Effect of Government Transfer on Money Supply: A Closer Look into the Interaction Between Monetary and Fiscal Policy

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Abstract

Although government transfer is a well-known fiscal variable, it can significantly influence the overall supply of money in the economy. Beneficiaries of government transfer program will consume a portion of it while the rest is saved and these initial savings will then be amplified inside the economy through the multiplier effect. Apart from consumption and savings a portion of government transfer will return to government in the form of taxes. Here, in the first place, we intuitively calculate the contribution of government transfer on private consumption, households' savings, government tax revenue and money supply. In the next step we provide a microfoundation for our intuitive reasoning using a simple endowment economy with finitely lived households. Finally, we empirically calculate our proposed multipliers using impulse response analysis under structural panel VAR framework. Response of money supply to changes in government transfer uncovers a channel through which monetary and fiscal policy may interact. Moreover, variance decomposition of money supply indicates that a significant portion of variance in money supply can be explained in terms of government transfer under structural panel VAR framework.

JEL Codes

E52, E62

Keywords

Government transfer, money supply, fiscal policy, monetary policy, interaction between monetary and fiscal policy

1 Introduction

Milton Friedman once argued that although the monetary policy can not permanently influence real output and unemployment it has a substantial impact on general price level [13]. However, the role of monetary policy to stabilize the general price level has been challenged several times. Most notably, Sargent and Wallace in their seminal paper titled *Some unpleasant monetarist arithmetic* show that a contractionary monetary policy may lead to higher inflation in near future during the periods of fiscal dominance [26]. So, in order to perform its designated role of stabilizing the general price level monetary policy needs to interact with the fiscal one. Since then the interaction between the monetary and the fiscal policy has become a central topic in monetary economics. A whole bunch of papers is dedicated to the investigation of whether and to what extent the unpleasant monetarist arithmetic of Sargent and Wallace works. A brief description of the literature since *unpleasant monetarist arithmetic* is sketched below.

Allan Drazen (1985) [9] shows that temporary monetary tightening will eventually lead to higher inflation when the deficit is fixed only if the elasticity of money demand with

respect to the money growth rate is less than unity. Bhattacharya and Kudoh (2002) [3] shows that unpleasant monetarist arithmetic holds even when the real interest rate is well below the growth rate of the economy. Alan S. Blinder (1982) [5] uses the traditional targets-instruments approach to assess the potential gains from greater coordination between monetary and fiscal policies. Since greater coordination is often associated with looser money and tighter fiscal policy two different models of the economy are used to gauge the quantitative importance of the policy mix. Guido Tabellini (1986) [30] analyzes a dynamic linear-quadratic game between the fiscal and monetary authorities and shows that coordination between monetary and fiscal policies takes the steady state value of public debt closer to the desired target. Beetsema and Bovenberg (1999) [1] explores how debt accumulation is affected by the strategic interplay between monetary and fiscal authorities. Dixit and Lambertini (2003) [8] shows that if monetary policy is more conservative than the fiscal one then the coordination between the two policies entails a smaller output and a higher inflation which neither authorities would like to have.

On the other hand, formation of monetary union in different jurisdictions and enhanced independence of the central banks in the formulation of the monetary policy give researchers new grounds to explore and investigate more on the coordination between the two policies. How monetary and fiscal policy interact inside a monetary union has become an active area of research after the formation of the Economic and Monetary Union (EMU) and a whole bunch of literature is dedicated to the investigation of this newly flourishing field. For example, Jordi Galli et al. (2003) [14] has shown that Maastricht Treaty and the Stability and Growth Pact (SGP) have minimal but not substantial role on the government of EMU countries trying to stabilize their economy through an effective fiscal policy. Beetsma and Bovenberg (2005) [2] argues that the conflict between ECB and fiscal authorities inside EMU is specially harmful if labor-market rigidities and high distortionary taxes give rise to widespread unemployment, if ECB pursues tight monetary policy aimed at price stability and if nominal wage contracts are rigid so that the fiscal policy is set more frequently than nominal wage contracts are. Tatiana Kirsanova et el. (2007) [19] uses a microfounded New Keynesian model of a monetary union, which incorporates persistence in inflation and non-Ricardian consumers and derives optimal simple rules for fiscal authorities.

Meanwhile, Sims (2016) [29] argues that during periods of rapid inflations or long periods of very low inflation and interest rates coordination of fiscal and monetary policy is necessary. Hommes et al. (2019) [17] explains why monetary policy alone is not sufficient to avoid liquidity traps even if it preventively cuts the interest rate when inflation falls below a threshold. However, monetary policy augmented with a fiscal switching rule can successfully escape episodes of liquidity trap.

Moreover, another strand of research tends to evolve around the fiscal theory of the determination of price level (FTPL) gradually introduced by Leeper (1991) [21], Sims (1994) [28], Woodford (1995) [31]. FTPL attempts to say that price level determination is not the monopoly of the monetary policy. Rather, the fiscal policy has a lot to say regarding this. According to the fiscal theory of price level determination, for the price level to remain stable, the government debt must be sustainable, i.e., the government must not run a structural deficit. Since its inception back in 1990s, a whole bunch of literature has been developed around the verification, appropriateness and applicabilities of the propositions of FTPL. Kocherlakota and Phelan (1999) [20] argues that fiscal policy can affect inflation if and only if the government uses non-Ricardian policies. Buiter (2002) [6] argues that The FTPL confuses two key building blocks of a model of a market economy: budget constraints which must be satisfied identically and market clearing or equilibrium conditions. The FTPL asssumes that the government's intertemporal budget constraint needs to be satisfied only in equilibrium. According to McCallum and Nelson

(2005) [22] the FTPL attains prominence only because it appears to provide a theory whose implications differ greatly from conventional monetary analysis. Sims (2016) [29] argues fiscal expansion can replace ineffective monetary policy at the zero lower bound. Orphanides (2018) [25] explains why monetary policy has fiscal implications that are especially pronounced at the zero lower bound.

None of the above literature considers the role of government transfer in the money creation process through successive consumption and savings. Nor they attempt to show the direct algebraic link through which government transfer and money supply are inter-related. Here, in the first place, we intuitively quantify the impact of government transfer on total consumption, savings, money supply and taxes. Next we provide a microfoundation of our arguments using a simple endowment economy with finitely lived households. Once we are done with the microfoundation we fit in the consumption, savings, taxes, transfers and money supply data of some 10 (ten) OECD countries into a structural panel VAR framework in order to capture the dynamic response of money supply to changes in government transfer. Next, we resort to variance decomposition to unveil how much variance in money supply is attributed to government transfer as well as other endogenous variables in the system. The rest of the article is organized as follows: Section: 2 describes the inter-relation between government transfer and private consumption, gross savings, taxes and money supply in a rather intuitive fashion while Section: 3 provides its microfoundation in the context of a small endowment economy. Section: 4 formally defines different kinds of impact and cumulative multipliers introduced thematically in Section: 2 and 3 for the purpose of empirical estimation. Section: 5 narrates the methodology used for empirical estimation. Section: 6 presents the results of empirical analysis. Section: 7 presents a general discussion about how and where our work fits into the existing body of knowledge as well as its main contribution and finally section: 8 concludes the article.

2 Intuitive Reasoning Regarding the Interaction Between Transfers, Taxes, Consumption, Savings and Money Supply

To start our analysis let us assume that marginal propensity to consume and marginal tax Rate of the economy under consideration be given by MPC and MTR respectively where $0 \leq MPC, MTR \leq 1$. Let us also assume that consumption, savings, tax and disposable income be given by C, S, T and DI respectively and they are subscripted by $i, i \in N$ to indicate the quantity at any arbitrary period i.

