

MONETARY POLICY AND THE DISTRIBUTION OF PERSONAL INCOME AND WEALTH

A STOCK-FLOW CONSISTENT APPROACH

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MOTIVATION OF THE PAPER

- Over the last decades the research on monetary policy has largely concentrated on the effects of monetary authorities' decisions on inflation and the fine-tuning of the macroeconomy.
- Much less attention has been paid to the impact of monetary policy, and in particular of the policy interest rate, on income and wealth distribution.
- There are a few studies that have explored the link between the interest rate and the **functional** or **personal distribution of income** (e.g. Niggle, 1989; Moore, 1989; Arestis and Howells, 1994; Argitis and Pitelis, 2001; Hein, 2006; Hein and Schoder, 2011; Coibion et al., 2012).

MOTIVATION OF THE PAPER

- However, in the existing literature there is a lack of an integrated theoretical framework that connects the policy interest rate with the distribution of personal income and wealth.
- This paper intends to fill this gap by developing a **theoretical platform** for the analysis of the various **channels** through which the interest rate set by the central bank influences the inequality in the distribution of personal income and wealth.

MOTIVATION OF THE PAPER

- In order to do so the paper uses a new approach to macroeconomic modelling: the **stock-flow consistent approach**.
- The stock-flow consistent approach has been developed by **Godley and Lavoie (2007)** and goes back to the works of the *Cambridge Economic Policy Group* (see, e.g. Cripps and Godley, 1976) and the *Yale group of James Tobin* (see e.g. Backus et al., 1980; Tobin, 1982).
- This approach has gained a growing popularity over the last years. Interestingly, certain aspects of this approach have been used by some researchers in the **ECB** and the **Bank of England** (e.g. Barwell and Burrows, 2011; Cour-Thimann and Winkler, 2013).

STRUCTURE OF THE PRESENTATION

1. The stock-flow consistent approach
2. The model
3. Income and wealth inequality: indices and decomposition
4. Simulation results
5. Future research

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1. THE STOCK-FLOW CONSISTENT APPROACH

Some of the main features of stock-flow consistent models are the following:

- 1) The **stocks** (deposits, equities, loans etc.) and the **flows** (e.g. interest, profits, wages) of the institutional sectors of the macroeconomy are explicitly depicted via balance sheet and transactions matrices. This ensures that macroeconomic modelling is consistent with accounting principles.
- 2) There is a clear distinction between **accounting identities** and **behavioural equations**. The behavioural equations reflect the researcher's theoretical presuppositions about the behaviour of economic agents.

1. THE STOCK-FLOW CONSISTENT APPROACH

- 3) **Money** is introduced both as a stock and as a flow variable. It is **endogenously created** when commercial banks provide loans to households and firms; this is consistent with the view recently adopted by the Bank of England (2014).
- 4) The **future values of the endogenous variables** cannot by definition be known by the economic agents since the economic system is **non-ergodic** and **complex**: *its future is non-predetermined and is created by the complex interaction between the decisions of many agents*. The agents can form expectations using lagged values of the endogenous variables.

1. THE STOCK-FLOW CONSISTENT APPROACH

The stock-flow consistent approach is useful for our purposes because:

- a) Personal income and wealth distribution can be easily formulated by splitting the household sector into various groups characterised by different income sources and balance sheet structures that are directly or indirectly affected by the interventions of monetary policy.
- b) Stock-flow consistent models take explicitly into account the interconnected trajectories in which **wealth** and **income** evolve.
- c) In a stock-flow coherent system any change in a specific part of the system due to an alteration in the interest rate is automatically reflected in the rest of the system via various macro channels.

STRUCTURE OF THE PRESENTATION

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2. THE MODEL

There are 5 sectors in our postulated economy:

