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Job Guarantee: a Structuralist Perspective

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Abstract

The structuralist and Stock Flow Consistent (SFC) approaches share some common grounds. Computable General Equilibriums (CGE) models, often used by structuralists, are based on Social Accounting Matrices, which are close SFC's Transaction Flow Matrices. However, the analysis of structuralists model is more on the meso-level while SFC models are rather at macro-level. Our paper is a step, following Missaglia (2011), towards the creation of a structuralist/SFC model. We introduce several new features in an SFC model: (i) a more disaggregated households sector than usual, (ii) three production sectors and the possibility of constrained output, and (iii) a more elaborated labor market with endogenous labor supply. We use the model to compare two Keynesian policies: the Job Guarantee (JG) and a traditional Keynesian Demand Spur (KDS).

Keywords: Job Guarantee, Structuralist, Stock-Flow Consistent
JEL Codes: E12, E24, L16

1 Structuralism

The structuralist approach (Taylor, 1983, 1990, 2004) concentrates on the dynamics of a growing economy. As the economy evolves, its structure and characteristics change constantly. Structural change is thus at the hart of the structuralist approach. Most of the authors analyze developing economies and, with the help of models, formulate policy recommendations (see Ocampo (2005); Taylor and Rada (2006); Taylor and von Arnim (2006); Rada and von Arnim (2011) among others).

According to (Taylor, 1990, Chapter 1), six general hypotheses are shared by structuralists authors:

- Powerful economic actors are price makers and identifying those actors is essential in the design of a model.

- Macroeconomic equilibriums, even if influenced by microeconomic features, depend overall on aggregate variables such as investment, consumption. Full employment is not necessarily the state of affair prevailing in a macroeconomic equilibrium.

- Money is endogenous.

- Finance matters and financial fragility is an ever present risk. Nexus between the real and financial sides of the economy are crucial.

- Capital control and import substitution are required to support local production.

- Development is not a smooth process. Technical change and innovation are key aspects of the development process.

It seems to us that the theoretical approach of structuralist scholars is very close to the post-Keynesian (PK) approach. Most of PK authors would agree with the aforementioned hypotheses. Furthermore, Computable General Equilibriums (CGE) models, often used by structuralists, are very close to Stock Flow Consistent (SFC) models. Indeed, CGE are based on Social Accounting Matrices (SAM) and input-output matrices, which are very close to the Transaction Flow Matrices and Balance Sheets of SFC models. However, structuralist models differ from their SFC counterparts in that they are more disaggregated. Indeed, one could put CGE models within the "meso-economic" category, rather than the macroeconomic one. This is particularly true for large CGE models such as those used by the World Bank or the FAO.

Our paper is a step, following Missaglia (2011), towards the creation of a structuralist/SFC model. This paper is not a growth model and is only composed of three sectors. Nonetheless, it already allows to observe structural and pricing interdependencies. Furthermore, we introduce the complementary slackness conditions or the "complementary problem" that allows for price and output to be complement (Missaglia, 2010, 2011). That is prices are mark-up

price if the output constraint (demand smaller or equal to supply) is not binding. If the output constraint is binding, then prices are such that the market clears.

We also develop a more complex labor market than usually observed in SFC models. Indeed, we follow Seccareccia (2004) and have an inelastic labor supply curve. Furthermore, we endogenize the labor supply via the introduction of endogenous participation rate and average hours worked. Finally, we disaggregate the households sector in three different sectors: unemployed workers, wage earners and capitalists. This will allow us to analyse income distribution.

The model is then used to compare two policies: the Job Guarantee (JG) and a traditional Keynesian Demand Spur (KDS). The model will be used to analyze the critiques to the JG described in section 1.1. Particularly, we will address the critiques regarding inflation (Ramsay, 2002-3; Palley, 2001), budget deficit (Sawyer, 2003; Aspromourgos, 2000) and wages (Seccareccia, 2004).