Now, if the government intends to stimulate the economy by a fiscal stimulus ΔG in the form of transfers and subsidies then a portion of ΔG will return to the government in the form of tax revenue, another portion will be consumed by the households while the rest will be saved. Thus changing the extent of government transfer is supposed to have an effect on household consumption, gross savings and tax revenue: When the government transfer increases so do the private consumption, gross savings and tax revenue and also the vice versa. Then the amount of tax revenue (T_1), disposable income (DI_1), consumption (C_1) and savings (S_1) induced by the initial government transfer ΔG during the first period of our analysis will be given by the following constructs.

$$T_1 = MTR \times \Delta G$$

$$DI_1 = (1 - MTR) \times \Delta G$$

$$C_1 = MPC \times (1 - MTR) \times \Delta G = P \times \Delta G$$

$$S_1 = (1 - MPC) \times (1 - MTR) \times \Delta G = Q \times \Delta G$$

where $P = MPC \times (1 - MTR)$ and $Q = (1 - MPC) \times (1 - MTR)$. Money spent in consumption namely $P \times \Delta G$ will be received by the seller of the goods and services who receives it as income and in turn, consumes a portion of it, pays another portion as taxes and saves the rest. These second levels of taxes (T_2), disposable income (DI_2), consumption (C_2) and savings (S_2) induced from the initial government transfer ΔG are given by the following.

$$T_2 = MTR \times P \times \Delta G$$
$$DI_2 = (1 - MTR) \times P \times \Delta G$$
$$C_2 = MPC \times (1 - MTR) \times P \times \Delta G = P^2 \times \Delta G$$
$$S_2 = (1 - MPC) \times (1 - MTR) \times P \times \Delta G = Q \times P \times \Delta G$$

Like before money spent in consumption in the second step namely $P^2 \times \Delta G$ will be received by the seller of goods and services as revenue. Following the same logic as applied before a portion of this revenue is taxed, a portion is consumed while the rest will be saved. So, the amount of taxes collected (T_3), disposable income received (DI_3), consumption (C_3) and savings (S_3) made during this step will be given by the following.

$$T_3 = MTR \times P^2 \times \Delta G$$
$$DI_3 = (1 - MTR) \times P^2 \times \Delta G$$
$$C_3 = MPC \times (1 - MTR) \times P^2 \times \Delta G = P^3 \times \Delta G$$
$$S_3 = (1 - MPC) \times (1 - MTR) \times P^2 \times \Delta G = Q \times P^2 \times \Delta G$$

The above process of successive consumption, savings and taxation will not continue indefinitely during a given period due to the finite velocity of money. Cumulative impact of government transfer on consumption, savings, money supply and taxation in a given year will partly depend upon this finite velocity of money. When the velocity of money increases ceteris paribus more and more transactions take place and with every new transaction the impulse of initial government transfer is felt one more time. If the velocity of money is given by v then the total amount of taxation induced by the initial government transfer ΔG will be given by:

$$\begin{aligned} T &= T_1 + T_2 + T_3 + ... + T_{v-1} \\ &= MTR \times \Delta G + MTR \times P \times \Delta G + MTR \times P^2 \times \Delta G + ... + MTR \times P^{v-2} \times \Delta G \\ &= MTR \times \Delta G \times [1 + P + P^2 + P^3 + ... + P^{v-2}] \\ &= MTR \times \Delta G \times \frac{1 - P^{v-1}}{1 - P} \end{aligned}$$

In the above expression we have calculated the summation of first $(v - 1)$ terms of the series instead of v because money changes hand for the first time when government makes its initial transfer ΔG and this trasaction exhausts money velocity by 1 (one). So, the total amount of taxes induced by the initial government transfer ΔG is given by:

$$T = MTR \times \Delta G \times \frac{1 - P^{v-1}}{1 - P} \tag{1}$$

Similarly, total amount of consumption induced by the initial government transfer is given by:

$$
\begin{aligned}
C &= C_1 + C_2 + C_3 + ... + C_{v-1} \\
&= P \times \Delta G + P^2 \times \Delta G + P^3 \times \Delta G + ... + P^{v-1} \times \Delta G \\
&= \Delta G \times [P + P^2 + P^3 + ... + P^{v-1}] \\
&= \Delta G \times P \times \frac{1 - P^{v-1}}{1 - P}
\end{aligned}
$$

So, aggregate amount of consumption induced by the initial government transfer is given by the following equation:

$$
C = \Delta G \times P \times \frac{1 - P^{v-1}}{1 - P} \tag{2}
$$

Applying the same logic we can calculate the total increase in gross savings brought about by the initial government transfer ΔG:

$$
\begin{aligned}
S &= S_1 + S_2 + S_3 + ... + S_{v-1} \\
&= Q \times \Delta G + Q \times P \times \Delta G + Q \times P^2 \times \Delta G + ... + Q \times P^{v-2} \times \Delta G \\
&= Q \times \Delta G \times \frac{1 - P^{v-1}}{1 - P}
\end{aligned}
$$

So, change in gross savings brought about by the initial government transfer ΔG is given by the following equality:

$$
S = Q \times \Delta G \times \frac{1 - P^{v-1}}{1 - P} \tag{3}
$$

These savings will enter into the banking system and the bank, after maintaining adequate reserve (here we assume the banks are operating under a fractional reserve banking system and are supposed to keep a certain portion of its total demand and time liabilities as reserve), will lend out the rest of the amount. The borrowers of the fund will then deposit a portion of the borrowed fund with another bank. This new deposit receiving bank like its predecessor bank will keep a fraction of its deposits as reserve and lends out the rest and the process of money creation continues. Unlike the conventional approach of calculating money multiplier which mistakenly assumes money changes an infinite number of hands during a given period here we take the finite velocity of money into account. So, the extent of money created in the process will depend upon the time at which the savings are created. The earlier the savings are made the more impact it will have on the money creation process. So, the savings made at period i will create relatively more money (by money we mean demand and time deposits of varying maturity) than that of the savings made at period $(i + k), i + k \in N, k > 0$. If the reserve ratio of the bank is given by RR then money created by the savings S_1 is given by the following:

$$
\begin{aligned}
D_1 &= Q \times \Delta G + (1 - RR) \times Q \times \Delta G + (1 - RR)^2 \times Q \times \Delta G + ... + (1 - RR)^{\frac{v}{2}-1} \times Q \times \Delta G \\
&= Q \times \Delta G \times [1 + (1 - RR) + (1 - RR)^2 + ... + (1 - RR)^{\frac{v}{2}-1}] \\
&= Q \times \Delta G \times \frac{1 - (1 - RR)^{\frac{v}{2}}}{RR}
\end{aligned}
$$

In the derivation of the above equation we consider three different types of transactions each of which exhausts the money velocity by 1.

- The saver will bring the savings, say x to the bank to create a demand or a time deposit.
- The bank will keep $RR \times x$ as regulatory reserve and lends out the rest.
- The borrower will keep the borrowed amount $(1 - RR) \times x$ into another bank account which in turn creates more deposit for the banks as a whole.

Similarly, the amount of money created by the savings S_2 is given by the following:

$$\begin{aligned} D_2 &= Q \times P \times \Delta G \times [1 + (1 - RR) + (1 - RR)^2 + ... + (1 - RR)^{\frac{v-1}{2}-1}] \\ &= Q \times P \times \Delta G \times \frac{1 - (1 - RR)^{\frac{v-1}{2}}}{RR} \end{aligned}$$

Proceeding in the same manner, $\forall i, 1 \leq i \leq (v-1)$, we can calculate the amount of deposit D_i created by S_i:

$$D_i = Q \times P^{i-1} \times \Delta G \times \frac{1 - (1 - RR)^{\frac{v-(i-1)}{2}}}{RR}$$

So, the total amount of deposit (D) created by the initial government transfer ΔG will be given by the following:

$$D = \sum_{1=1}^{v-1} D_i = \sum_{i=1}^{v-1} Q \times P^{i-1} \times \Delta G \times \frac{1 - (1 - RR)^{\frac{v-(i-1)}{2}}}{RR} \tag{4}$$

3 Microfoundations

We start with the case of an endowment economy where the households receive some endowment Y_i at period $i, \forall_{1 \leq i, \leq n}$ where n indicates the total life span of the households. In addition to that households are also entitled to T_i amount of government transfer at period i. Households living through these n periods seek to maximize their lifetime utility over these n periods by optimally splitting their periodic endowments and transfer payments into consumption and savings. Savings made at period i is entitled to interest payment at the rate r_{i+k} in period $(i+k), \forall_{i+k \leq n}$. Moreover, let us also assume that government imposes a distortionary tax on households' consumption which is collected at $TC\%$ of consumption amount. Under the above circumstances households' budget contraint at the last period of its time span must satisfy the following equality:

$$(1 + TC) \times C_n = Y_n + T_n + \sum_{i=1}^{n-1} (Y_i + T_i - (1 + TC) \times C_i) \times \prod_{j=i+1}^{n} (1 + r_j)$$

where $\sum_{i=1}^{n-1} (Y_i + T_i - (1 + TC) \times C_i) \times \prod_{j=i+1}^{n} (1 + r_j)$ is households' accumulated savings with interest there on up to period n. In descriptive term the above constraint implies that the households need to eat up their entire endowment Y_n and transfer T_n at period n in addition to any accumulated savings and interest there on in order to maximize their overall life time utility through consumption. As n-th year is presumably the households' last year of existence they need to consume it all for anything left unconsumed after period n will be of no effect towards households' objective of life time utility maximization. Hence, the equality sign follows in the households' budget constraint instead of an inequality. Simple rearranging of households' life time budget constraint entails the following:

$$\sum_{i=1}^{n}(1+TC)\times C_i\times\prod_{j=i+1}^{n}(1+r_j)=\sum_{i=1}^{n}(Y_i+T_i)\times\prod_{j=i+1}^{n}(1+r_j)$$