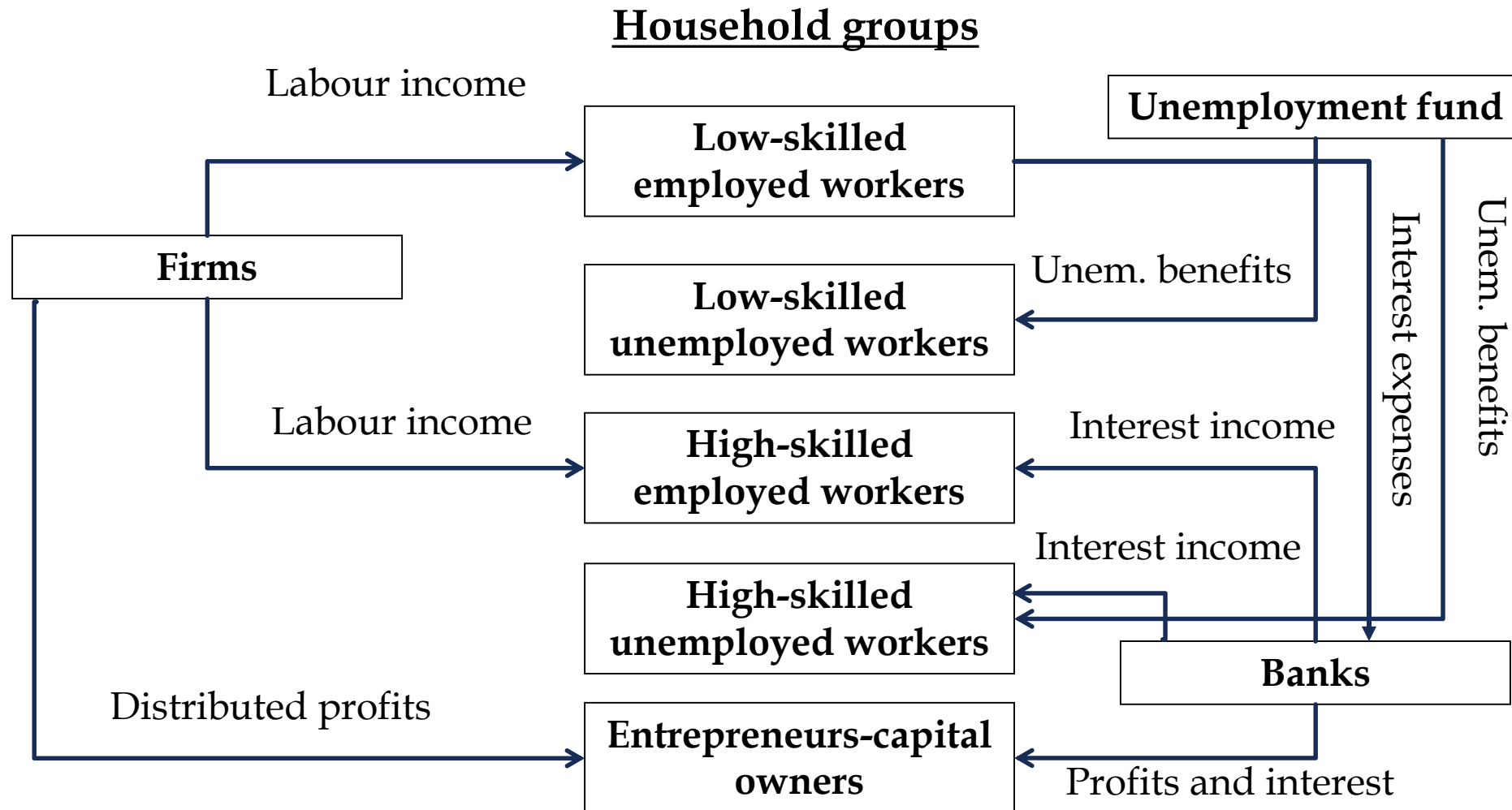
- 1) Households:** There are 5 groups that receive income from different sources or from the same sources in different proportions (see the next slide).
- 2) Firms:** They run investment projects using both internal funds (retained profits) and external finance (equities and loans).
- 3) Commercial banks:** They provide loans to firms and households.
- 4) Unemployment fund:** It provides unemployment benefits and is financed by employees' and employers' contributions.
- 5) Central bank:** It lends to the commercial banks and sets the base interest rate.

2. THE MODEL

Households are divided into 5 groups:

- 1) *Low-skilled employed workers*: They work in low-skilled jobs. They do not save and they take on consumer debt.
- 2) *Low-skilled unemployed workers*: They search for a low-skilled job and receive unemployment benefits. They do not save.
- 3) *High-skilled employed workers*: They work in high-skilled jobs. Their income not consumed is saved in the form of deposits.
- 4) *High-skilled unemployed workers*: They search for a high-skilled job and receive unemployment benefits.
- 5) *Entrepreneurs-capital owners*: They receive the distributed profits of firms and banks. Their wealth is saved in the form of deposits and equities.

2. THE MODEL



2. THE MODEL

Balance sheet matrix

	Households of					Firms	Unemployment fund	Commercial banks	Central bank	Total
	Low-skilled employed workers	Low-skilled unemployed workers	High-skilled employed workers	High-skilled unemployed workers	Entrepreneurs- capital owners					
Deposits			$+M_{HE}$	$+M_{HU}$	$+M_E$		$+M_F$	$-M$		0
Equities					$+e \cdot p_e$	$-e \cdot p_e$				0
Household loans	$-D_{LE}$	$-D_{LU}$						$+D_{LE} + D_{LU}$		0
Firm loans						$-L$		$+L$		0
Capital						$+K$				$+K$
Advances								$-A$	$+A$	0
High-powered money								$+HPM$	$-HPM$	0
Total (net worth)	$-D_{LE}$	$-D_{LU}$	$+M_{HE}$	$+M_{HU}$	$+V_E$	$+V_F$	$+M_F$	0	$+K_{CB}$	$+K$

2. THE MODEL

Transactions matrix

	Households of					Firms		Unemployment fund	Commercial banks		Central bank		Total
	Low-skilled employed workers	Low-skilled unemployed workers	High-skilled employed workers	High-skilled unemployed workers	Entrepreneurs-capital owners	Current	Capital		Current	Capital	Current	Capital	
Consumption	$-C_{LE}$	$-C_{LU}$	$-C_{HE}$	$-C_{HU}$	$-C_E$	$+C$							0
Investment						$+I$	$-I$						0
Wages	$+w_L \cdot N_{LE}$		$+w_H \cdot N_{HE}$			$-W$							0
Unemployment benefits		$+ub \cdot N_{LU}$		$+ub \cdot N_{HU}$				$-UB$					0
Firms' distributed profits					$+DP$	$-DP$							0
Firms' undistributed profits						$-UP$	$+UP$						0
Commercial banks' profits					$+BP$				$-BP$				0
Central bank's profits											$-CBP$	$+CBP$	0
Contributions	$-T_W \cdot w_L \cdot N_{LE}$		$-T_W \cdot w_H \cdot N_{HE}$			$-T_F \cdot W$		$+CO$					0
Debt transfers	$+DT$	$-DT$											0
Deposit transfers			$+MT$	$-MT$									0
Interest on deposits			$+r_M \cdot M_{HE-1}$	$+r_M \cdot M_{HU-1}$	$+r_M \cdot M_{E-1}$			$+r_M \cdot M_{F-1}$	$-r_M \cdot M_{-1}$				0
Interest on household loans	$-r_D \cdot D_{LE-1}$	$-r_D \cdot D_{LU-1}$							$+r_D \cdot (D_{LE-1} + D_{LU-1})$				0
Interest on firm loans						$-r_L \cdot L_{-1}$			$+r_L \cdot L_{-1}$				0
Interest on advances									$-r_B \cdot A_{-1}$		$+r_B \cdot A_{-1}$		0
Δ deposits			$-\Delta M_{HE}$	$-\Delta M_{HU}$	$-\Delta M_E$			$-\Delta M_F$		$+\Delta M$			0
Δ equities					$-\Delta e \cdot p_e$		$+\Delta e \cdot p_e$						0
Δ loans							$+\Delta L$			$-\Delta L$			0
Δ advances										$+\Delta A$		$-\Delta A$	0
Δ high-powered money										$-\Delta HPM$		$+\Delta HPM$	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0