This chapter is structured as follows: this section describes the JG scheme and its critiques. Section 2 describes the model, its structure and the modeling hypotheses. Section three will present the results. We ran several simulations representing different scenarios: (i) no sector is constrained, (ii) one or more sectors are constrained, (iii) a budget balancing policy is implemented, and (iv) labor supply is endogenous. Finally, section four concludes.

1.1 Job Guarantee in a nutshell

JG programs have been declined in different versions according to how to set wages and benefits, target populations, type of projects to be included in the program, administrative way to deal with the program, way to finance it, etc. The version described here is the one proposed by Wray[1] in his article published by the ILO in 2007 Wray (2007a). Practical examples of such job guarantee schemes exist, even if never developed on a full scale[2].

1.1.1 Design of a JG program

Wray proposes "a universal job guarantee with a single compensation package for all participants". He recommends that the program provides full time (or part-

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[1] Many scholars from the Levy Economics Institute of Bard College and the Center of Full Employment and Equity (CofEE) propose job guarantee programs, see Forstater (1998, 2006); Mitchell (2007); Papadimitriou (1999); Wray (1998, 2007b, 2012); Murray and Forstater (Forthcoming), among others.

Furthermore, the crisis has shed some light on the work of Minsky, creating burgeoning literature around his work.Mastromatteo (2011) analyses Minsky's work and calls for the creation of JG. Wisman (2008) explores the functional role of unemployment and its personal costs. He then argues for the creation of a JG program. Finally, he analyses existing employment policies that are close enough to a Job Guarantee policy and wonders why no country ever enabled a full employment scheme, given the negative impact of unemployment both on the personal level and in aggregate.

[2] The *National Rural Employment Guarantee Act* in India and the plan *Jefes y Jefas de Hogar Desocupados* in Argentina are examples of such policies (UNCTAD, 2010; Kostzer, 2008)

time when required by the applicant) jobs to anyone who is in legal age, able, ready and willing to work in exchange of a compensation package. Education and training should be part of the activities proposed under JG schemes. Since the goal of JG workers is to be hired in private enterprises, they should be given the opportunity to complete/improve their education level. In addition, job searching should be proposed as an activity during the first weeks of the beneficiary life in the program.

Community services, environment protection jobs, infrastructure creation or maintenance could be other activities proposed by the program. The administration of the program should be, according to Wray, highly decentralized in order to fit with the local realities. The federal government should provide funds for the employees and a part of the capital cost of each project funded by the JG scheme. The rest of the capital cost would be the burden of local governments. Each project would thus be implemented in cooperation between the federal and local governments and/or NGOs. A number of projects may be designed as "permanent" while the rest of the projects would be "need based". This structure would allow postponing these need-based projects in time where JG employment is declining.

1.1.2 Objections to JG

Full employment policies are highly controversial[3], not only because some think that they might be inflationary or they might create important budget deficits but also because they are difficult to defend politically, we briefly sketch here some of the relevant critiques.

Sawyer (2003) claims that JG programs are no more than a "pump-priming" attempt to stimulate aggregate demand. And as such, any fiscal or monetary expansion policy would attain the same effects as a JG scheme.

Ramsay (2002-3) argues that JG program is likely to add pressure on prices and would thus create inflation as unemployment goes under a certain limit (like NAIRU). Moreover, he adds that there would also be a wage increasing cycle due to the fact that JG is more appealing than current unemployment, triggering another form of inflation.

JG critics claim that JG advocates have underestimated the impact of JG financing on the budget (Sawyer, 2003; Aspromourgos, 2000). They argue that the financing has either inflationary effects or that the government will be increasingly indebted year after year.

Many critiques pinpoint the lack of structural analysis of JG schemes (Kadmos and O'Hara (2000); Moudud (2006)). These authors argue that prices and wages inflation might arise because of capacity constraints or because of the structure of the economy. They claim that the JG would not be able to tackle unemployment rising from these structural aspects.

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[3]The heated debate going on in the blogosphere between ELR proponent and contenders is a good example of the vitality of the controversy, see for example NewEconomicPerspective (2012); Palley (2012).