Let us assume that the households' life time utility function is given by the following:

$$U(C)=\sum_{i=1}^{n}\beta^{i-1}\times\frac{C_i^{1-\sigma}}{1-\sigma}$$

where β is the discounting factor and σ is the coefficient of Constant Relative Risk Aversion (CRRA). So, the households' optimization problem takes the following form:

$$Max\sum_{i=1}^{n}\beta^{i-1}\times\frac{C_i^{1-\sigma}}{1-\sigma}$$

$$S.T.\sum_{i=1}^{n}(1+TC)\times C_i\times\prod_{j=i+1}^{n}(1+r_j)-\sum_{i=1}^{n}(Y_i+T_i)\times\prod_{j=i+1}^{n}(1+r_j)=0$$

Taking the Lagrangian of the above maximization problem yields:

$$L=\sum_{i=1}^{n}\beta^{i-1}\times\frac{C_i^{1-\sigma}}{1-\sigma}-\lambda\times\left[\sum_{i=1}^{n}(1+TC)\times C_i\times\prod_{j=i+1}^{n}(1+r_j)-\sum_{i=1}^{n}(Y_i+T_i)\times\prod_{j=i+1}^{n}(1+r_j)\right]$$

Taking the first order partial derivative of the above Lagrangian with respect to C_i and setting it to zero as first order optimality condition yields the following expression for C_i.

$$C_i=\lambda^{-\frac{1}{\sigma}}\times\left[\frac{(1+TC)\times\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}}\right]^{-\frac{1}{\sigma}}\tag{5}$$

Now taking the derivative of the Lagrangian with respect to λ and setting it to zero as an another FOC yields the following (what we yield here is inevitably the households' life time budget constraint).

$$\sum_{i=1}^{n}(1+TC)\times C_i\times\prod_{j=i+1}^{n}(1+r_j)=\sum_{i=1}^{n}(Y_i+T_i)\times\prod_{j=i+1}^{n}(1+r_j)$$

Substituting the value of C_i from Equation: 5 into the above expression yields:

$$\sum_{i=1}^{n}(1+TC)\times\lambda^{-\frac{1}{\sigma}}\times\left[\frac{(1+TC)\times\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}}\right]^{-\frac{1}{\sigma}}\times\prod_{j=i+1}^{n}(1+r_j)=\sum_{i=1}^{n}(Y_i+T_i)\times\prod_{j=i+1}^{n}(1+r_j)$$

Simplifying the above equation and solving for λ yields:

$$\lambda=\left[\frac{\sum_{i=1}^{n}(Y_i+T_i)\times\prod_{j=i+1}^{n}(1+r_j)}{\sum_{i=1}^{n}(1+TC)\times\left[\frac{(1+TC)\times\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}}\right]^{-1/\sigma}\times\prod_{j=i+1}^{n}(1+r_j)}\right]^{-\sigma}$$

Substituting the above value of λ into Equation: 5 we can get an exact expression for optimal consumption sequence C_i:

$$C_i = \left[\frac{\sum_{i=1}^{n}(Y_i + T_i) \times \prod_{j=i+1}^{n}(1+r_j)}{(1+TC) \times \sum_{i=1}^{n} \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}} \right]^{-1/\sigma} \times \prod_{j=i+1}^{n}(1+r_j)} \right] \times \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}} \right]^{-1/\sigma} \tag{6}$$

Now that we have an exact representation of optimal consumption sequence we are in the position to estimate different kinds of multipliers algebraically that we have intuitively discussed about in the previous section.

- **Consumption Multiplier:** Consumption multiplier is defined as the change in household consumption brought about by a unit change in government transfer. So, to estimate algebraically the consumption multiplier we should take partial derivative of optimal consumption sequence C_i with respect to government transfer T_i at period i. Taking the partial derivate of C_i with respect to T_i yields the following expression for consumption multiplier.

$$\frac{\partial C_i}{\partial T_i} = \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{(1+TC) \times \sum_{i=1}^{n} \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}} \right]^{-1/\sigma} \times \prod_{j=i+1}^{n}(1+r_j)} \right] \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}} \right]^{-1/\sigma} \tag{7}$$

- **Tax Multiplier:** As the government imposes distortionary taxes on consumption a part of the government transfer to households will eventually return to the government as part of the tax revenue. Let the total amount of tax collected by the government up to period k be given by τ_k. So,

$$\tau_k = \sum_{i=1}^{k} TC \times C_i = TC \times \sum_{i=1}^{k} C_i$$

Tax multiplier is therefore defined to be the amount of changes in tax revenue brought about by a unit change in government transfer. In order to estimate tax multiplier we need to take the first order partial derivate of tax revenue collected by the government up to an arbitrary period $k, \forall_{1 \leq k \leq n}$ with respect to the government transfer at another arbitrary period $i, \forall_{1 \leq i \leq n}$. Hence we get the following as an algebraic representation of the said tax multiplier.

$$\frac{\partial \tau_k}{\partial T_i} = TC \times \sum_{i=1}^{k} \frac{\partial C_i}{\partial T_i}$$

Substituting the value of $\frac{\partial C_i}{\partial T_i}$ from Equation: 7 we get the following representation for our proposed tax multiplier.

$$\frac{\partial \tau_k}{\partial T_i} = TC \times \sum_{i=1}^{k} \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{(1+TC) \times \sum_{i=1}^{n} \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}} \right]^{-1/\sigma} \times \prod_{j=i+1}^{n}(1+r_j)} \right] \left[\frac{\prod_{j=i+1}^{n}(1+r_j)}{\beta^{i-1}} \right]^{-1/\sigma} \tag{8}$$

- **Savings Multiplier:** Apart from influencing consumption and tax revenue government transfer is also supposed to have an impact on households' savings. It is perhaps due to the fact that the households will not spend the whole portion of government transfer in present consumption. Rather depending upon the anticipated future rate of interest they tend to save a portion of it. Thus a change in government transfer should be followed by a change in households' savings as well and the savings multiplier is defined to be the change brought about in households' savings in response to a unit change in government transfer. Households' savings at period $k, \forall_{1 \leq k \leq n}$ can be defined as follows:

$$S_k = \sum_{i=1}^{k} [Y_i + T_i - (1 + TC) \times C_i] \times \prod_{j=i+1}^{k} (1 + r_j)$$

Taking the first order partial derivate of S_k with respect to government transfer T_i at period $i, \forall_{1 \leq i \leq n}$ we can get an algebraic expression for households' savings multiplier:

$$\frac{\partial S_k}{\partial T_i} = \prod_{j=i+1}^{k} (1 + r_j) - (1 + TC) \times \sum_{i=1}^{k} \frac{\partial C_i}{\partial T_i} \times \prod_{j=i+1}^{k} (1 + r_j) \tag{9}$$

Substituting the value of $\frac{\partial C_i}{\partial T_i}$ from Equation: 7 we get the precise representation for $\frac{\partial S_k}{\partial T_i}$.

- **Money Supply Multiplier:** In the previous section we have described how households' savings behavior can be effected by the government transfer. As households' savings are effected by government transfer so will be the money supply. This is because money supply which is essentially the summation of different kinds of demand and time deposits along with the currency in circulation is partly defined by the households' savings tendency: the larger the households' gross savings ceteris paribus larger will be the money supply. Apart from households' savings money supply tends to depend upon the reserve requirement under fractional reserve banking system and also on the velocity of money. When the reserve ratio is increased banks' ability to extend loans shrinks and the vice versa. On the other hand, if the money velocity increases banks can quickly convert their loanable funds into loans. Loans thus created will induce further deposits through the money creation and the process continues. For the sake of present analysis let us assume that the reserve ratio be given by RR and the velocity of money in a period be given by v. Like before we consider three different kinds of transactions that take place through the money creation process. In the first transaction households deposit the money with the bank. In the second step banks keep a fraction of the deposited amount as reserve and lend out the rest. In the third step the borrowers inject their borrowed fund into another bank account before they start to spend it all and thereby create more loanable funds for the banks. When the borrowers inject their borrowed fund into a bank account a cycle of the money creation process ends while an exact similar one begins. Each of the above three types of transactions exhausts money velocity by 1(one). Under the above simplyfying assumptions savings created at period i will change $[k - (i - 1)] \times v$ number of hands up to period k. So, the amount of money D_i (here money implies demand and/or time deposits) created by the savings S_i is given by the sum of the following series:

$$D_i = S_i \times \left[1 + (1-RR) + (1-RR)^2 + ... + (1-RR)^{\frac{[k-(i-1)\times v]-1}{2}}\right]$$
$$= S_i \times \left[\frac{1-(1-RR)^{\frac{[k-(i-1)\times v]+1}{2}}}{RR}\right]$$

So, the total amount of money created up to period k will be given by the following construct:

$$MS_k = \sum_{i=1}^{k} D_i$$
$$= \sum_{i=1}^{k} S_i \times \left[\frac{1-(1-RR)^{\frac{[k-(i-1)\times v]+1}{2}}}{RR}\right]$$

Taking the first order partial derivative of MS_k with respect to T_i we will get our desired money supply multiplier.

$$\frac{\partial MS_k}{\partial T_i} = \sum_{i=1}^{k} \left[\frac{1-(1-RR)^{\frac{[k-(i-1)\times v]+1}{2}}}{RR}\right] \times \frac{\partial S_i}{\partial T_i} \tag{10}$$

Substituting the value of $\frac{\partial S_i}{\partial T_i}, \forall_{1\leq i\leq k}$ from Equation: 9 we can get a precise expression for our proposed money supply multiplier $\frac{\partial MS_k}{\partial T_i}$.

