages 3% of GDP and fiscal deficit to GDP at 7.25%. The external balance deteriorates marginally owing to higher domestic growth. Fiscal deficit to GDP rises by 0.7%, whereas the debt-GDP ratio remains at around 75% over the projection period. Social expenditure ratio remains at around the existing levels of 7% of GDP. SDI increases gradually in the baseline scenario. It is again important to remind oneself that these are conditional forecasts, dependent on the various assumptions of exogenous values.

Table 3: Baseline Projection

	2025-6	2030-31	Average
Nominal Growth	10.1%	10.5%	10.2%
Real Growth	5.8%	6.7%	6.4%
CAD-GDP	2.4%	3.7%	3.2%
FD-GDP	7.0%	7.7%	7.3%
Debt-GDP	74.6%	75.5%	74.9%
Inflation	4.0%	3.6%	3.6%
Private investment rate	22.3%	22.8%	22.7%
Overall investment Rate	29.7%	31.1%	30.6%
Social expenditure ratio	7.0%	7.2%	7.0%
SDI	123.2	126.7	125

Section 5: Results from Policy Simulation

Policy simulations capture the impact of exogenous shocks or policy changes on target variables. In each case, the baseline scenario becomes the benchmark against which the policy change is administered and outcomes analysed. The scenarios below focus on the impact of change in social expenditure (now transformed into an exogenous policy variable) on the macroeconomic indicators, considering the inter-relationships across various model variables. The objective is to study the impact of expansion in social spending in a macro-consistent framework.

5.1 The impact of expansion in social expenditure on growth: Fiscal multiplier

The estimated model can be used to calculate the fiscal multipliers. Fiscal multiplier measures the impact of change in government expenditure on nominal GDP. Initial round of spending stimulates further rounds of spending such that ultimately the effect on output is multiplier times the original increase in spending. The value of fiscal multiplier is the accumulated effect on output through various rounds of spending. In a situation where investment is determined by the growth of income itself, feedback on investment through the accelerator gets captured as well. Leakages on imports (besides savings and taxes) reduce the power of government expenditure in an open economy.[14]

The value of the social spending multiplier is estimated to be 1.67 (Figure 4). A unit increase in social spending results in 1.67 addition to GDP in the first year. There are several channels through which social spending impact various components of aggregate demand (refer to Section 2). Public consumption expenditure, along with private consumption spending, goes up on the demand side. The impact on investment and exports is via the stock of human capital and therefore is more incremental and long-term in nature. Note that the value of the social spending multiplier is not only more than 1, but the multiplier effect also continues into the next periods (Figure 4). Besides leading to improvement in HD outcomes, expansion in social spending is growth-promoting. It reinforces what Ranis and Stewart (2005) among others proposed about the simultaneity between growth and HD.

[14] The multiplier is greater, when interest rates do not respond to fiscal stimulus, and there is virtually no crowding out.

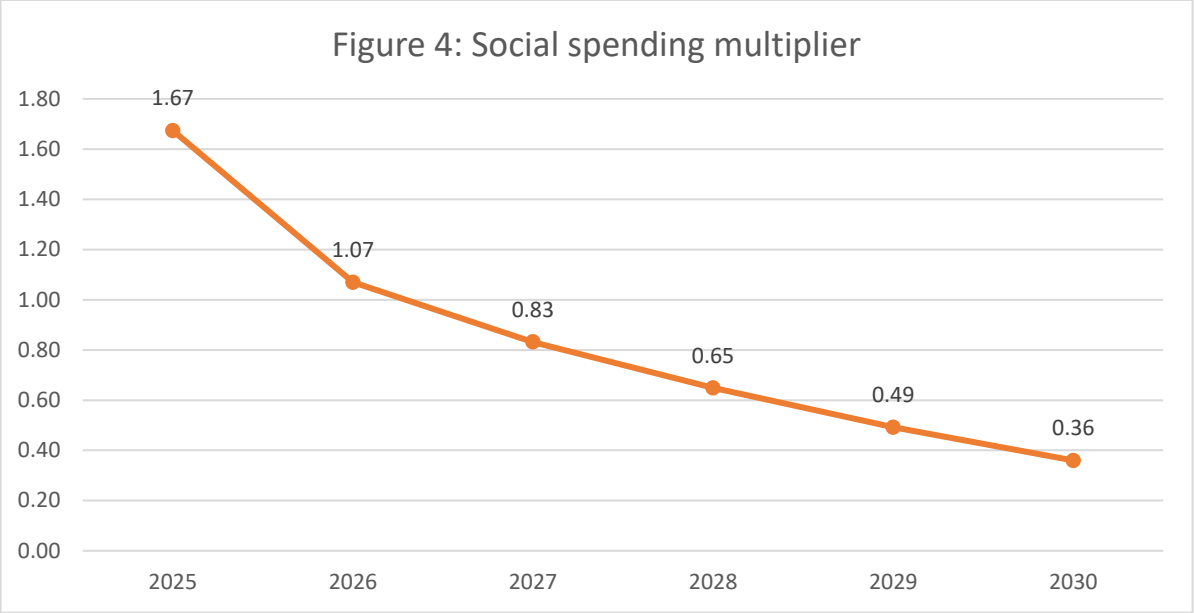
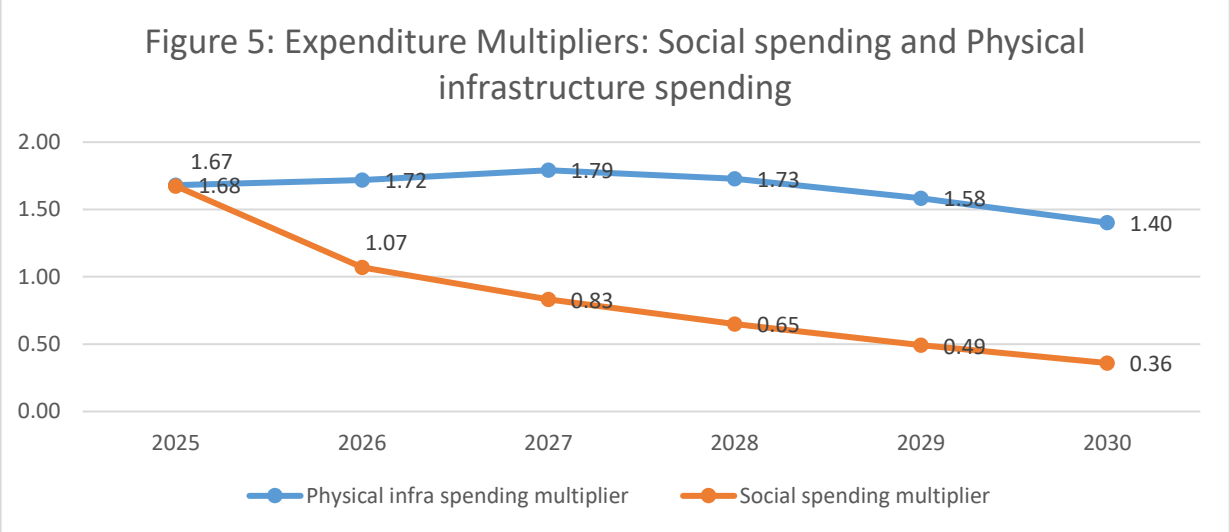