Seccareccia (2004) brings an interesting critique to JG. He considers that the JG would lead to a low-wage full employment. The argument is based on a more elaborated labor market than usually assumed in most post-Keynesian works. He notes that the labor supply curve as a function of the average wage prevailing in the economy should not be considered completely inelastic but should rather viewed as upward sloping with varying slope (see figure 1). If we accept such a labor supply curve, then there are two full-employment equilibrium positions, A and B on the graph. He calls B the "low-wage" full employment and notes that this equilibrium might arise in developing countries in which massive underemployment (the distance between L_B and L_A) is the norm. On the other hand, equilibrium A, the "high-wage" full employment, would prevail in developed capitalist economies. Any economy with unemployment is in a situation between w_A and w_B and the unemployment level is equal to the distance between the labor supply curve (L_S) and the labor demand curve (L_B).

Seccareccia goes on by discussing whether the JG program would lead to equilibrium A or B. He affirms that trough inflationary pressure and due to political constraints the JG would lead to equilibrium B. He thus argues that JG schemes would be counter productive if the goal is to achieve more equal income distribution, even if these programs are an interesting step in the right direction, particularly because they tackle the social costs of unemployment.
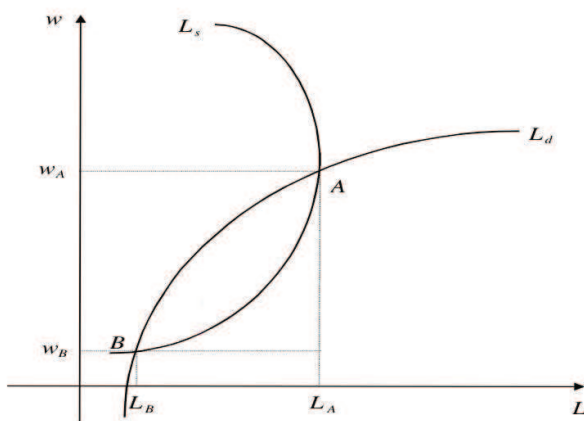

Figure 1: Labor market characterization (Seccareccia, 2004)

1.2 Overview of the model

The Stock Flow Consistent model presented here is designed so that it can be used to analyze the critiques and comments to a Job Guarantee scheme. The economy modeled in this paper is composed of three household sectors (unemployed workers, wage earners and capitalists), three productive sectors (capital goods, energy and widgets), a banking sector and a public sector. Figure 2 rep-

resents the flow diagram of the model. Both household sectors and the public sector consume widgets and electricity (thin dashed lines on the diagram). All productive sectors use energy, fixed capital (produced by the capital good sector, thin dash-dotted line) and labor (thick solid line) to produce their own goods. In order to invest, firms borrow money from banks and pay interests (thick dotted line) or emit equities and pay dividends (thick dashed line). Finally, industries pay wages to workers (thick solid line). Households sectors save part of their wealth as cash on their deposit account (thin solid lines) or as equities (thick dash line). Banks balance their liabilities (current accounts) with loans to firms and bond holding (thin dotted line) for which they receive interests. The government imposes a tax on wages and profits (thick dash-dotted lines), pay interests on bonds and give a dole to unemployed workers (thick dashed line).
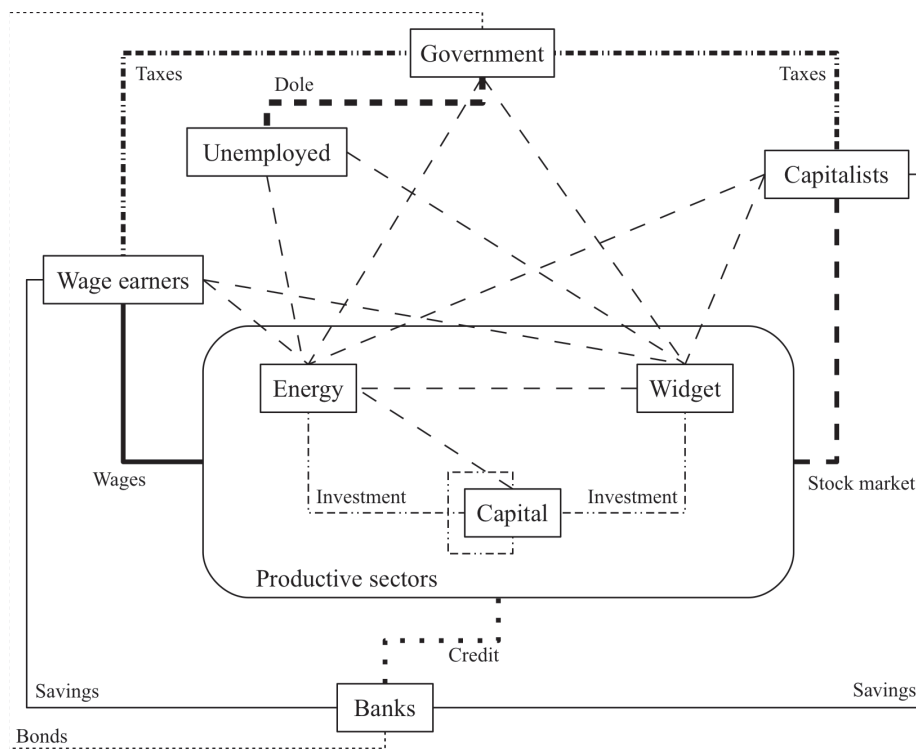