4 Formal Definitions of Multipliers for the Purpose of Empirical Estimation

In the previous sections we have provided the intuitive reasoning for different kinds of multipliers to exist in the first place (Equation: 1 to 4) and also provided the microfoundation against our first hand intuitive arguments (Equation: 7 to 10). From the above discussion it is evident that if the government transfer changes by an amount ΔG then in response tax revenue, private consumption, households' savings and money supply will also change and these changes will be some multiple of ΔG. Hence, we can say that government transfer has a multiplier effect on the aforesaid four macroeconomic variables and in this section we will provide the formal definitions of different kinds of multipliers for the purpose of precise empirical estimations.

- **Tax multiplier for government transfer (TM)**: If the government transfer is changed by an amount ΔG then a portion of ΔG will return to the government in the form of taxes. If the changes in tax revenue brought about by ΔG change in government transfer is given by ΔT then the corresponding tax multiplier for government transfer can be written as follows:

$$TM = \frac{\Delta T}{\Delta G}$$

- **Consumption multiplier for government transfer (CM)**: When government transfer changes by an amount ΔG then private consumption is also supposed to change as a by-product. This stems from the fact that the beneficiaries of

government transfer program will spend a part of their endowment in consumption. If the changes in consumption brought about by ΔG change in government transfer is given by ΔC then consumption multiplier for government transfer can be defined by the following:

$$CM = \frac{\Delta C}{\Delta G}$$

- **Savings multiplier for government spending (SM)**: Changes in government transfer will induce savings into the economy. It is because the beneficiaries of government transfer program will consume a portion of it while the rest will be saved. If the changes in households' savings in response to ΔG changes in government transfer are given by ΔS then savings multiplier for government transfer is given by:

$$SM = \frac{\Delta S}{\Delta G}$$

- **Money supply multiplier for government spending (MSM)**: We have discussed previously that a change in government transfer may induce successive savings and consumption in the economy. As the savings increases so does the money supply. If the changes in money supply due to ΔG changes in government transfer is given by ΔMS then the corresponding money supply multiplier is given by the following construct:

$$MSM = \frac{\Delta MS}{\Delta G}$$

In the preceding portion we have defined the multipliers on period by period basis and these are known as impact multipliers. However, the impact of changes in government transfer may not remain confined only in the period it is applied. Rather its effect may be pronounced over subsequent time periods and considering this we can define a cumulative version of the above four multipliers over an n-period long time horizon as follows:

$$TM = \frac{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta T_i}{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta G_i}$$

$$CM = \frac{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta C_i}{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta G_i}$$

$$SM = \frac{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta S_i}{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta G_i}$$

$$MSM = \frac{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta MS_i}{\sum_{i=1}^{n}(i+d)^{-i} \times \Delta G_i}$$

where d is the discounting rate which is used to appropriately discount the future responses. Above set of multipliers which captures the dynamic impact of initial government transfers and subsidies on tax, consumption, savings and money supply over an n-period long time horizon are termed as the cumulative multipliers.

5 Methodology

Here, we are interested to estimate how tax revenue, private consumption, gross savings and money supply respond to a unit change in government transfer. In the existing literature, the responsiveness of one variable to changes in another is usually estimated through impulse response analysis under structural VAR framework. See for example, Fatas and Mihov (2001) [11], Blanchard and Perotti (2002) [4], Mountford and Uhlig (2009) [23], Burriel et al (2010) [7], Ilzetzki et al (2013) [18] etcetera. The literature cited above broadly attempted to measure the extent of changes in GDP brought about by a unit change in different fiscal variables (government expenditure in many different forms and/or tax revenue) by building a structural VAR model comprising GDP, intended fiscal variables and other controlling variables including but not limited to real interest rate, real effective exchange rate etcetera. In our context, we build a structural VAR model with government transfer, tax revenue, private consumption, gross savings and money supply as endogenous variables and perform impulse response analysis on this framework. Following Ilzetzki et al (2013) [18] our structural VAR model takes the following form:

$$AY_{n,t} = \sum_{i=1}^{k} C_i \times Y_{n,t-i} + Bu_{n,t}$$

where $Y_{n,t}$ is the vector of government transfer, tax revenue, private consumption, gross savings and money supply of country n at time t, $C_i, \forall_{1 \leq i \leq k}$ is the matrix of coefficients of the lagged terms of $Y_{n,t}$, B is a diagonal matrix and $u_{n,t}$ is orthogonal identically distributed shocks in endogenous variables such that $E(u_{n,t}) = 0$ and $E(u_{n,t}u_{n,t}^{'})$ is an identity matrix. Finally, matrix A accounts for the contemporaneous interactions among the endogenous variables and is assumed to be a lower triangular matrix. Moreover, the variable k is the optimum lag length for our structural VAR model which is empirically selected using different information criteria. To build a VAR model and to perform impulse response analysis on it the following step by step procedure is followed.

- Our analysis begins with the determination of the optimum lag length k for the endogenous variables under VAR framework. Lag lengths that minimize different information criteria are noted. Here, we report the optimum lag lengths suggested by Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwartz Criteria (SC) and Hannan-Quinn information criterion (HQ). Finally, the lag length suggested by the majority of the above information criteria is used as k for the structural VAR model to be constructed.

- Time series data often suffer from heteroskedasticity and a convenient way out of this problem is to convert them into their logarithmic form. In fact, log transformation is a commonly used practice in the empirical literatures of estimating different kinds of multipliers see for example Ilzetzki et al (2013) [18], Gonzalez-Garcia et al (2013) [16] among others. Following the footsteps of the vast empirical literature we also log-transform our variables before fitting them into VAR.

- VAR methodology requires each of the endogenous variables included into the system to be stationary. So, the first step to be followed in this regard is to determine the order of integration of all the endogenous variables namely government transfer, tax revenue, private consumption, gross savings and money supply. As we use panel data in our analysis a number of panel unit root testing procedures are used to determine the order of integration of the underlying time series. Tests we use here include Levin-Lin-Chu test, Im, Pesaran and Shin W-statistic test, ADF - Fisher Chi-square and PP - Fisher Chi-square test. When different testing methods provide conflicting results regarding the order of integration of the underlying time series then we rely on

the order suggested by the majority of the tests. After the orders of integration of the variables are determined the variables are appropriately differenced before being fed into the VAR framework.

- To identify shocks in the endogenous variables we follow recursive formulation approach (Cholesky Decomposition) proposed by Sims (1980) [27]. In this approach ordering of the variables plays a crucial role: variables appearing later in the VAR representations respond contemporaneously to any change in the variables appearing earlier but not the vice versa. In fact, to model this restriction the matrix A in the initial VAR definition is assumed to be a lower triangular matrix. Ordering of the variables in our context is assumed to be government transfer, tax revenue, private consumption, gross savings and money supply. This implies that tax revenue, private consumption, gross savings and money supply respond contemporaneously to any change in government transfer but not the vice versa. Similarly, private consumption, gross savings and money supply respond contemporaneously to any change in government tax revenue; gross savings and money supply respond contemporaneously to any change in private consumption and money supply respond contemporaneously to any change in gross savings but not the vice versa. By ordering the variables in this manner we assume a transmission channel amongst the variables in which an impulse in government transfer is immediately reflected to government tax collection which effects private consumption which in turn influences gross savings and which eventually gets reflected into money supply. The transmission channel thus described is quite obvious provided that the government does not intend to run a structural fiscal deficit and plunge into debt as a by-product.

- Once the ordering of the variables is set we provide one standard deviation Cholesky shock in government transfer and note down the impact and cumulative responses of tax revenue, private consumption, gross savings and money supply. Moreover, the impact and cumulative response of government transfer to its own shock are also noted. However, the cumulative responses thus noted directly from the impulse response analysis need to be discounted by the corresponding risk free rate. As we use panel data the median interest rate of government treasuries is used to discount the cumulative responses. We then divide the impact response (discounted cumulative response) of tax revenue, private consumption, gross savings and money supply by the impact response (discounted cumulative response) of government transfer to estimate the desired multiplier values.