Figure 5 compares the social spending multiplier and physical infrastructure spending multiplier. Policymaking in India and elsewhere has favoured physical infrastructure creation, while neglecting social infrastructure investments (discussed further in Section 5.3). One of the arguments is the high growth impact of the former, which is found to be true in our estimates as well. What is to be emphasized, however, is that social spending multiplier is significantly high and can be used as a powerful tool for demand expansion. This is discussed further in the following section.



It may appear from Figure 5 that the cumulative impact of physical infrastructure is much higher than that of social infrastructure in the years following the one-time shock, but this result should be interpreted with caution for at least three reasons. First, the SDI used in this study is constructed only from indicators of education and earnings and does not include indicators of health infrastructure. We believe that including health indicators in the SDI would narrow the observed gap between the physical and social infrastructure multipliers.[15] Second, *employment multipliers* are likely to be higher for social spending than for physical infrastructure investment. Given that employment expansion is an important policy objective in its own right, this reinforces the value of social spending. Third, the model has been simulated for a five-year horizon, which limits its ability to capture the long-term productivity effects of both physical and social infrastructure, but particularly the latter, which typically has a longer gestation period. Extending the model to incorporate these considerations, though beyond the scope of this study, would raise the estimated value of the social spending multiplier even further.

5.2 Fiscal multiplier: The general case

To examine the general case, we consider a (smaller) static model of a closed economy at time t

$$Y_t = C_t + I_t + G_t \qquad (1)$$

Where $Y_t$is output, C_t is consumption Expenditure, I_t is investment expenditure, G_t is government expenditure. Income comprises of labour income and capital income. Consumption out of capital income is assumed to be zero, a simplifying assumption. Consumption depends on disposable labour income and public expenditure on social services denoted by $\widehat{E_t^S}$, a policy variable

$$C_t = C_0 + [\, c_w(1 - \hat{\tau}_w)\bar{m}_t]Y_t \; + c_f\widehat{E_t^S} \qquad (2)$$

where $C_0 >$ 0 is autonomous consumption $\hat{\tau}_w$ is tax rate on labour income, c_w denotes marginal propensity to consume (MPC) of labour income and c_f is MPC of social service expenditure of government. Also c_w & $c_f \in [0,1]$. $\bar{m}_t$denotes share of labour income exogenously determined [17].

[15] As Atolia et al. (2021) note "the incentives to alleviate these concerns would become even stronger if another major component of social infrastructure, namely, health, were also taken into consideration."

[16] We assume rupee by rupee conversion between budgetary expenditure and their national account counterpart.

[17] $\bar{x}_t$ denotes exogenous variable, $\hat{x}_t$ denotes policy variable

Private investment is assumed to depend on (i) income, which captures accelerator effect (Y_t); (ii) public investment which has a crowding-in effect (I_t^P); (iii) interest rate measuring cost of borrowing ($\hat{r_t}$); (iv) social determinant of investment (SDI_t) capturing host of social development factors boosting private investment via higher productivity; and (v) the impact of profit share of income (1-$\bar{m}_t$) on expected profitability and therefore investment.

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 I_t^P + \beta_3 SDI_t - \beta_4 \hat{r_t} - \beta_5 \bar{m}_t \qquad (3)$$

β_i>0 ∀ I

The entire government expenditure is devoted to investment purposes either on physical infrastructure expenditure $\widehat{E_t^P}$ or social infrastructure creation $\widehat{E_t^S}$.

$$G_t = \widehat{E_t^P} + \widehat{E_t^S} \qquad (4)$$

The social determinant of investment (SDI) depends on social expenditure (exogenously determined) and share of labour income.

$$\text{SDI} = \gamma_0 + \gamma_1 \widehat{E_t^S} + \gamma_2 \bar{m}_t \quad , \gamma_1, \gamma_2 > 0 \qquad (5)$$