2. THE MODEL

In the model there is a clear distinction between two groups of equations:

(i) Those that stem from the **accounting identities** based on the transactions and balance sheet matrices.

(ii) Those that rely on the assumptions about the **behaviour** of the economic agents and refer, therefore, to our theoretical presuppositions. In the behavioural equations of this paper the decision-making process of economic units is postulated to rely on norms and rules of thumb. The equations draw on well-established theories and previous econometric evidence.

The model consists of about 80 equations.

2. THE MODEL

Consumption function

- The consumption functions in the model are of the following form:

$$C = c_1 Y_{-1} + c_2 V_{-1}$$

where C is the consumption, Y is the income, V is the accumulated wealth, c_1 is the propensity to consume out of income and c_2 is the propensity to consume out of wealth. This is an **Ando and Modigliani-type** consumption function.

- We also assume that the propensity to consume out of income is a negative function of the deposit interest rate (r_M): $c_1 = \kappa_1 - \kappa_2 r_M$

2. THE MODEL

Trickle-down consumption

- Recent theoretical and empirical literature has shown that the consumption of low and middle income households depends on the consumption of high income households via an **emulation effect**.
- The argument is that the lower income households try to follow the prevailing consumption norms determined by the top income households (see e.g. Cynamon and Fazzari, 2008; Bertrand and Moss, 2013; Frank et al., 2014).
- We consider this effect for the low-skilled workers in our model by assuming that their desired consumption is a fraction of the consumption of entrepreneurs-capital owners. This in our model creates consumer debt.

2. THE MODEL

Portfolio choice

- The portfolio choice of entrepreneurs-capital owners relies on Godley's (1999) formulation of **imperfect asset substitutability** which has been inspired by Brainard and Tobin (1968) and Tobin (1969). The imperfect asset substitutability framework has recently become quite popular in the field of international economics (e.g., Blanchard et al., 2005; Sà and Viani, 2011).
- The households allocate their wealth between equities (E) and deposits (M) based on the relative rates of return:

$$E = (\lambda_0 + \lambda_1 r_{e-1} - \lambda_2 r_M) V_{E-1}$$

$$M = [(1 - \lambda_0) - \lambda_1 r_{e-1} + \lambda_2 r_M] V_{E-1}$$

2. THE MODEL

Investment function

- We use a simple specification:

$$\frac{I}{K_{-1}} = d_0 + d_1 r_{-1}$$

where I is investment, K is the capital stock and r is the rate of undistributed profits.

- This specification focuses on the positive impact of **internal cash inflows** on investment. This is well-documented in the related empirical literature (see e.g. Fazzari et al., 1988; Hubbard, 1998).

2. THE MODEL

Wage rates

- The **wage rate of low-skilled workers** is a negative function of the unemployment rate. For similar specifications see Stockhammer (2004) and Layard et al. (2005).
- The **wage rate of high-skilled workers** is determined as a combination of a mark-up over the wage rate of low-skilled workers and a variable remuneration linked to firms' profits. In other words, we have assumed a profit-sharing procedure (see e.g. Lima, 2012).

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3. INCOME AND WEALTH INEQUALITY: INDICES AND DECOMPOSITION

- **Income inequality** is captured by two broadly used indices:
 - a) the **Gini coefficient**
 - b) the **squared coefficient of variation**.
- In our model the **Gini coefficient** is written as:

$$GINI = \frac{1}{2N \cdot Y_T} \sum_j \sum_i |YH_i - YH_j| N_i N_j$$

where $N = N_L + N_H + N_E$, $Y_T = Y_{LE} + Y_{LU} + Y_{HE} + Y_{HU} + Y_E$, $i, j = LE, LU, HE, HU, E$.

- YH is the per household income.
- The Gini coefficient lies between 0 (perfect equality) and 1 (perfect inequality).

3. INCOME AND WEALTH INEQUALITY: INDICES AND DECOMPOSITION

- The **squared coefficient of variation** is defined as follows:

$$C^2 = \frac{1}{N \cdot \mu^2} \sum_i N_i (YH_i - \mu)^2$$

where $\mu = Y_T / N$.

- The Gini coefficient is more sensitive to changes that take place in the **middle** of the income distribution.
- The squared coefficient of variation is more sensitive to changes taking place in the **top** of the income distribution.

3. INCOME AND WEALTH INEQUALITY: INDICES AND DECOMPOSITION

- The squared coefficient of variation is used to decompose overall inequality by income source. This index turns out to perform satisfactorily and conveniently in breaking down inequality by factor components (Shorrocks, 1982; Jenkins, 1995; Cowell, 2011).
- We have that:

$$S = \sum s_k$$

where S is the overall inequality and s_k is the absolute contribution of income source k to overall inequality.