- As we use log-transformation of our endogenous variables, multiplier values estimated directly from the impulse response analysis also happen to have the same logarithmic unit. So, instead of being the true multipliers what we calculate in the previous steps are essentially the elasticity of the four endogenous variables namely tax revenue, private consumption, gross savings and money supply with respect to government transfer. To get back the multipliers in their original *multiplier* unit we need to divide each of the multipliers calculated in the above manner by the average value of government transfer to respective endogenous variable ratio for the whole sampling data [16].

6 Data

We collect annual time series data of government subsidies and other transfer (% expense), total government expenditure (%GDP), GDP (current USD), tax revenue (%GDP), final consumption expenditure (%GDP), final consumption expenditure of the government (%GDP), gross savings (%GDP) and money supply (%GDP) from World Bank Open

Data [32] of some 10 (ten) OECD countries during 1990-2017. Countries included in the analysis are Australia, Denmark, Iceland, Korea, Norway, Romania, Sweden, Switzerland, United Kingdom (UK) and United States (US). Countries are chosen depending upon the availability of the required data. Moreover, to get private consumption expenditure we subtract government final consumption expenditure from total consumption expenditure. Once all the data are gathered we determine the orders of integration of all the time series data by using Levin-Lin-Chu test, Im, Pesaran and Shin W-statistic test, ADF - Fisher Chi-square and PP - Fisher Chi-square test. The results of panel unit root testing are presented in Tables: 1 and 2. From these tables it is evident that all the series are non-stationary at level and stationary at first differenced form. As all the series are $I(1)$ process we take first difference of each series before fitting them into VAR model.

In the next step, we determine the appropriate lag length for the endogenous variables in our structural VAR model. The lag lengths suggested by different information criteria are depicted in Table: 3. From Table: 3 it can be seen that LR criteria suggests 05 (five) lags while FPE and AIC suggest 02(two) lags instead. Moreover, SC and HQ criteria suggest 01 (one) lag for our endogenous variables. Here, we choose 02 (two) lags as it is suggested by both FPE and AIC.

We then build a VAR model by taking all of our endogenous variables in logged first differenced form with 02 (two) lagged terms and provide one standard deviation Cholesky shock in government transfer. Both the impact and cumulative responses of tax revenue, private consumption, gross savings and money supply to shocks in government transfer are noted. Responses of government transfer to its own shock are also noted. Impact and cumulative responses of tax revenue, private consumption, gross savings, money supply and government transfer to shocks in government transfer are graphically represented in Figs: 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 respectively.

Figs: 1 and 2 present the impact and cumulative responses of tax revenue to government transfer. From these figures it is evident that governments' collection of tax revenue responds positively to transfers which means when the government transfer increases so does the taxes. This is essentially due the fact that the governments across the globe are reluctant to run a structural fiscal deficit and rather wish to meet up their expenses from revenues. For the first few periods the response of tax revenue to shocks in government transfer is positive although it gradually diminishes to zero. This diminishing response of tax revenue to shocks in transfer can be easily anticipated as we use the variables in their stationary (first differenced) form. Hence all the shocks are eventually absorbed and the system goes back to equilibrium after some initial jittering. After the responses are noted now we can estimate the corresponding tax multiplier values. The impact and cumulative government tax multipliers are tabulated in column 11 and column 12 of Table: 4. From Table: 4 it can be seen that the impact multipliers vary between -0.84 to 0.78 in different time periods. Although the impact multiplier moves to and fro between positive and negative values and thus giving no clear indication regarding the inter-relation between government transfer and tax revenue the cumulative multiplier smoothes out the jittering quite nicely and shows all through positive values: Small opposite movements of transfers and taxes are heavily offsetted by the large persistent positive co-movements of the two. Moreover, the values of the cumulative multipliers are also very consistent moving in between 0.43 to 0.53 in different time periods.

Next we are set to identify the impact of government transfer on private consumption. Intuitively we can assume that private consumption should respond positively to any influx of government transfers and subsidies. When the households receive an extra endowment from the government they tend to spend more on consumption. This intuitive idea is entertained quite nicely by the empirical findings as can be seen from Figs: 3 and 4. Figs: 3 and 4 show the impact and cumulative response of private consumption

to one standard deviation Cholesky shock in government transfer. From these figures it is evident that the impact response of private consumption to shocks in government transfer is roughly positive although sometimes it swings between positive and negative values. However, these negative responses are quite small in magnitude and the overall response of private consumption to transfer shock is positive as anticipated (as can be seen from the cumulative responses in Fig: 4). Once we have estimated the impact and cumulative responses of private consumption we can then calculate the corresponding multiplier values. Multiplier values are tabulated in column 11 and column 12 of Table: 5. From column 11 of Table: 5 it is evident that the impact multipliers are rather inconsistent in this case and move between -4.45 to 4.17. Negative responses of private consumptions are obtained during the later periods of the forecasting horizon and are convincingly absorbed by the large persistent positive responses obtained during the first few periods of the analysis. And hence the cumulative multipliers show persistent large positive values all over the period as expected. From column 12 of Table: 5 we can see that the cumulative multiplier vary between 2.22 to 2.46 which is consistently positive.

Impact and cumulative response of gross savings with respect to a unit shock in government transfer are presented in Figs: 5 and 6. From these figures it is evident that gross savings responds positively to any increase in government transfer and the impact response is positive in most of the periods after the shock is applied. Although during period 7 and 8 the impact response temporarily goes negative the magnitudes of these negative responses are quite low and they are easily offsetted by the earlier positive responses. Numeric results of the impulse response analysis of gross savings under VAR are depicted in Table: 6. From column 11 of Table: 6 it can be seen that the impact multipliers are mostly positive except for period 7 and period 8. Although the impact multipliers are negative during these periods these negative responses are small, non-persistent and rather transitory in nature as they seem to become positive right after period 8. However, the cumulative multipliers are positive throughout the analysis as can be seen from column 12 of Table: 6. This implies that the negative responses of gross savings to changes in government transfer at period 7 and 8 are properly accounted for by the large persistent positive responses. From column 12 of Table: 6 it can be seen that the cumulative multipliers vary rather consistently between 0.71 to 0.79 in different time periods.

Last but not the least we will analyze the responses of money supply to changes in government transfer. From Figs: 7 and 8 it can be seen that unlike the responses of other endogenous variables the responses of money supply to changes in government transfer are always positive from period 1 to period 10. While the responses of tax revenue, private consumption and gross savings to changes in government transfer temporarily have small negative values, the responses of money supply are solely positive throughout the forecasting horizon which reinforces the claim made in this article. As can be seen from column 11 of Table: 7 that the impact multipliers vary between 1.50 to as high as 6.52 in different time periods. Although, the impact multipliers vary drastically in magnitude the cumulative multipliers are rather consistent in nature and vary within the short range of 2.90 to 3.35.

After we are done with the impulse response analysis we carry out variance decomposition of different endogenous variables in the system to explore how much of the variance in one variable is attributed to others. Table: 8 presents the variance decomposition of government tax revenue in terms of government transfer, private consumption, gross savings and money supply. From this table it is evident that 25.24% of the variance in tax revenue is due to government transfers and subsidies at period 1. The stake of government transfer in the variance of tax revenue slightly decreases after period 1 and reaches 22.39% at period 10. Still transfers and subsidies are the very significant endogenous variables in the system to explain variance in government tax revenue only

next to tax revenue itself.

Variance decomposition of private consumption in terms of other variables are depicted in Table: 9. It can be seen from Table: 9 that 39.56% variance in private consumption is due to government transfer itself making it the single most important contributor to the variance in private consumption. Moreover, contribution of government transfer to the variance in private consumption slightly decreases afterwards reaching 36.80% at period 10. Still at period 10 the contribution of government transfer in explaining variances in private consumption is greater than that of any other variables in the system.

In the penultimate step we analyze the variance decomposition of gross savings in terms of other variables. It can be seen from Table: 10 that 14.93% of the variance in gross savings is due to government transfer at period 1 while at period 10 it contributes to nearly 13.94%. Thus the role of government transfer in explaining variance in gross savings is quite substantial only next to tax revenue and gross savings itself and clearly ahead of private consumption and money supply.

Finally, we analyze the variance decomposition of money supply in terms of government transfer, tax revenue, private consumption and gross savings. The results are presented in Table: 11. From Table: 11 it is evident that the contribution of government transfer to the variance in money supply is 29.04% at period 1 while tax revenue, private consumption, gross savings and money supply itself contribute to $17.73\%, 17.85\%, 0.96\%$ and 34.42% respectively. Thus the contribution of government transfer in explaining variance in money supply is quite significant and only next to money supply itself. Government transfer retains its position as an important contributor to the variance in money supply throughout the forecasting horizon reaching 27.04% at period 10.