Substituting equation (5) in equation (3) and equation (2) to (4) in (1) we get

$$Y_t = C_0 + [c_w(1 - \hat{\tau}_w \bar{m}_t) + c_f \widehat{E_t^S} + \beta_1] Y_t + \beta_0 + (1 + \beta_2)\widehat{E_t^P} + \beta_3 \gamma_0 - \beta_4 \hat{r_t} + (\beta_3 \gamma_2 - \beta_5)\bar{m}_t + (1 + \beta_3 \gamma_1 + c_f)\widehat{E_t^S}$$

Or solving for Y_t

$$Y_t^e = \frac{C_0 + \beta_0 + \beta_3 \gamma_0 - \beta_4 \hat{r_t} + (1+\beta_2)\widehat{E_t^P} + (1 + \beta_3 \gamma_1 + c_f)\widehat{E_t^S} + (\beta_3 \gamma_2 - \beta_5)\bar{m}_t}{1 - [c_w(1 - \hat{\tau}_w)\bar{m}_t + \beta_1]} \qquad (6)$$

The stability of the equilibrium requires

$$[c_w(1 - \hat{\tau}_w)\bar{m}_t + \beta_1] < 1 \qquad (7)$$

The stability condition implies the slope of aggregate demand curve must be less than 1. The first term is marginal propensity to consume (MPC) of the economy and second term is the marginal impact of income on the investment function (MYI). The required stability conditions are: i) 0 < MPC<1; (ii) 0 < MYI<1 and (iii) 0 < MPC+MIY<1

The social expenditure multiplier is given by the expression

$$\frac{dY_t^e}{d\widehat{E_t^S}} = \frac{1 + \beta_3 \gamma_1 + c_f}{1 - [c_w(1 - \hat{\tau}_w)\bar{m}_t + \beta_1]} \qquad (8)$$

Whereas physical infrastructure multiplier is

$$\frac{dY_t^e}{d\widehat{E_t^P}} = \frac{1 + \beta_2}{1 - [c_w(1 - \hat{\tau}_w)\bar{m}_t + \beta_1]} \qquad (9)$$

If the stability condition holds, both social as well as physical infrastructure multipliers are greater than one. Both the multipliers are affected by marginal propensity to consume out of labour income, labour income share, tax rates on labour income, and marginal effect of income on private investment expenditure. The magnitude of social infrastructure multiplier would also depend on: (a) sensitivity of social development outcome (SDI) to social sector expenditure (b) the sensitivity of private investment to SDI; and (c) marginal propensity of private consumption to social spending. Physical infrastructure multiplier will be high when complementary effect of public investment on private investment is higher. It is also possible for public social infrastructure multiplier to be higher than higher than public physical infrastructure multiplier when $\beta_3\gamma_1 + c_f > \beta_2$, that is, when the sensitivity of private investment to social expenditure plus that of consumption expenditure to social transfers exceeds the responsiveness of private investment to government's physical infrastructure expenditure.

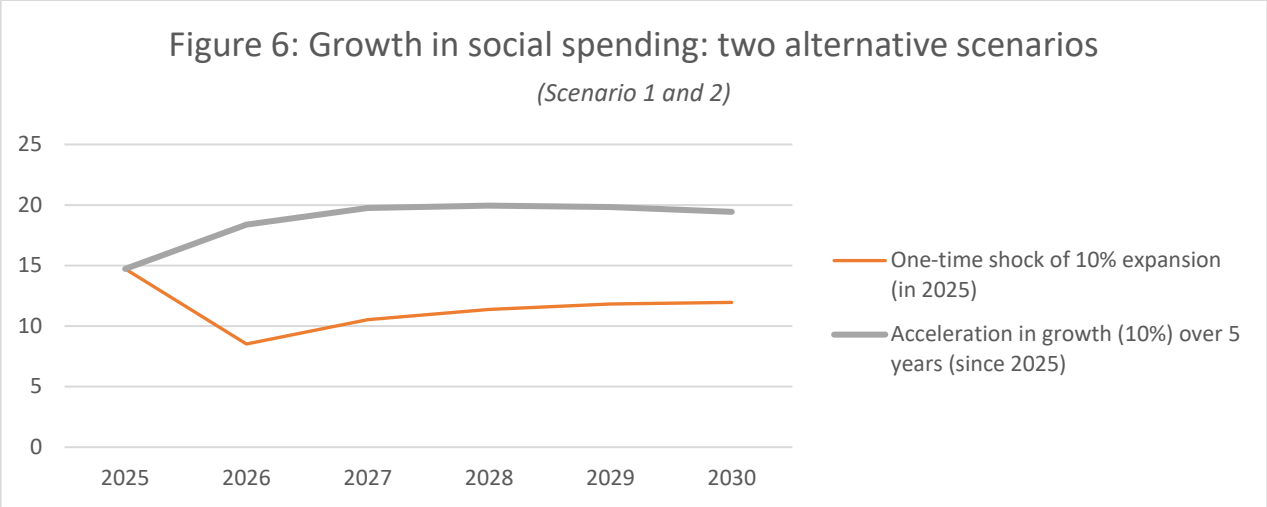
Finally, the distributional change in favour of labour income ($\overline{m}_t$) raises disposable income and thus increases consumption demand. Its effect on investment depends on the relative strength of the two effects moving in opposite direction. On the one hand, private investment increases as increase in ($\overline{m}_t$) increases SDI, on the other hand, profitability declines due to fall in profit share. The net effect is ambiguous.

5.3 The impact of expansion in social expenditure on fiscal deficit and debt: Can a substantial rise in social spending be compatible with debt-stability?

Social spending in India is far below the normative benchmark, which has resulted in massive gaps in essential provisions of basic social services. National policies on health and education have set expenditure targets that are consistently underachieved. The present expenditure levels are about half the normative targeted expenditure of 8.5% of GDP for health and education as per the national policies.[18] Assuming a similar (proportional) gap in social services as a whole, the normative target for social spending would be around 14% of GDP.