3. INCOME AND WEALTH INEQUALITY: INDICES AND DECOMPOSITION

- The absolute contribution of each income source is given by:

$$S_k = fs_k \rho_k \sqrt{C_k^2 C^2}$$

where fs_k is the factor income share, ρ_k is the correlation coefficient of the income source k with the total income of each individual and C_k^2 is the squared coefficient of variation of income source k .

- By decomposing inequality using the above formula it becomes possible to examine how the distribution of income sources affects personal income distribution.

3. INCOME AND WEALTH INEQUALITY: INDICES AND DECOMPOSITION

- **Wealth inequality** is captured by the Gini coefficient.
- In our model there are households with negative wealth. The Gini coefficient can successfully consider the existence of negative wealth (see Jenkins and Jännti, 2005).
- Since there is negative wealth, the Gini coefficient can take values above 1.

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4. SIMULATION RESULTS

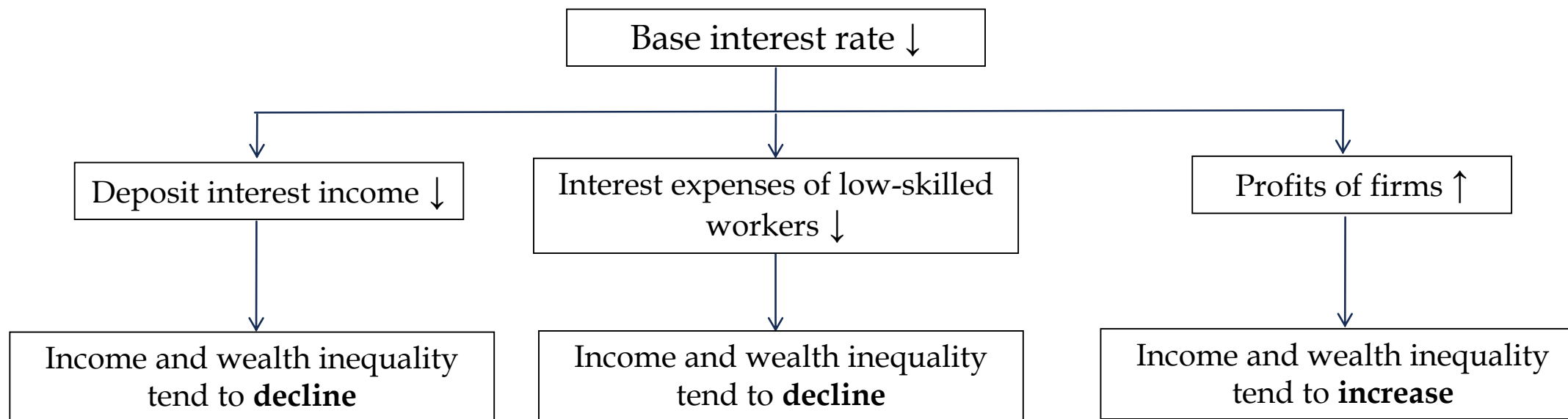
- The model's properties are explored with the aid of computer simulations, using plausible values for the parameters and the exogenous variables.
- In the simulations the model is allowed to operate sequentially until a steady state is reached.
- At $t=0$ we assume that the monetary authorities decide to decrease the **base interest rate** from 2% to 1%.

4. SIMULATION RESULTS

- We identify 4 main channels through which the decline in the interest rate affects income and wealth inequality:
 - 1) The **'interest payments'** channel
 - 2) The **'portfolio'** channel
 - 3) The **'macroeconomic activity'** channel
 - 4) The **'indebtedness'** channel