7 Discussion

It can be argued that the government transfers can only have a redistributive impact on the money supply, i.e., money transferred by the government to the households, was, in the first place, collected from the households as direct and indirect taxes and thus it has no net impact on the overall money supply. However, it is to be noted in this regard, the government collects money as taxes from the affluent segments of the economy and spends it for or transfers it to the relatively impoverished segments and these two segments do not necessarily have the same marginal propensity to consume. Some studies have even estimated that, for low income households, marginal propensity to consume can be as much as 10 times of their wealthy peers [12]. Thus the money transferred to them as subsidy is supposed to be spent mostly on consumption and thus it (the money) gets recirculated into the economy again and again through successive consumptions and savings which enhances the broad money supply in the process in such a way as discussed earlier in this article. On the contrary, studies suggest that the affluent segments of the economy usually have a higher savings rate and, not to mention, have a relatively higher marginal propensity to save [10], [15], i.e., money is ultimately clogged into the rich peoples' wallet away from the real economic activity. Thus the government's collection of revenue from the affluent segments and distribution of the same to the poor as subsidy rejuvenate the economy by infusing new economic activities. Apart from having only a redistributive role, it is supposed to enhance the equilibrium output by uplifting aggregate demand, i.e., more and more goods will be produced and sold in the market as the poor gets (some) purchasing power which (the newly produced goods) would otherwise be stored in the inventory as unsold or may not even get produced in the first place. As economic activities are boosted and more goods are produced and sold in the market, more and more money is required to transact such goods which brings in previously clogged money into the market as a by-product. As the initial economic cycle through purchase (for consumption) is started, many more

follow as an eventual consequence.

Moreover, government nowadays does not need to run a balanced budget which means the government can spend virtually as much as they wish to meet up their social and political agenda, which implies that the government transfer program (along with any other government expenditure spree) is not necessarily backed by the revenue collection as most of the countries these days operate under deficit financing schemes and often opt to spend more money than they can actually collect through taxations and run on an ever-lasting budget deficit [24]. To make things even worse, the governments throughout world can simply print money at their will for pursuing social and political agenda as the currencies now are only fiat currencies with no intrinsic value within. Modern history of fiat currency can be traced back to 1971, when, Richard Nixon, 37th president of the United States of America, unilaterally took United States away from the covenants of the Bretton-Woods and stopped the convertibility of US dollar to gold to the shock of the rest of the world. This historical incident, popularly known as Nixon Shock, gives the sovereign governments across the globe an unlimited freedom to print money at their whim, i.e., the governments no longer need golds, silver or any other valuables to back their currency in circulation. Aside from this, countries no longer need US dollars to back up their currency and US dollar no longer ensures convertibility to a pre-fixed amount of gold at Federal Reserve fully defying the Bretton-Woods pacts. As an obvious consequence of the Nixon Shock, the governments around the world can now arbitrarily spend any amount of money on transfer programs regardless of what they can actually earn through taxation. Such transfers happen to perform a greater role than simply redistribution of wealth inside the economy: This extra money beyond the means (of the government) can stimulate economic activity (by uplifting AD curve), enhance money supply (in a way described earlier), serve social and political agendas of the government like welfare state, warfare etcetera (by printing more fiat currencies as and when necessary) and, through these, may act as a catalyst to raise GDP (as AD soars) and general price level (according to quantity theory of money as money stock is inflated) as well. Here, in this study, we investigate the role of the government transfer program on money supply considering the transfer amount to some extent *exogenous* to revenue collection as there are many sources for governments to facilitate such transfers apart from general taxation reveue, e.g., deficit financing through borrowing and printing money as and when necessary.

8 Conclusion

Government collects money from the rich and spends it for public goods and provides subsidy to the poor from the fund. In simple term, government's action of collecting taxes and providing subsidies is simply redistributive in nature. However, it is only redistributive when the government runs a balanced budget or it runs a temporary structural deficit to combat business cycles with the intention to fill up the gap during economic boom which is not the case in reality. Moreover, for the government program of taxation and transfer to have no effect on money supply, both the taxed and transferee (one who receives transfer payments) segments must happen to have the same marginal propensity to consume. But, as we discussed earlier, the marginal propensities to consume of the two segments vary drastically along the income line where the poorer segments tend to have a marginal propensity as much as 10 times higher than their affluent peers [12]. So, when the impoverished segments receive transfer payments, they spend almost all of it in consumption and trigger new series of economic cycles. Ultimately, aggregate demand curve is shifted upward and so is the output (due to a raised AD curve). As output is enhanced, more and more money is required to purchase the goods and services and money comes into circulation from government's coffer

to the poorer's pocket. These newly entered money will then be amplified through successive consumptions and savings by the multiplier process. In essence of the above discussion, here, we argue that the monetary policy, i.e., determining short term interest rate by manipulating money supply, is not the monopoly of the monetary authority alone. Rather, the fiscal policy, through transfer program, can play a significant role in the determination of the overall supply of money and thereby inevitably influences the short term interest rate. For example, when the government increases its expenditure through transfers and subsidies, disposable income of impoverished segment increases as a by-product. A portion of this enhanced income will then be spent in consumption while another portion will be saved. The saved portion of disposable income will create more money into the economy through the process of fractional reserve banking. On the other hand, the amount of money spent in consumption will be the income for another entity inside the economy. The entity receiving the money will then save a portion of it while the rest will be consumed and the process continues. Here, we investigate the algebraic structure through which government transfer and money supply are inter-related. Our empirical estimation here also suggests a positive inter-relation between the two variables and hence changing government transfer will also bring about a significant change in money supply due the presence of multiplier effect. On the contrary, if the government chooses not to impose taxes on the riches, the idle money would be simply stored into people's wallets or bank accounts and may be mostly left unused apart from the fact that a portion of this idle money will be invested by the banks (this portion will be defined by the law of the land, availability of good customers, bank's limit for investment and risk taking and the overall business scenario after the fulfilment of cash reserve requirements as imposed by the monetary authority) while the rest would serve no economic purposes.

Declaration

- Funding: No funding is received to accomplish this work.
- Conflict of Interest: No conflict of interest exists.
- Availability of data and material: The data that support the findings of this study are openly available World Bank Open Data available at `data.worldbank.org` and also in OECD Insurance Database at `https://www.oecd.org/daf/fin/insurance/oecdinsurancestatistics.htm`.
- Code availability: NA

9 Figures

Fig 1. Impact response of tax revenue to shocks in government transfer

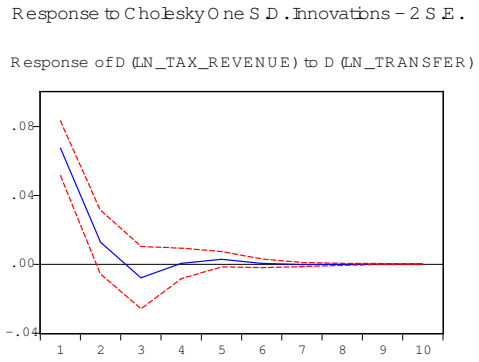


Fig 2. Cumulative response of tax revenue to shocks in government transfer

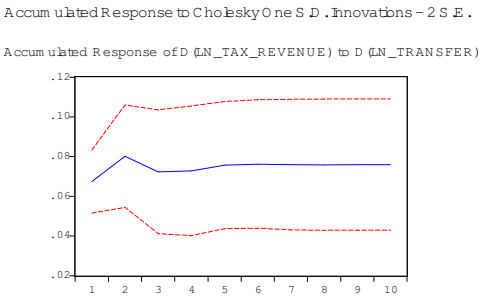


Fig 3. Impact response of private consumption to shocks in government transfer

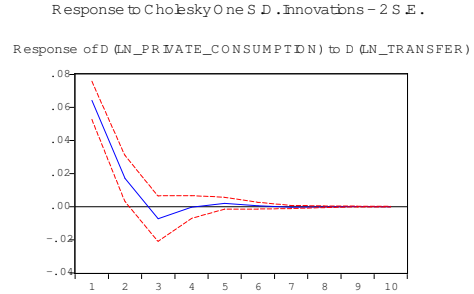


Fig 4. Cumulative response of private consumption to shocks in government transfer