Three policy simulations are considered below, each presenting a different scheme of expansion of social expenditure on the baseline scenario. In the first case, the expansion is a one-time positive shock, after which social spending returns to the baseline growth path. Scenario 1 mimics a one-time upward shock in growth of social spending. This kind of change is similar to changes due to pay commission award, which is a one time in nature. In the second case, there is an acceleration in social spending targeted to reach 10% of GDP (which is still short of 14% normative target) by 2030-1 (Figure 6). That is, additional fiscal space for social spending up to 3% of GDP by the end of the forecast period is seen in scenario 2.

[18] Policy target for public spending on health is 2.5% of GDP by 2025 (National health policy, 2017) and 6% on education (National education policy, 2020).



In scenario 3, the growth in social expenditure (as in scenario 2) is accompanied by a distributive change in favour of labour income. Scenario 3 represents better pre-distributive policies aimed at higher labour share through higher bargaining power of labour, better terms of employment, higher minimum wages, active labour market policies etc. Some of these interventions may have fiscal implications like employer of last resort policies, whereas others are not fiscal policy instruments. These policies constitute necessary complements/ adjuncts of policies aimed at improvement in human capabilities and would tackle the phenomenon of educated unemployment and rising inequality. There is no guarantee that more skill or better health will translate into higher earnings in the face of weak bargaining power of workers which can then result in slack in demand (Seguino, 2012, Ranis and Stewart, 2005; Nayyar, 2012). Policies to rebalance workers' bargaining power and incentivize firms to share the benefit of increased earnings with the workers are essential.

Table 4: Simulation results ***(Change vis-à-vis baseline)***

	Scenario 1: One-time shock of 10% expansion of social spending			**Scenario 2: Continued higher growth in social spending**			**Scenario 3: Higher Labour share on Scenario 2** (5% increase in labour share)		
	2025-6	2030-31	Average (2025-2030)	2025-6	2030-31	Average (2025-2030)	2025-6	2030-31	Average (2025-2030)
Nominal Growth	1.29%	0.18%	0.60%	1.29%	3.12%	2.43%	2.57%	3.11%	2.93%
Real Growth	1.16%	0.07%	0.40%	1.16%	2.34%	1.96%	2.32%	2.21%	2.30%
CAD-GDP	0.21%	0.49%	0.40%	0.21%	2.05%	1.09%	0.41%	2.43%	1.44%
FD-GDP	**0.38%**	**-0.19%**	**0.00%**	**0.38%**	**0.19%**	**0.42%**	**0.22%**	**-0.70%**	**-0.21%**
Debt-GDP	**-0.40%**	**-1.39%**	**-0.90%**	**-0.40%**	**-4.99%**	**-2.45%**	**-1.33%**	**-9.08%**	**-5.12%**
Inflation	0.08%	0.10%	0.10%	0.08%	0.63%	0.37%	0.15%	0.75%	0.50%
Private investment ratio	-0.18%	-0.15%	-0.20%	-0.18%	-0.93%	-0.57%	-0.19%	-1.26%	-0.73%
Overall investment Ratio	-0.17%	-0.19%	-0.20%	-0.17%	-1.01%	-0.59%	-0.27%	-1.68%	-0.98%
Social expenditure ratio	0.61%	0.48%	0.50%	0.61%	2.89%	1.80%	0.52%	2.63%	1.61%
SDI	0	0.07	0.03	0	0.22	0.08	0	0.22	0.08

In all the three cases, GDP growth is higher than the baseline case (Table 4). As a result of expansionary fiscal push, constituents of domestic demand increase, especially government final consumption expenditure and private consumption. The increase in demand generated through social spending spreads through the system via expenditure multiplier. The highest GDP growth is observed for scenario 3 when two changes, fiscal expansion is accompanied by a distributional change towards labour income. The growth impact is substantial, 3% higher on average compared to baseline. Most of the GDP growth is due to real growth rather than inflation.

Fiscal Deficit to GDP worsens in the year of shock in Scenario 1 but quickly recovers thereafter, such that there is no change in overall fiscal deficit to GDP compared to the baseline (Table 4). In scenario 2, which corresponds to creation of substantial additional fiscal space for social spending, there is a permanent widening of the fiscal deficit to GDP gap but only by 0.4%. While a part of fiscal expansion is financed by borrowing and therefore higher fiscal deficit, social spending also results in higher revenue growth. Revenue growth is higher in all the scenarios relative to baseline, demonstrating that fiscal space is dynamic. Expansion in social expenditure is self-sustaining. Public debt to GDP goes down because of higher nominal growth even

though higher fiscal deficit exerts the opposite influence. This result shouldn't come as a surprise; the underlying economic logic is well-established. "The proper solution of the debt problem lies not in tying ourselves into a financial straight jacket, but in achieving faster growth of the GNP, a result which is, of course desirable by itself" wrote Domar (1993: 478). An answer to public debt burden is higher growth a la Domar; debt-GDP improves in all three scenarios.[19]

The inflationary impact of fiscal expansion, while not completely absent, is marginal (Table 4). Current account deficit to GDP rises due to higher imports from higher domestic growth. With higher social spending, improvement in SDI is faster in Scenarios 2 and 3. While investment increases compared to baseline, the investment rate as a share of GDP falls compared to the baseline, which indicates that growth in GDP is primarily caused by consumption growth rather than being investment-led. An objection may be raised that the lower investment rate (vis-à-vis the baseline) runs counter to the theoretical arguments advanced in the paper; however, this merely indicates that social spending may not yield an immediate increase in private investment. The 6-year time horizon of forecasts is not enough to see a significantly large positive impact on the investment rate via SDI. The channel is expected to operate with a lag of say, 10 to 20 years. This accords with the characterization of investments in schools (versus roads) by Atolia et al (2021). Public investment in physical infrastructure such as roads crowds-in private investment directly, which explains the high multiplier values for physical infrastructure spending. On the other hand, when the outlay is on social investment, the impact on private investment will be lagged. The channel operates indirectly via SDI. The response of SDI to public expenditure shock is gradual via cumulative expenditure, which will result in crowding-in of private expenditure over time. Policy making with a shorter time frame will result in suboptimal social investments due to political myopia. Fiscal sustainability needs to be seen in a long-term horizon with a long-term fiscal roadmap for social investments.