Figure 2: Flow diagram: each line represents a group of flows between two sectors. Each group of flow might be bi-directional. For example, the line linking capitalists and the productive sectors represent flows from capitalists to the productive sectors (equities bought) and from the productive sectors to capitalists (dividends).

2   A multi-sectorial SFC model

The economy presented here is composed of three households sectors; unemployed workers, wage earners and capitalists, three production industries; energy, investment and widget, a banking sector and one public sector. As already explained, some goods produced in one industry serve as inputs for other industries. Finally, the model presents a financial market where equities from the three productive sectors are sold. This implies that capitalists have to make a portfolio choice between each of the four financial assets[4] they hold. This also implies that firms may chose between two sources of finance when investments are larger than retained earnings.

Only three industries are modeled. Lee (1998) criticizes aggregate model having only one sector pointing out the lack of pricing interdependencies. This critique does not apply to our model since we will be able to observe some pricing interdependence as the three productive sectors are using output of other industries as input for their own production.

2.1   Structure of the model

Table 2 is the Balance Sheet. It represents how stocks are distributed among the different sectors. It shows that net worth of firms is equal to the difference between their assets (capital stocks) and their liabilities (loans and equities). It also indicates that banks have no net worth as they use bond holding to balance their liabilities and assets[5]. Private wealth is thus composed of deposits from both workers and capitalists and equities held by capitalists. It is assumed that unemployed workers are consuming all their income and thus have no wealth.

The Transaction Flow Matrix (TFM, table 1) ensures that the sum of all flows is always nil. A plus sign expresses an inflow while a minus sign represents an outflow. For instance, the fourth row shows that wages are paid by the three productive sectors to wage earners and thus come with a minus sign in the Energy column and with a plus sign in the Wage earners sector. We can see that dividends are distributed to the capitalist class. Household sectors consume both energy and widgets, pay taxes (T_h and T_{ca}) and save everything left either as deposits (ΔD_w and ΔD_{ca}) or as equities ($\sum \Delta(E_x p_{e,x})$). An important feature of the SFC approach is that it specifically accounts for capital gains. The variation of assets held by capitalists is equal to capitalists' savings plus capital gains. Banks hold deposits from both kinds of households, receive interests for the loans accorded to firms and from the bonds they hold and pay interests on deposits. Finally, government, seen here as both the government and the central bank, consumes both energy and widgets, transfers an unemployment benefit (YD_u) to jobless workers and pays interests on bonds to banks. The change in stock is represented in the second part of the TFM.