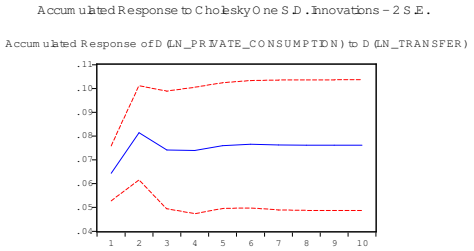


Fig 5. Impact response of gross savings to shocks in government transfer

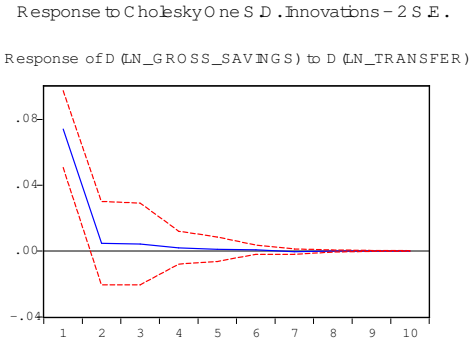


Fig 6. Cumulative response of gross savings to shocks in government transfer

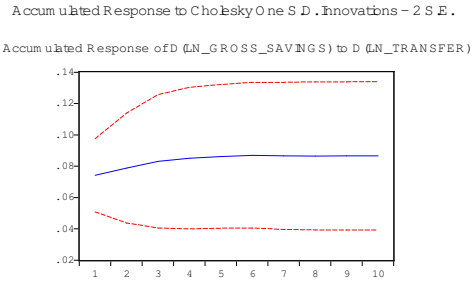


Fig 7. Impact response of money supply to shocks in government transfer

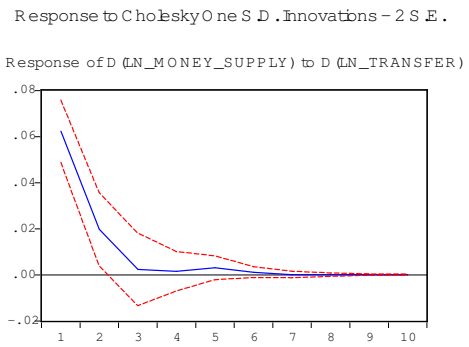


Fig 8. Cumulative response of money supply to shocks in government transfer

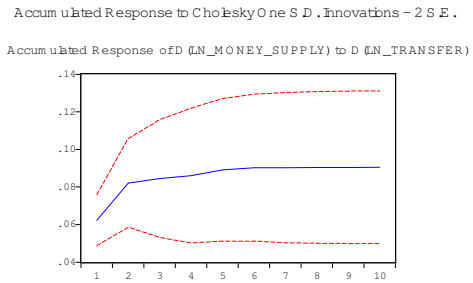


Fig 9. Impact response of government transfer to its own shock

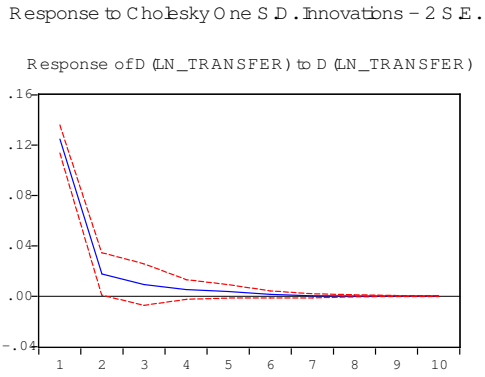
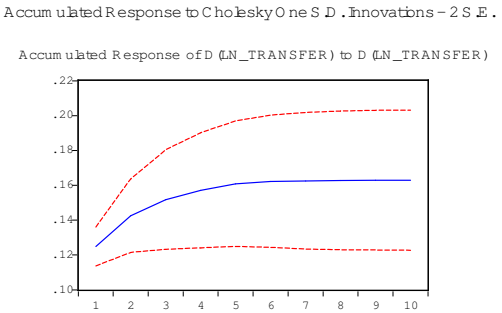


Fig 10. Cumulative response of government transfer to its own shock



10 Tables

Table 1. ADF unit root test

Series	Year	Test	Test variant	Lag length selection	L/FD	Statistic	p-value	Remark
Government Transfer	1990-2017	Levin-Lin-Chu	individual intercept	Schawrz Info Criterion	L	-1.33004	0.0918	NS
				Schawrz Info Criterion	FD	-9.02573	0	S
		Im, Pesaran and Shin W-stat	individual intercept	Schawrz Info Criterion	L	1.84668	0.9676	NS
				Schawrz Info Criterion	FD	-8.50311	0	S
		ADF - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	7.95451	0.9922	NS
				Schawrz Info Criterion	FD	103.443	0	S
		PP - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	9.01669	0.9827	NS
				Schawrz Info Criterion	FD	102.992	0	S
Tax Revenue	1990-2017	Levin-Lin-Chu	individual intercept	Schawrz Info Criterion	L	-0.56005	0.2877	NS
				Schawrz Info Criterion	FD	-10.517	0	S
		Im, Pesaran and Shin W-stat	individual intercept	Schawrz Info Criterion	L	2.32875	0.9901	NS
				Schawrz Info Criterion	FD	-10.1116	0	S
		ADF - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	5.8121	0.9991	NS
				Schawrz Info Criterion	FD	126.491	0	S
		PP - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	5.56152	0.9994	NS
				Schawrz Info Criterion	FD	145.562	0	S
Private Consumption	1990-2017	Levin-Lin-Chu	individual intercept	Schawrz Info Criterion	L	-2.97387	0.0015	S
				Schawrz Info Criterion	FD	-9.10618	0	S
		Im, Pesaran and Shin W-stat	individual intercept	Schawrz Info Criterion	L	1.53747	0.9379	NS
				Schawrz Info Criterion	FD	-8.24491	0	S
		ADF - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	10.8726	0.9495	NS
				Schawrz Info Criterion	FD	101.156	0	S
		PP - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	9.71919	0.973	NS
				Schawrz Info Criterion	FD	108.203	0	S

Table 2. ADF unit root test

Series	Year	Test	Test variant	Lag length selection	L/FD	Statistic	p-value	Remark
Gross Savings	1990-2017	Levin-Lin-Chu	individual intercept	Schawrz Info Criterion	L	-0.41475	0.3392	NS
				Schawrz Info Criterion	FD	-9.51082	0	S
		Im, Pesaran and Shin W-stat	individual intercept	Schawrz Info Criterion	L	2.05881	0.9802	NS
				Schawrz Info Criterion	FD	-9.39402	0	S
		ADF - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	6.44389	0.9981	NS
				Schawrz Info Criterion	FD	117.426	0	S
		PP - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	5.98589	0.9989	NS
				Schawrz Info Criterion	FD	127.029	0	S
Money Supply	1990-2017	Levin-Lin-Chu	individual intercept	Schawrz Info Criterion	L	0.1157	0.5461	NS
				Schawrz Info Criterion	FD	-8.12898	0	S
		Im, Pesaran and Shin W-stat	individual intercept	Schawrz Info Criterion	L	3.52336	0.9998	NS
				Schawrz Info Criterion	FD	-7.48621	0	S
		ADF - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	3.73515	1	NS
				Schawrz Info Criterion	FD	90.0341	0	S
		PP - Fisher Chi-square	individual intercept	Schawrz Info Criterion	L	3.8866	1	NS
				Schawrz Info Criterion	FD	89.4624	0	S

Table 3. Lag length selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-873.2667	NA	0.004486	8.782667	8.865125	8.816036
1	946.5092	3530.365	7.20E-11	-9.165092	-8.670344*	-8.964875*
2	983.8671	70.60642	6.37e-11*	-9.288671*	-8.381633	-8.921607
3	1008.049	44.49406	6.43E-11	-9.280486	-7.961159	-8.746575
4	1025.376	31.01578	6.95E-11	-9.203759	-7.472142	-8.503
5	1041.587	28.20796	7.62E-11	-9.115873	-6.971967	-8.248267

Table 4. Calculation of tax revenue multiplier

Period	Impact responsse of tax revenue	Impact response of government transfer	Impact Multiplier	Cumulative responsse of tax revenue	Cumulative response of government transfer	Discounted cumulative response of tax revenue	Discounted Cumulative response of government transfer	Cumulative multiplier	Transfer to tax revenue ratio	Adjusted impact multiplier	Adjusted cumulative multiplier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	0.067411	0.124906	0.54	0.067411	0.124906	0.067411	0.124906	0.54		0.51	0.51
2	0.0128	0.017642	0.73	0.080211	0.142548	0.079346	0.14101098	0.56		0.68	0.53
3	-0.007886	0.009238	-0.85	0.072325	0.151786	0.070774	0.148530391	0.48		-0.80	0.45
4	0.000439	0.005328	0.08	0.072764	0.157114	0.070436	0.152086371	0.46		0.08	0.43
5	0.002908	0.00376	0.77	0.075672	0.160874	0.072461	0.154046939	0.47	1.06499511	0.73	0.44
6	0.000528	0.001382	0.38	0.076200	0.162256	0.072180	0.153695015	0.47		0.36	0.44
7	-0.000256	0.000287	-0.89	0.075944	0.162543	0.071161	0.152306729	0.47		-0.84	0.44
8	-0.000111	0.000227	-0.49	0.075833	0.162770	0.070291	0.150874897	0.47		-0.46	0.44
9	9.99E-05	0.00012	0.83	0.075933	0.162890	0.069625	0.149358124	0.47		0.78	0.44
10	3.57E-05	5.97E-05	0.60	0.075969	0.162950	0.068907	0.147801825	0.47		0.56	0.44