5.4 Debt Sustainability: The general case

With some changes, the skeletal model of the economy presented above can be extended to accommodate the dynamics of public debt and fiscal deficit.

Apart from physical infrastructure and social spending, government expenditure has a new component called *other expenditure* (E_t^O) arising out of public debt servicing.

$$G_t = \widehat{E_t^P} + \widehat{E_t^S} + E_t^O \qquad (10)$$

[19] Angeletos et al (2024) using a new-Keynesian model acknowledge the self-financing nature of fiscal policy. "Self-financing—and in particular self-financing via tax base expansion—to be a real-world possibility when there is sufficient slack in the economy in the dual sense of (i) aggregate employment and output being demand-determined, and (ii) increases in aggregate demand translating to a real boom without significant inflationary pressures." (p. 1387).

$E_t^O = \hat{r}_t D_{t-1}$ (11)[20]

The interest payment on account of debt servicing is given by interest rate and stock of outstanding public debt. Let D_{t-1} be the stock of public debt in period t-1.

Fiscal deficit can be defined as excess of government spending over tax revenue $T_t = \hat{\tau}_t Y_t$, where $\hat{\tau}_t$ is average tax rate of the economy

$F_t = G_t - T_t$ (12)

The stock of public debt in period t is

$D_t = \widehat{E_t^P} + \widehat{E_t^S} + \hat{r}_t D_{t-1} - \hat{\tau}_t Y_t + D_{t-1}$ (13)

Dividing (13) by Y_t and denoting

$\frac{F_t}{Y_t} = f_t$, $\frac{D_t}{Y_t} = d_t$, $\frac{E_t^S}{Y_t} = e_t^S$, $\frac{E_t^P}{Y_t} = e_t^P$, $\hat{r}_t = \hat{r}$ and $\frac{Y_{t-1}}{Y_t} = \frac{1}{(1+g)}$

Equation (13) can be written as,

$d_t = \widehat{e_t^P} + \widehat{e_t^S} + \frac{(1+r)}{(1+g)} d_{t-1} - \hat{\tau}_t$ (14)

Equation (13) is a first-order linear non-homogenous difference equation and can be solved to get the time path of debt-GDP ratio.[21]

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[20] The feedback from deficit to monetary variables is not considered here.

[21] Consider homogenous part

$d_t - \frac{(1+\hat{r})}{(1+g)} d_{t-1} = 0$

Let the solution be $d_t = A\lambda^t$, $\lambda \neq 0$

Thus $A\lambda^{t-1}(\lambda - \frac{(1+\hat{r})}{(1+g)}) = 0$

Or, $\lambda = \frac{(1+\hat{r})}{(1+g)}$

For the non-homogenous part,

Let $d_t = d_{t-1} = d^*$ and if we do away with time subscript

$d^* = e^p + e^s - \hat{\tau}_t + \frac{(1+\hat{r})}{(1+g)} d^*$

Or $[1 - \frac{(1+\hat{r})}{(1+g)}] d^* = e^p + e^s - \hat{\tau}_t$

Or $d^* = \frac{(g-\hat{r})}{(1+g)}[e^p + e^s - \hat{\tau}_t]$

The time path for the debt-GDP ratio evolves through

$d_t = \frac{(g-\hat{r})}{(1+g)}[e^p + e^s - \hat{\tau}_t] + A(\frac{(1+\hat{r})}{(1+g)})^t$

Let d_0 be the (given) initial debt-GDP ratio

$$d_t = \frac{(g-\hat{r})}{(1+g)}(e^p + e^s - \hat{\tau}_t) + [d_0 - \frac{(g-\hat{r})}{(1+g)}(e^p + e^s - \hat{\tau}_t)](\frac{(1+\hat{r})}{(1+g)})^t \quad (15)$$

Where d_0 is the (given) initial debt-GDP ratio

The debt-GDP ratio will converge if $g>\hat{r}$. That is, $g>\hat{r}$ is a sufficient condition for achieving debt-stability, for any positive gap between expenditure and tax (primary deficit).

Two propositions can be drawn on debt path.

Proposition 1: Higher the g-$\hat{r}$ where g is exogenously determined nominal growth rate and r is the nominal rate of interest, faster the economy approaches steady state debt-GDP ratio. The problem of public debt stability reduces to a problem of expanding national income as proposed by Domar (1944).

Propositions 2: Instead of exogenously determined g, if g depends positively on primary deficit, (with r exogenously given) the economy approaches steady state debt-GDP ratio faster. The speed of convergence depends on sensitivity of growth to primary deficit.

Section 6: Conclusion and Policy recommendations

The divergence between human development and growth performance constitutes a structural problem for the Indian economy. Public expenditure on social services holds the key to broad-based improvements in human development by creating equal opportunities irrespective of class, caste, and gender. This paper attempted to theorize social spending within a heterodox macroeconomic framework that integrates growth, distribution, and human development, offering an alternative way of conceptualizing fiscal policy for India.