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[4]On top of the three kinds of equities, capitalists may also hold deposits.
[5]In the case of negative bond holdings, this could be seen as central banks advances. In that case, interests would be paid at the bonds interest rate.

	Unempl.	Workers	Capitalists	Consumption		Energy		Capital		Banks	Govt	$\sum$
				Current	Capital	Current	Capital	Current	Capital			
Consumption	$-c_{u,c}p_c$	$-c_{w,c}p_c$	$-c_{ca,c}p_c$	$p_c y_c$							$-C_{g,c}$	0
Energy	$-c_{u,e}p_e$	$-c_{w,e}p_e$	$-c_{ca,e}p_e$	$-c_{c,e}p_e$		$p_e y_e$		$-c_{k,e}p_e$			$-C_{g,e}$	0
Capital					$-Ic$		$-Ie$	$p_k y_k$	$-Ik$			0
Wages		$\sum N_x W_x$		$-N_c W_c$		$-N_e W_e$		$-N_k W_k$				0
Transfers	YD_u										$-YD_u$	0
Taxes		$-T_w$	$-T_{ca}$								T	0
Loans int.				$-i_l L_{c,-1}$		$-i_l L_{e,-1}$		$-i_l L_{k,-1}$		$i_l \sum L_{x,-1}$		0
Deposits int.		$i_d D_{w,-1}$	$i_d D_{ca,-1}$							$-i_d \sum D_{x,-1}$		0
Bonds int.										$i_b B_{s,-1}$	$-i_b B_{s,-1}$	0
Dividends			$F_b + \sum FD_x$	$-FD_c$		$-FD_e$		$-FD_k$		$-F_b$		0
Retained earn.				$-FU_c$	FU_c	$-FU_e$	FU_e	$-FU_k$	FU_k			0
Savings	0	sav_w	sav_{ca}	0	sav_c	0	sav_e	0	sav_k	0	sav_g	0
Capital Gains			$+\sum CG_x$									0
Δ Dep.		$-\Delta D_w$	$-\Delta D_{ca}$							$\sum \Delta D_x$		0
Δ Loans					ΔL_c		ΔL_e		ΔL_k	$-\sum \Delta L_x$		0
Δ Bonds										$-\Delta Bs$	ΔBs	0
Δ Equities			$-\sum \Delta(E_x p_{e,x})$		$\Delta(E_c p_{e,c})$		$\Delta(E_e p_{e,e})$		$\Delta(E_k p_{e,k})$			0
$\sum$	0	0	0	0	0	0	0	0	0	0	0	0

Table 1: Transaction Flow Matrix

	Unempl.	Workers	Capit.	Cons.	Energy	Capital	Banks	Government	$\sum$
Deposits		D_w	D_{ca}				$-\sum D_x$		0
Loans				$-L_c$	$-L_e$	$-L_k$	$\sum L_x$		0
Bonds							B_s	$-B_d$	0
Capital				$k_c p_k$	$k_e p_k$	$k_k p_k$			$-pk\left(\sum k_x\right)$
Equities		$\sum E_x p_{e,x}$		$-E_c p_{e,c}$	$-E_e p_{e,e}$	$-E_k p_{e,k}$			0
Net Wealth	0	V_w	V_{ca}	V_c	V_e	V_e	0	$-B_d$	$-pk\left(\sum k_x\right)$

Table 2: Balance sheet

2.2 Households

2.2.1 Unemployed workers

Unemployed workers perceive a dole from the state and consume all their income. Their consumptions of energy and widget is determined trough a Linear Expenditure System (LES) reflecting their preferences over energy and widget and according to relative prices[6].

2.2.2 Wage earners

Wage earners offer their labor for a salary and perceive interests for their deposits. Their aggregated nominal disposable income is thus composed of the wage bill minus taxes, and of interests on deposits.