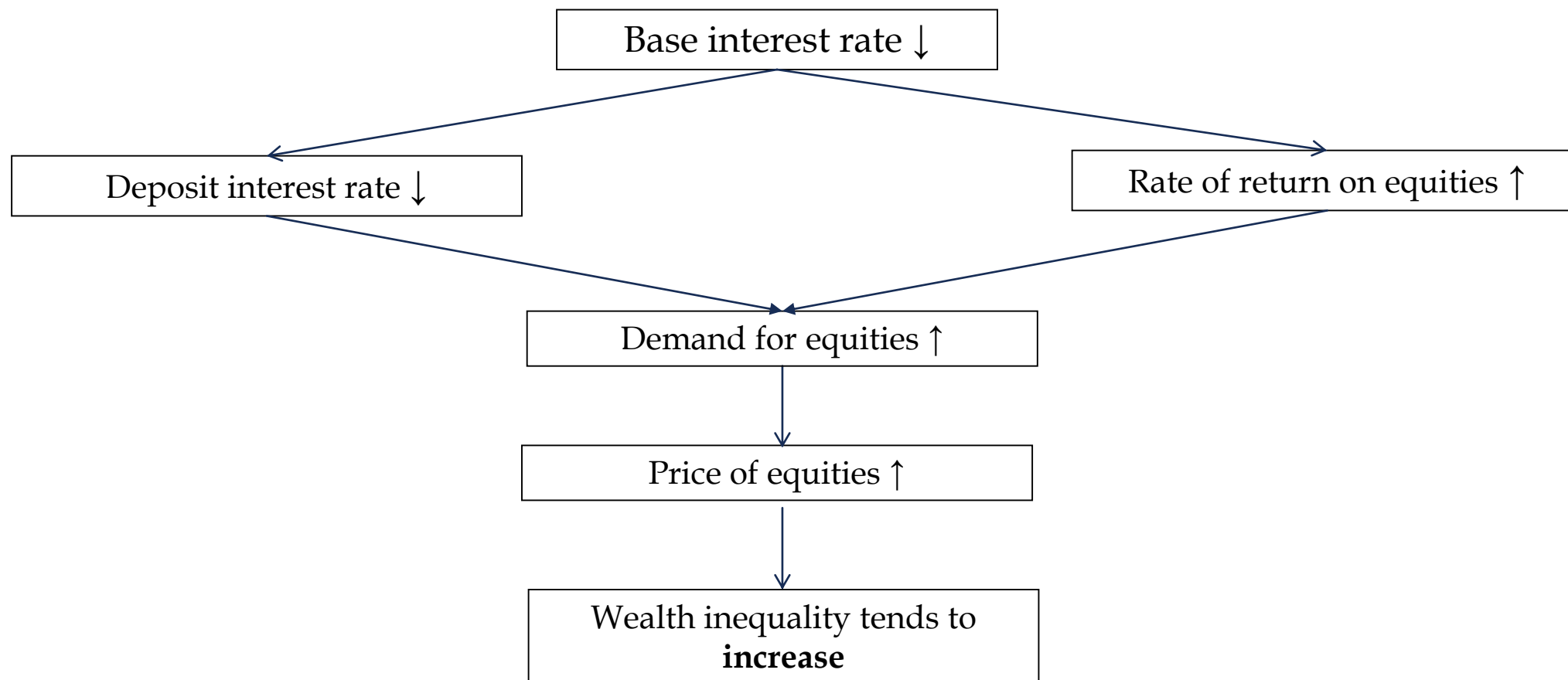
4. SIMULATION RESULTS

1) The 'interest payments' channel



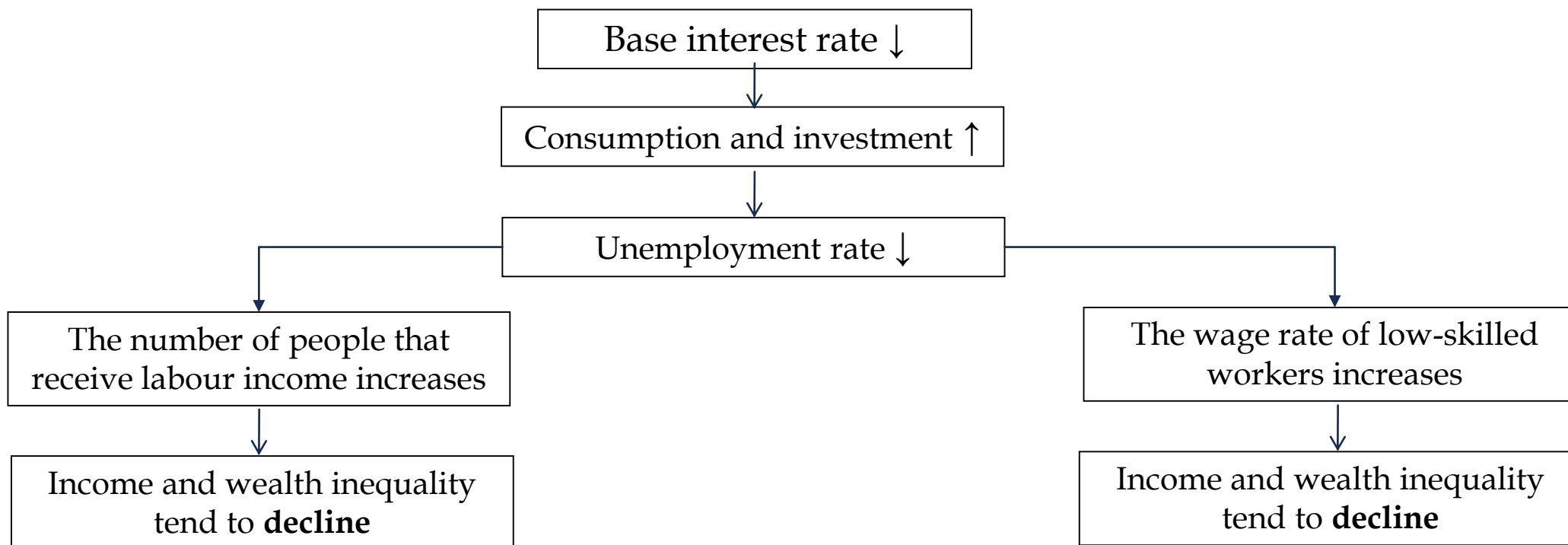
4. SIMULATION RESULTS

2) The 'portfolio' channel



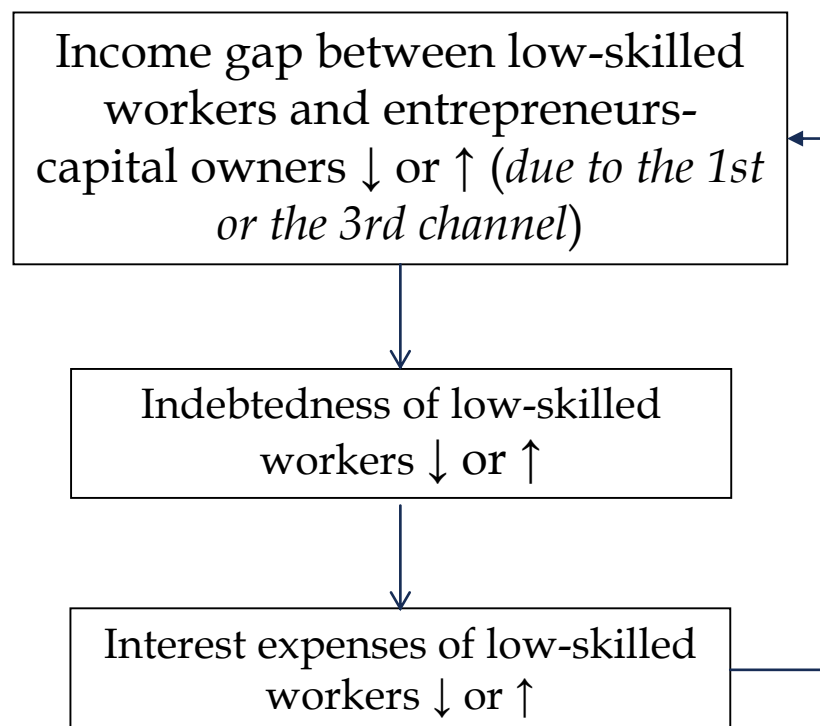
4. SIMULATION RESULTS

3) The 'macroeconomic activity' channel



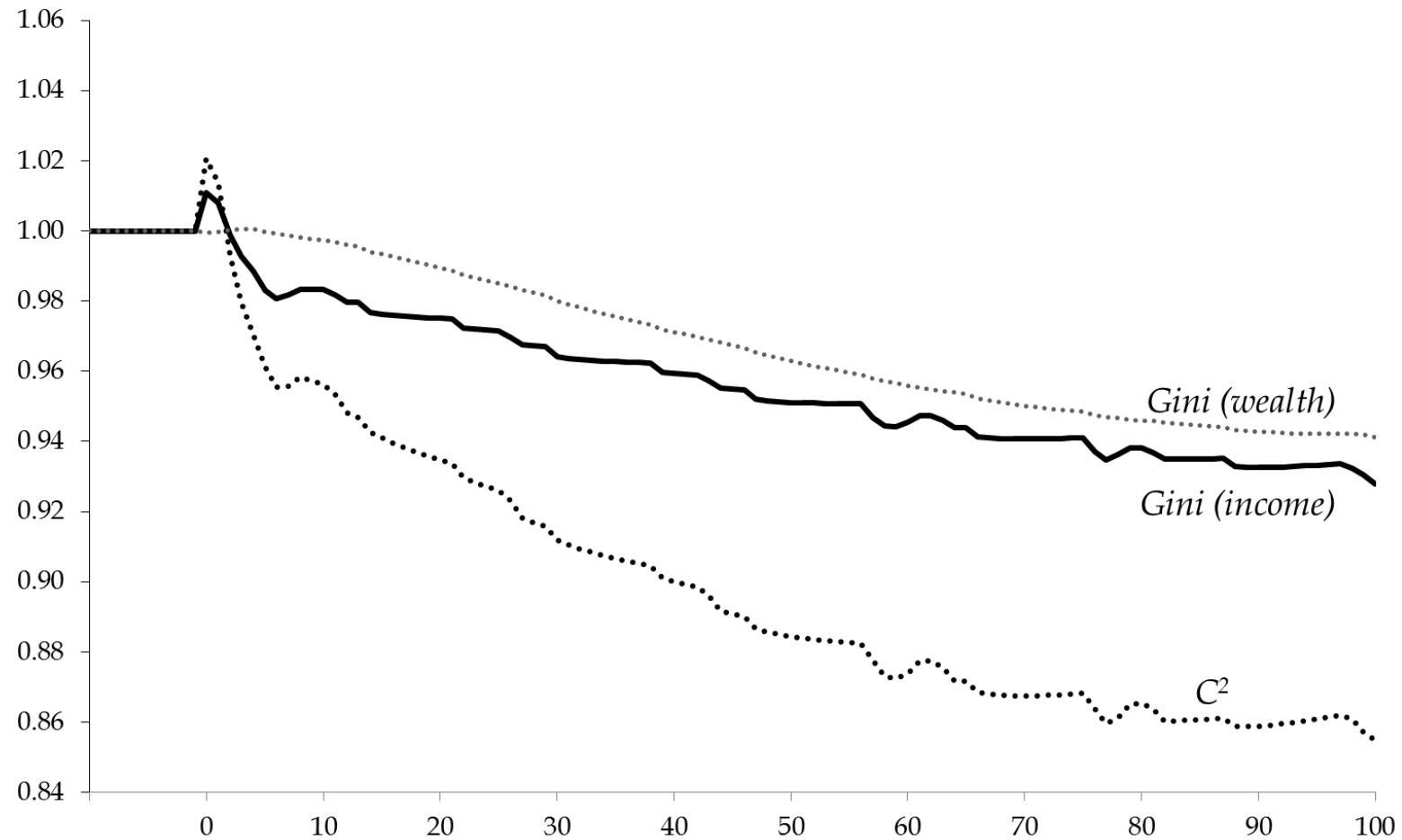