A key message emerging from the analysis is that **human development objectives must be incorporated into the larger macro-fiscal framework**, explicitly recognizing the interconnections between growth, distribution, and development. This represents a major **philosophical shift** from the prevailing approach, where social services are often viewed as residual or a sink absorbing resource generated elsewhere (with "where will the money come from" being the constant refrain). Instead, HD and growth form a mutually reinforcing cycle of causation, with success in one tending to promote success in the other.

It implies that the **normative targets**—derived from development goals such as the SDGs and domestic policy commitments—should serve as the starting point for fiscal policy design. This is of particular importance as the social sector has regularly been

$A=[d_0 - \frac{(g-\hat{r})}{(1+g)}(e^p + e^s - \hat{\tau}_t)]$

$d_t = \frac{(g-\hat{r})}{(1+g)}(e^p + e^s - \hat{\tau}_t) + [d_0 - \frac{(g-\hat{r})}{(1+g)}(e^p + e^s - \hat{\tau}_t)](\frac{(1+\hat{r})}{(1+g)})^t$

treated as a residual and macroeconomic policy has dominated social policy. Reframing expenditure classification is another important recommendation based on experience of several decades where revenue expenditure was compressed because of its supposedly unproductive nature and as a result harming sectors like the social sector. Instead of revenue and capital expenditure and the assumed hierarchy between the two, institutionalized in FRBM, **a functional distribution of expenditure with explicit focus on the social sector is proposed.**

The paper demonstrated the **potential of raising aggregate demand and hence economic growth through social spending**. It emphasizes the reinforcing role of social sector expenditure in driving growth and improving development outcomes through several channels: (i) Social spending boosts private and public consumption demand. (ii) An innovation in this framework is the concept of the *social determinant of investment* (SDI), which represents the capability sets created through investments in education, health, and other social services—attributes essential for spurring private investment and boosting export demand. (iii) A more equitable income distribution raises consumption (given the higher marginal propensity to consume among wage earners) and further enhances SDI. (iv) Revenue buoyancy from growth expands fiscal space. These combined effects lead to higher growth, which, in turn, exerts a downward pressure on the fiscal deficit–GDP ratio and stabilizes the debt–GDP ratio, consistent with the Domar condition. Thus, unlike earlier models where fiscal consolidation defined the growth trajectory, this framework starts with normative development targets and arrives at fiscal sustainability as an outcome, rather than as a prior constraint.

The empirical findings confirm the potential of **social spending as a driver of growth**. The estimated social spending multiplier of **1.67**, with even larger long-term effects via improvements in social determinants of investment, underscores the growth-promoting and therefore **self-financing character** of such expenditures. Simulations suggest that expanding social spending even by a substantial 3% of GDP by 2030 not only avoids deterioration in the debt burden but improves debt dynamics, satisfying the Domar condition. This challenges the capital–revenue hierarchy embedded in frameworks such as the FRBM Act, showing that borrowing for social spending can be fiscally sustainable.

Improvements in social outcomes, say, universal access to health and education can lead to higher welfare and more equal distribution of human capabilities and perhaps impact income distribution positively. Furthermore, better **pre-distributive policies** aimed at higher labour share through higher bargaining power of labour, better terms of employment, higher minimum wages, employer of last resort policies, active labour market policies etc. constitute necessary complements/ adjuncts of policies aimed at improvement in human capabilities.

Politics, as Hume reminds us, concerns attention to our long-term interests, making them the short-term interests of those who have political responsibility (Hume, 1978: Bk III, Pt 2, p. 537). This gives the State, in Hume's sense of a body whose short-term interest is the long-term interest of the population, responsibility for public goods. Following Hume's insight that politics involves a**ligning long-term public**

interests with short-term political priorities, substantial expansion of social spending demands a **policy establishment capable of overcoming political myopia and committing to a clear long-term expenditure roadmap**.

Areas of further work: Some key issues are identified for future work. Notably, the policy simulations have not incorporated taxation as a tool for expanding fiscal space for the social sector, despite ongoing debates in India on wealth and inheritance taxes targeting the richest sections of society—both as redistributive measures and as revenue sources for financing health and education (Bharti et al., 2024). This debate is relevant to the framework proposed here. In addition, the employment question, central to inclusive growth, remains an area for further research.[22]

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[22] Some missing areas were identified under the section limitations of the study. For instance, the model can be extended to incorporate a monetary sector.

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Appendix 1

Definition of Variables and Data Sources

ADVGDP is the GDP of all advanced countries taken together measured in current US $. Source: World Economic Outlook. IMF

AVERAGE CAPITAL-OUTPUT RATIO is the three-year moving average of the ratio between gross domestic product at factor cost and net capital stock at current price.

CAPY is the nominal amount of total non-labour income, calculated from YF and LABSH using KLEMS data.

CPR is nominal value of private final consumption expenditure. Source: National Accounts Statistics (NAS), base 2011-12.

CPT is the corporate income tax. The data is taken from two sources. Income Tax Department's Time Series Data for Financial Year 2000-01 to 2023-24 issued by Central Board of Direct Taxes, and data for previous decade is taken from Indian Public Finance Statistics.

CPU is the nominal consumption expenditure of central and state government. Source: NAS.

CU_RATE is capacity utilization rate. It is calculated from gross domestic product at factor cost, net capital stock at current prices and average output capital ratio. Source: NAS.

DEBT is combined total liabilities of Centre & States Data from Handbook of Statistics on Indian Economy (HSIE, RBI)

DEFLATOR is a ratio between nominal gross domestic product and real gross domestic product. Source: HSIE, RBI.

DISCAPY is the disposable capital income in nominal values. It is calculated as capital income less sum of corporate profit tax, personal income tax on capital income and undistributed profit.

DISPW is the disposable labour income in nominal values. It is calculated as labour income less personal income tax on labour income.

DISCREPANCY is the discrepancy in the national income identity.