Table 5. Calculation of private consumption multiplier

Period	Impact responsse of consumption	Impact response of government transfer	Impact Multiplier	Cumulative responsse of consumption	Cumulative response of government transfer	Discounted cumulative response of consumption	Discounted Cumulative response of government transfer	Cumulative multiplier	Transfer to consumption ratio	Adjusted impact multiplier	Adjusted cumulative multiplier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	0.064312	0.124906	0.51	0.064312	0.124906	0.064312	0.124906	0.51		2.22	2.22
2	0.017073	0.017642	0.97	0.081385	0.142548	0.080507	0.14101098	0.57		4.17	2.46
3	-0.007241	0.009238	-0.78	0.074144	0.151786	0.072554	0.148530391	0.49		-3.38	2.11
4	-0.000246	0.005328	-0.05	0.073898	0.157114	0.071533	0.152086371	0.47		-0.20	2.03
5	0.002058	0.00376	0.55	0.075956	0.160874	0.072733	0.154046939	0.47	0.231857807	2.36	2.04
6	0.000566	0.001382	0.41	0.076522	0.162256	0.072485	0.153695015	0.47		1.77	2.03
7	-0.000296	0.000287	-1.03	0.076226	0.162543	0.071426	0.152306729	0.47		-4.45	2.02
8	-0.000102	0.000227	-0.45	0.076124	0.162770	0.070561	0.150874897	0.47		-1.94	2.02
9	5.52E-05	0.00012	0.46	0.076179	0.162890	0.069851	0.149358124	0.47		1.98	2.02
10	2.92E-05	5.97E-05	0.49	0.076208	0.162950	0.069124	0.147801825	0.47		2.11	2.02

Table 6. Calculation of gross savings multiplier

Period	Impact responsse of gross savings	Impact response of government transfer	Impact Multiplier	Cumulative responsse of gross savings	Cumulative response of government transfer	Discounted cumulative response of savings	Discounted Cumulative response of government transfer	Cumulative multiplier	Transfer to savings ratio	Adjusted impact multiplier	Adjusted cumulative multiplier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	0.074101	0.124906	0.59	0.074101	0.124906	0.074101	0.124906	0.59		0.79	0.79
2	0.004726	0.017642	0.27	0.078827	0.142548	0.077977	0.14101098	0.55		0.36	0.74
3	0.004236	0.009238	0.46	0.083063	0.151786	0.081281	0.148530391	0.55		0.61	0.73
4	0.001997	0.005328	0.37	0.085060	0.157114	0.082338	0.152086371	0.54		0.50	0.72
5	0.001087	0.00376	0.29	0.086147	0.160874	0.082491	0.154046939	0.54	0.747929075	0.39	0.72
6	0.000773	0.001382	0.56	0.086920	0.162256	0.082334	0.153695015	0.54		0.75	0.72
7	-0.000404	0.000287	-1.41	0.086516	0.162543	0.081068	0.152306729	0.53		-1.88	0.71
8	-2.46E-05	0.000227	-0.11	0.086491	0.162770	0.080171	0.150874897	0.53		-0.14	0.71
9	3.63E-05	0.00012	0.30	0.086528	0.162890	0.079340	0.149358124	0.53		0.40	0.71
10	2.07E-05	5.97E-05	0.35	0.086548	0.162950	0.078503	0.147801825	0.53		0.46	0.71

Table 7. Calculation of money supply multiplier

Period	Impact responsse of money supply	Impact response of government transfer	Impact Multiplier	Cumulative responsse of money supply	Cumulative response of government transfer	Discounted cumulative response of money supply	Discounted Cumulative response of government transfer	Cumulative multiplier	Transfer to money supply ratio	Adjusted impact multiplier	Adjusted cumulative multiplier
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	0.062334	0.124906	0.50	0.062334	0.124906	0.062334	0.124906	0.50		2.90	2.90
2	0.019788	0.017642	1.12	0.082122	0.142548	0.081237	0.14101098	0.58		6.52	3.35
3	0.002375	0.009238	0.26	0.084497	0.151786	0.082685	0.148530391	0.56		1.50	3.24
4	0.001507	0.005328	0.28	0.086004	0.157114	0.083252	0.152086371	0.55		1.64	3.18
5	0.003065	0.00376	0.82	0.089069	0.160874	0.085289	0.154046939	0.55	0.17194368	4.74	3.22
6	0.001135	0.001382	0.82	0.090204	0.162256	0.085445	0.153695015	0.56		4.78	3.23
7	9.50E-05	0.000287	0.33	0.090299	0.162543	0.084612	0.152306729	0.56		1.93	3.23
8	6.53E-05	0.000227	0.29	0.090364	0.162770	0.083761	0.150874897	0.56		1.67	3.23
9	6.61E-05	0.00012	0.55	0.090430	0.162890	0.082918	0.149358124	0.56		3.20	3.23
10	5.51E-05	5.97E-05	0.92	0.090486	0.162950	0.082074	0.147801825	0.56		5.37	3.23

Table 8. Variance decomposition of tax revenue

Period	S.E.	Transfer	Tax Revenue	Private Consumption	Gross Savings	Money Supply
1	0.134183	25.24	74.76	0.00	0.00	0.00
2	0.143309	22.92	66.55	1.60	5.90	3.03
3	0.145408	22.56	66.83	1.93	5.73	2.94
4	0.146004	22.38	66.68	1.92	5.74	3.28
5	0.146069	22.40	66.66	1.92	5.75	3.28
6	0.146088	22.39	66.66	1.92	5.75	3.28
7	0.146091	22.39	66.66	1.92	5.75	3.28
8	0.146092	22.39	66.66	1.92	5.75	3.28
9	0.146092	22.39	66.66	1.92	5.75	3.28
10	0.146092	22.39	66.66	1.92	5.75	3.28

Table 9. Variance decomposition of private consumption

Period	S.E.	Transfer	Tax Revenue	Private Consumption	Gross Savings	Money Supply
1	0.102251	39.56	32.08	28.36	0.00	0.00
2	0.108099	37.89	30.66	25.94	2.93	2.57
3	0.10978	37.17	32.00	25.18	3.15	2.50
4	0.110319	36.81	32.26	24.96	3.23	2.74
5	0.110372	36.81	32.25	24.94	3.24	2.76
6	0.110391	36.80	32.26	24.93	3.25	2.76
7	0.110392	36.80	32.26	24.93	3.25	2.76
8	0.110393	36.80	32.26	24.93	3.25	2.76
9	0.110393	36.80	32.26	24.93	3.25	2.76
10	0.110393	36.80	32.26	24.93	3.25	2.76

Table 10. Variance decomposition of gross savings

Period	S.E.	Transfer	Tax Revenue	Private Consumption	Gross Savings	Money Supply
1	0.19175	14.93	23.15	1.85	60.07	0.00
2	0.19419	14.62	22.78	2.55	58.67	1.37
3	0.198909	13.98	23.85	2.44	56.02	3.70
4	0.199244	13.94	23.99	2.46	55.91	3.70
5	0.199315	13.94	23.98	2.46	55.88	3.74
6	0.199332	13.94	23.98	2.47	55.87	3.74
7	0.199334	13.94	23.98	2.47	55.87	3.74
8	0.199335	13.94	23.98	2.47	55.87	3.74
9	0.199335	13.94	23.98	2.47	55.87	3.74
10	0.199335	13.94	23.98	2.47	55.87	3.74

Table 11. Variance decomposition of money supply

Period	S.E.	Transfer	Tax Revenue	Private Consumption	Gross Savings	Money Supply
1	0.115674	29.04	17.73	17.85	0.96	34.42
2	0.123482	28.05	20.00	16.29	2.16	33.51
3	0.125736	27.09	20.15	16.31	2.99	33.46
4	0.125959	27.01	20.30	16.29	3.05	33.35
5	0.126026	27.04	20.28	16.30	3.05	33.32
6	0.126042	27.04	20.28	16.30	3.05	33.33
7	0.126044	27.04	20.28	16.30	3.05	33.33
8	0.126044	27.04	20.28	16.30	3.05	33.33
9	0.126044	27.04	20.28	16.30	3.05	33.33
10	0.126044	27.04	20.28	16.30	3.05	33.33

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