4. SIMULATION RESULTS

4) The 'indebtedness' channel



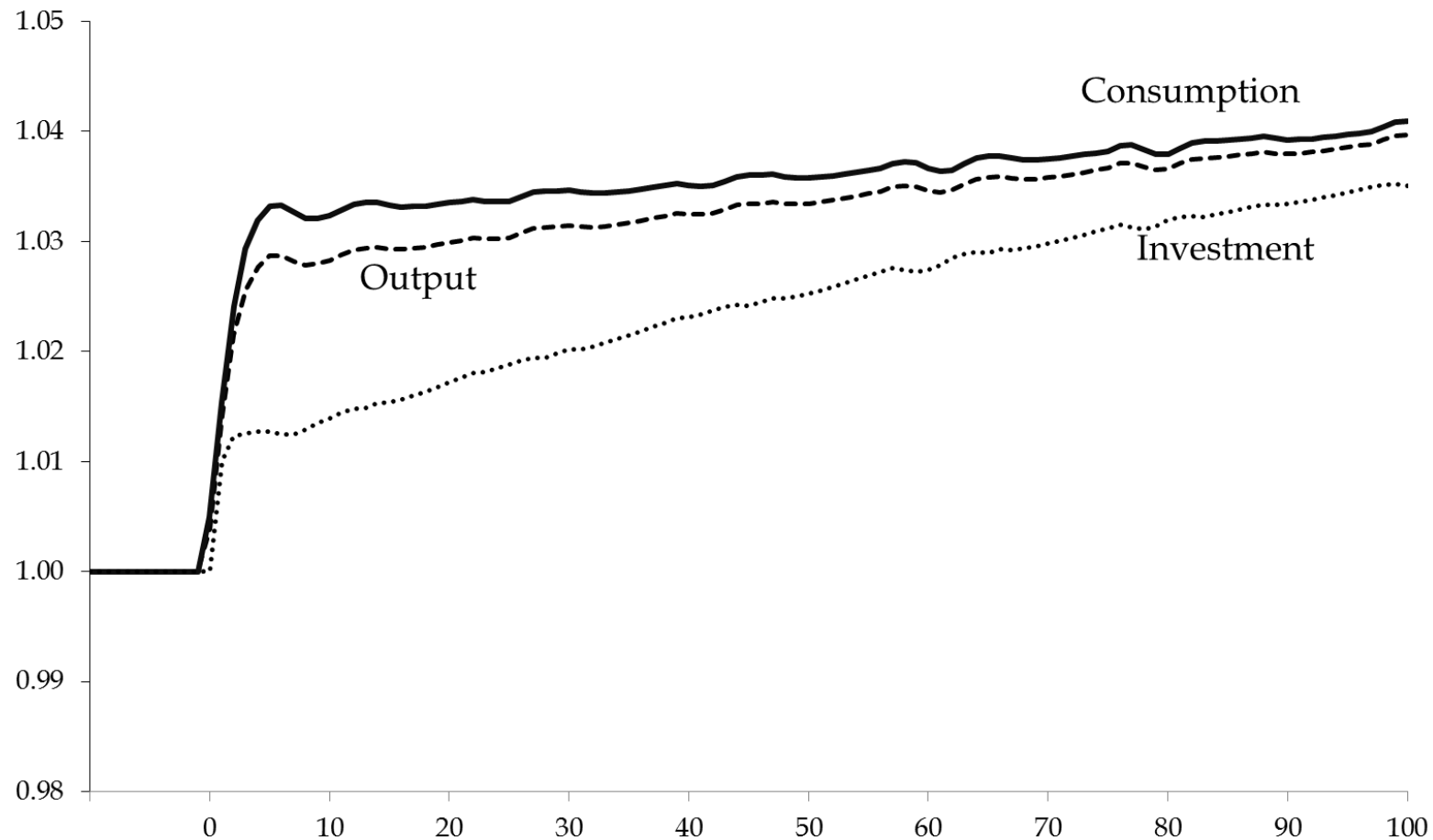
4. SIMULATION RESULTS

Inequality indices



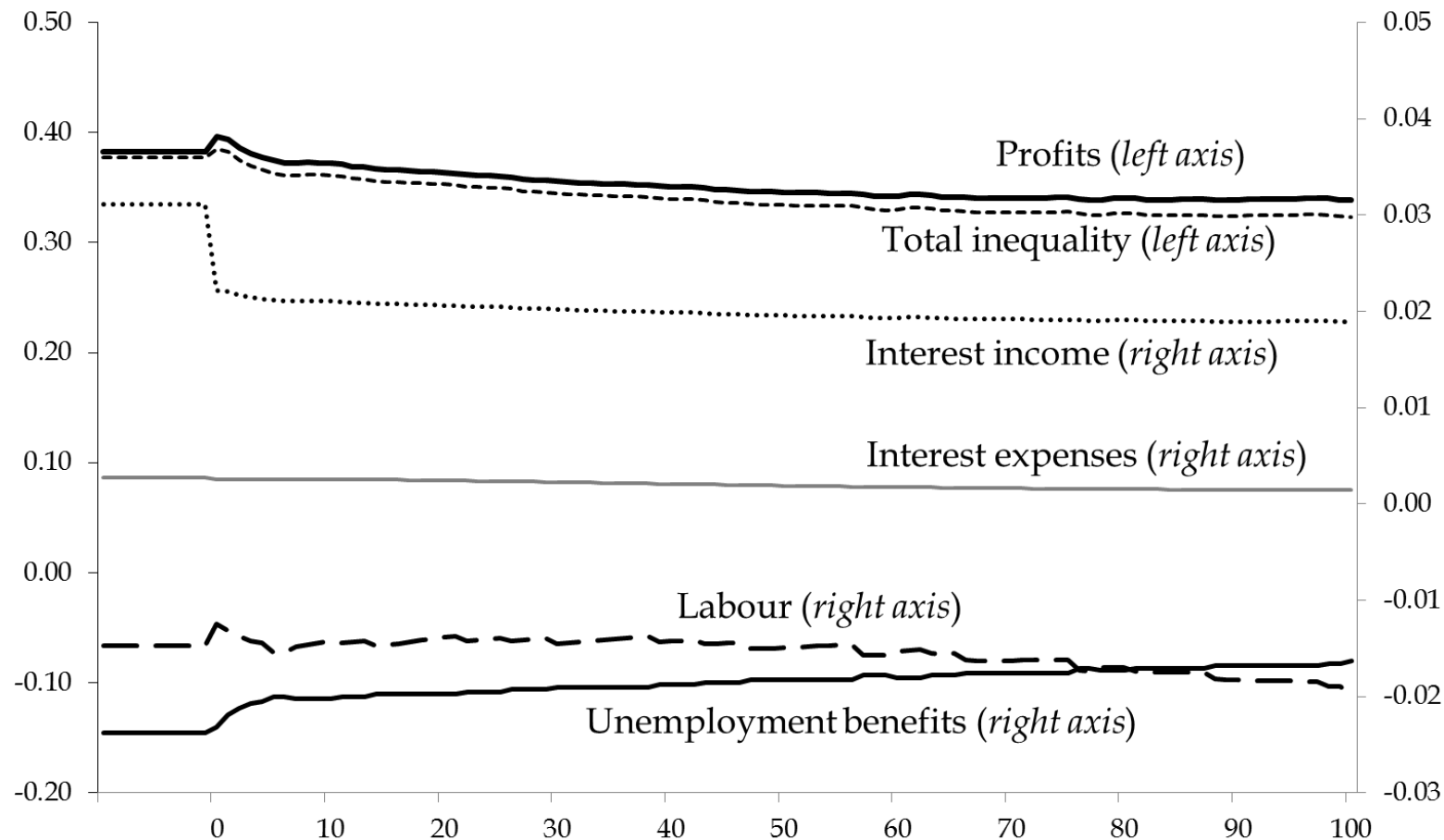
4. SIMULATION RESULTS

Macroeconomic activity



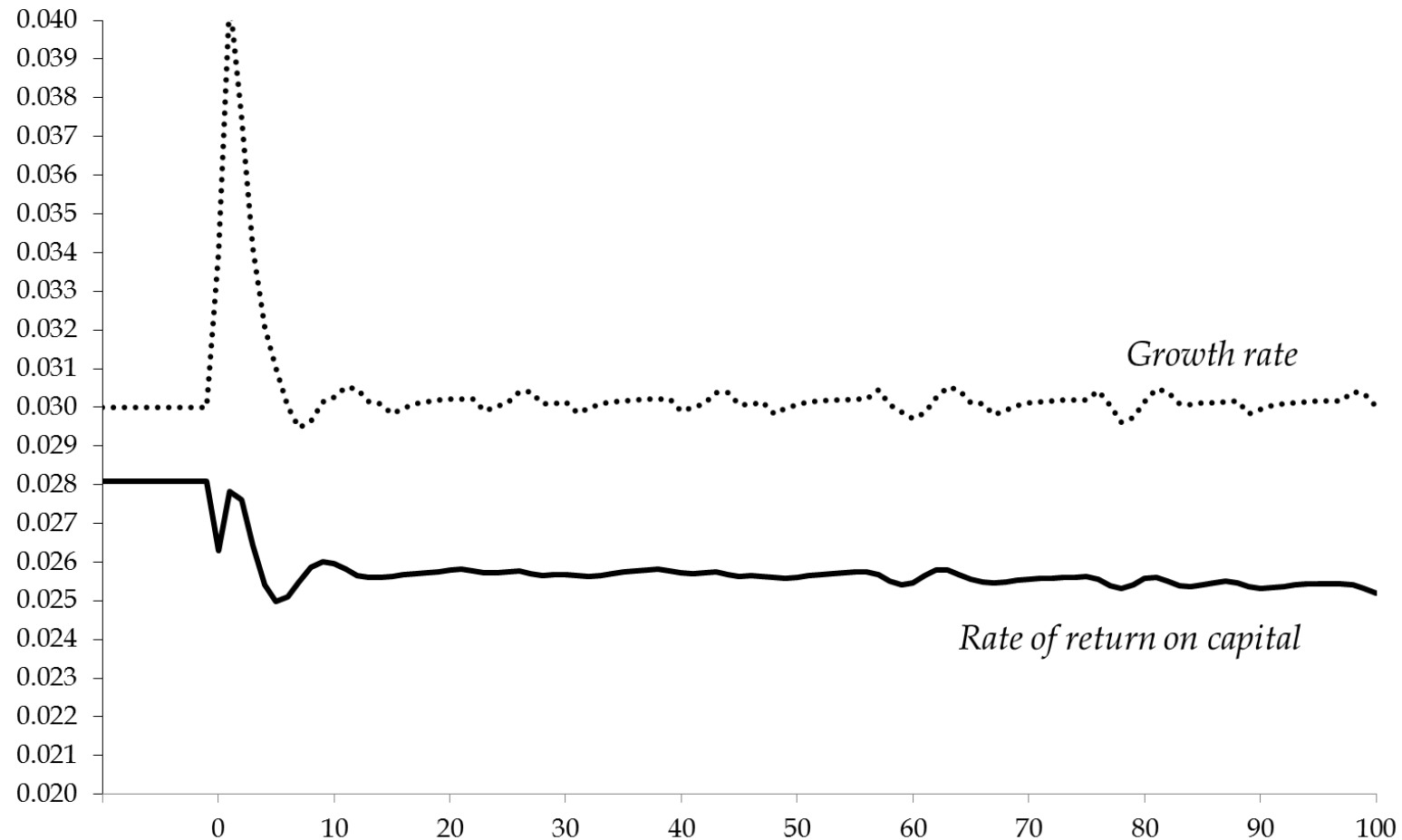
4. SIMULATION RESULTS

Decomposition of inequality by income source



4. SIMULATION RESULTS

Growth rate and return on capital (based on Piketty, 2014)



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5. FUTURE RESEARCH

- Various extensions of our analyses are necessary in future work:

First, other aspects of monetary policy need to be examined (e.g. inflation, quantitative easing).

Second, the quantitative importance of the various channels put forward in the paper need to be investigated empirically. For example, the ‘interest payments’ channel might be different between countries with different institutional and financial structures. Moreover, the ‘macroeconomic activity’ channel might be different when perceived uncertainty and liquidity preference change.