DUTY is the Trade weighted average of Tariffs on imports in India. Data from World Tariff Profile 2024

EPUBSOC is the public expenditure on social services by the general government. Source: Economic Survey, GoI.

EPUBSOC_CUM is cumulative public expenditure on social services by general government, with 1980 as the starting point. Source: Economic Survey, GoI.

EPUBPHY is general government capital expenditure excluding capital expenditure in social services. Source: HSIE, RBI.

ER is the nominal exchange rate of the Indian rupee vis-à-vis US Dollar (Rupees per unit of $, annual average) Source: HSIE, RBI.

EXPORT is the nominal value of export of goods and services. This this the sum of merchandise export and nonfactor services receipts. Source: HSIE, RBI.

FD is the gross fiscal deficit of the centre and state government combined in nominal value. Source: HSIE, RBI.

FDG is the gross fiscal deficit combined of the centre and state government to GDP ratio

GENEX is the combined expenditure of the general government. Source: HSIE, RBI.

IMPORT is the nominal value of import of goods and services. This this the sum of merchandise import and nonfactor services payment. Source: HSIE, RBI.

INDTAX is the total indirect tax receipt of the general government. Source: HSIE, RBI.

INTPAYMENT is the expenditure on debt servicing of combined government. Source: HSIE, RBI.

INVISIBLE is the net of invisibles less net nonfactor services. Data from Table 137: Invisibles by Category of Transactions – Rupees, Source: HSIE, RBI.

IPV is gross private investment in nominal terms. This is measured by gross capital formation (GCF) of the private sector which is a sum of GCF of private corporate sector and GCF of Household sector. Gross capital formation of any sector equals gross fixed capital formation plus net change in stock. Source: NAS, CSO

IPU is the nominal value of investment made by general government and public sector enterprises. Source: NAS, CSO

CPUIPU is the sum of general government final consumption and investment expenditure. Source: NAS, CSO.

LABSH is the share of labour income in GVA. Source: India KLEMS Database

MEGDP is the GDP of all Middle Eastern countries measured in current US $. Data from the World Economic Outlook. IMF

MSP is weighted average minimum support price on rice and wheat with procurement as weights. Source: HSIE, RBI.

NETCAPSTOCK is the net capital stock at current prices. Source: NAS, CSO.

OTHEREXP is calculated residually from GENEX after netting out EPUBSOC, EPUBPHY and INTPAYMENTS. Source: HSIE, RBI.

OTHREV includes non-tax revenues and other direct taxes of the general government. It is calculated residually after deducting PIT, CPT and INDTAX from REVENUE Source: HSIE, RBI.

PD is the nominal value of primary deficit of the general government. It is calculated by deducting interest payment of from gross fiscal deficit. Source: HSIE, RBI.

REVENUE is total revenue receipt of central and state government taken together. Source: HSIE, RBI.

PIT is the personal income and collected by the central government. The data is taken from two sources. Income Tax Department's Time Series Data for Financial Year 2000-01 to 2023-24 issued by Central Board of Direct Taxes, and data for previous decade is taken from Indian Public Finance Statistics.

PLR is the prime lending rate. Calculated by taking simple average of maximum and minimum rate prevailing in a year. Source: HSIE, RBI.

**OIL_PRICE_$** is the international price of oil and petroleum products in the Indian basket. It is equal to value of oil import in US$ divided by quantity of OIL import. Source: Petroleum Planning and Analysis Cell.

REPO is the simple average of monthly repo rate. Source: HSIE, RBI.

R_GSEC is the weighted average yield on central government's dated securities. Source: HSIE, RBI.

SDI is the social determinant of investment measured as Labour Quality Index. Source: India KLEMS Database

WAGE is the total income accrued to labour in nominal terms. It is calculated using YF and LABSH.

WPI is the whole sale price index. Source: HSIE, RBI.

PITLSHARE is the share of personal income tax falling on labour income. Source: Income Tax Department's Time Series Data for Financial Year 2000-01 to 2023-24, issued by Central Board of Direct Taxes.

UNDIS_PROFIT is the undistributed profit of the corporate sector. This is measured by corporate savings. Source: NAS, CSO.

YMP is GDP at current market prices. Source: NAS, CSO.

ZYMP is GDP at constant prices (2011-12 base). Source: NAS, CSO.

YF is the Gross Domestic Product at current factor prices. It is measured by gross value added (GVA) at current basic prices. Source: NAS, CSO.

Appendix 2

Estimated equations

Period: 1990-1 to 2022-3

National Income Block (7 equations)

(1) CPR = 11103.9 + 0.42*DISPW + 0.12*DISCAPY + 0.58*CPR(-1) + 0.83*EPUBSOC - 100567.5*DUMSB_2008
(0.88) (7.8) (1.82) (15.2) (3.01) (-3.42)

- 787139.9*DUMCOVID1 + 481621.9*DUMCOVID2 + 150233.05*DUMCPR
(-11.19) (6.5) (5.37)

Adjusted R-squared = 0.99
DW= 1.82

(2) IPV = -7199860.4 + 0.67*IPV(-1) + 0.93*IPU + 1174415.6*CU_RATE(-1) + 40137.7*SDI - 16589.3*PLR
(-1.8) (11.1) (4.0) (2.3) (2.1) (-2.6)

+3491415.5*LABSH + 96041.4*DUM2007 - 927798.4*DUMCOVID1 + 760027.1*DUMCOVID2
(0.9) (2.0) (-12.9) (8.6)

+880621.2*DUM2022 -206732.9*DUMIPV
(8.4) (-12.3)

Adjusted R-squared = 0.99
DW= 1.89

(3) CPUIPU = 23539.49 + 0.59*GENEX + 0.11*CPUIPU(-1) + 386235.95*DUMCPUIPU - 550538.26*DUMCOVID
(2.93) (13.08) (1.47) (15.07) (-13.06)

Adjusted R-squared = 0.99
DW= 1.7

(4) IPU = -1067.76 + 0.57*IPU(-1) + 1.06*EPUBPHY - 394086.79*DUMIPU - 51338.4*DUMSB_2014
(-0.16) (14.78) (14.56) (-21.7) (-2.77)

- 224876.4*DUMCOVID
(-9.9)

Adjusted R-squared = 0.99
DW= 2.13

(5) IMPORT = -319977.41 + 0.20*YMP + 29.6*ER*OIL_PRICE$ - 528303.4*DUMCOVID + 263773.3*DUMIMPORT
+
(-5.6) (35.1) (13.1) (-9.4)
(8.0)

0.70*AR(1)
(5.2)

Adjusted R-squared = 0.99
DW= 1.83

(6) D(EXPORT) = -762956.2 + 0.62*D(ADVGDP) - 1753.4*DUTY + 7651.75*SDI + 186693.99*DUMEXPORT
(-2.3) (13.26) (-2.2) (2.7) (25.8)

- 166482.3*DUMCOVID1 + 857697.6*DUMCOVID2
(-3.8) (17.6)

Adjusted R-squared = 0.98
DW= 2.5

(7) INVISIBLE = -51523.1 + 0.025*(ADVGDP+MEGDP) + 0.67*INVISIBLE(-1) - 47284.8*DUM2016
(-5.9) (7.2) (16.6) (-6.9)

- 43516.7*DUMCOVID1 + 26819.2*DUMCOVID2 + 33725.2*DUMINVISIBLE
(-5.6) (3.8) (19.8)

Adjusted R-squared = 0.98
DW= 1.98

Fiscal Block (5 equations)

(8) EPUBSOC = -1583.8 + 0.20*REVENUE + 0.47*EPUBSOC(-1) - 327801.62*FDG*DUMFRBM
(-0.6) (14.8) (10.7) (-4.3)

+ 99605.6*DUMCOVID + 76076.3*DUMEPUBSOC
(8.3) (5.5)

Adjusted R-squared = 0.99
DW= 1.82

(9) EPUBPHY = 5177.3 + 0.07*REVENUE + 0.13*FD + 0.34*EPUBPHY(-1) - 70658.9*DUMCOVID1
(1.5) (5.6) (7.1) (5.8) (-2.7)

+157821.4*DUMCOVID2 + 90967.3*DUMEPUBPHY
(8.5) (14.8)

Adjusted R-squared = 0.99
DW= 1.98

(10) INTPAYMENT = -20688.4 + 4405.2*R_GSEC + 0.02*DEBT(-1) + 0.8*INTPAYMENT(-1) + 39671*DUMCOVID2
(-1.4) (2.4) (3.0) (8.1)
(2.9)

- 19126.0*DUMINTPAYMENT
(-4.1)

Adjusted R-squared = 0.99
DW= 1.94

(11) OTHEREXP = 11110.2 + 1.1*OTHEREXP (-1) + 248130.5*DUMOTHEREXP + 389742.1*DUMCOVID1
(1.4) (115.3) (2.7) (11.2)

- 365301.1*DUMCOVID2 + 495043.3*DUM2022
(-9.6) (13.0)

Adjusted R-squared = 0.99
DW= 1.5

(12) OTHREV = 10585.5 + 0.02*YMP + 0.39*OTHREV(-1) + 32720.95*DUMOTHREV - 158063.3*DUMCOVID
(3.6) (17.7) (8.6) (19.7) (-17.5)

Adjusted R-squared = 0.99
DW= 1.82

Other Relationships (6)

(13) UNDIS_PROFIT = -38234.15 + 0.19*CAPY + 0.5*UNDIS_PROFIT(-1) + 199142.8*DUMUNDISPROFIT
(-2.8) (7.2) (5.8) (6.6)

+ 162128.4*DUM2007
(3.5)

Adjusted R-squared = 0.99
DW= 1.4

(14) WPI = -17.5 + 0.00*MSP + 0.0*OIL_PRICE$*ER + 0.87*WPI(-1) + 22.9*CU_RATE + 4.2*DUMWPI
(-2.5) (1.9) (9.5) (27.8) (3.2) (8.7)

+1.8*DUMCOVID1 + 8.6*DUMCOVID2
(1.8) (9.2)

Adjusted R-squared = 0.99
DW= 2.5

(15) g(GDPDEFLATOR) = 0.01 + 0.46*g(WPI) + 0.4*g(GDPDEFLATOR(-1)) + 0.02*DUMCOVID1
(1.9) (6.8) (4.8) (1.8)

+0.01*DUMGDPDEFLATOR
(3.6)

Adjusted R-squared = 0.84
DW= 1.69

(16) SDI = 23.7 + 1.4e-08*EPUBSOC_CUM + 0.1*@TREND + 0.78*SDI (-1) + 0.3*DUMSB_2005
(6.1) (2.2) (5.7) (20.8) (6.8)
- 0.23*DUMCOVID1 + 0.099*DUMSDI_CUM
(-3.9) (10.4)

Adjusted R-squared = 0.99
DW= 1.7

(17) PLR = 0.92 + 0.15*REPO + 0.8*PLR(-1) + 2.0*DUMPLR
(2.0) (1.74) (13.0) (7.24)

Adjusted R-squared = 0.95
DW= 1.7

(18) R_GSEC = 0.23 + 0.46*REPO + 0.57*R_GSEC(-1) + 2.8*DUMRGSEC
(0.59) (6.1) (7.7) (3.79)

Adjusted R-squared = 0.95
DW= 1.7

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