We assume that workers of each industry x target a real hourly wage (1) based on the hourly labor productivity of the industry ($pr_{n,x}$), aggregate unemployment (u) and the difference between previous period average real hourly wage among all industries ($W_{m,-1}$) and previous period real hourly wage in industry x[7].

$$w_x^T = \Omega_{0,x} + \Omega_{1,x} \log(pr_{n,x}) + \Omega_{2,x} \log(1 - u) + \Omega_{3,x}(\frac{W_{m,-1}}{cpi_{w,-1}} - \frac{W_{x,-1}}{cpi_{w,-1}}) \quad (1)$$

We suppose that wage earners construct a Consumer Price Index and an inflation rate based on their preferences and on prices of energy and widgets. We then define an expected real disposable income based on Haig-Simons' definition[8] in order to determine their consumption level. Total real consumption is a function of expected Haig-Simons' real disposable income and real wealth in previous period. As for unemployed workers, wage earners' consumption of energy and widget is determined trough a LES. All disposable income that is not consumed is saved as deposits.

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[6]The list of all equations can be found in appendix A.

[7]This equation differs from (Godley and Lavoie, 2007, Chapter 9) in order to account for the impact that the JG wage might have on industrial wages, as asserted by Seccareccia (2004), see section 3.3 for more details.

[8]Haig (1921) and Simons (1938) define income as the sum of consumption and variation in wealth. According, to (Godley and Lavoie, 2007, pp 293-294), Haig-Simons' real disposable income is composed of real disposable income minus the loss of real wealth due to inflation.

Due to Knightian/fundamental uncertainty, expectations on disposable income are backward looking over 4 periods and contain a learning process (2).

$$YD_w^e = \overline{YD_w} + \psi \left(YD_{w,-1} - YD_{w,-1}^e \right) \tag{2}$$

2.2.3 Capitalists

Capitalists' aggregate disposable income is composed of profits from all productive sectors and banks, minus taxes plus interests from deposits. As wage earners, capitalists consume both energy and widgets and save all income that is not spent. Expectations formation is similar for capitalists and wage earners. However, capitalists add expectations on capital gains to their expected disposable income (3). This implies that capital gain stimulates capitalists' consumption also via an income effect and not only via wealth effect.

$$YD_{ca}^e = \overline{YD_{ca}} + \psi \left(YD_{ca,-1} - YD_{ca,-1}^e \right) + \sum CG_x^e \tag{3}$$

Wealth of capitalists consists in their equities holding and deposits. A portfolio choice determines the distribution of capitalist wealth between the four different assets, where deposits are the buffer stock.

2.3 Industrial sectors

2.3.1 Demand

All production sectors are demand-driven. They all need fixed capital stock in order to produce. All productive sectors need electricity in order to produce their respective goods. Sectorial demands in electricity are determined through energy productivity in each industry. The energy sector has a demand equal to household consumption plus demand from the two other productive sectors and from the public sector. Aggregate demand for widget is equal to households' and government's desired consumption. Demand in the capital good industry is composed of investment from the three productive sectors. Capital stock level determines maximum output to be produced in each period.

2.3.2 Employment

A novelty aspect of this model lies in the treatment of labor demand and labor supply. We describe here a first simplified version of the labor market dynamics, see section 3.3 for more details. Employment in each sector is demand-determined through sectorial productivity. Firms determine the number of work-hours needed to produce their output and then determine their employment level depending on the number of hours worked per employee. At first we assume the numbers of hours worked per employee to be exogenous, however in section 3.3, we relax that assumption. If total employment is such that it would be above full employment, we assume that workers accept to work overtime[9] so

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[9]We assume that in that case there is no increase in hourly wage, without loss of generality. However, wages will increase in the next period due to low or even non-existing unemployment.

that unemployment actually disappears but does not become negative. Firms assume as many workers they need to produce enough goods to satisfy the demand they face. We assume perfect mobility of labor and no differentiation of workers. Firms hire workers from the labor force up to the level of employment they need. Unemployment is equal to the difference between labor force and aggregate employment.

2.3.3 Investments

Desired capital growth (g_k, 4) is function of *actual* capacity utilization[10] (u) and *targeted* capacity utilization (u^T)[11]. Capacity utilization (5) is defined as the ration of actual output (y) and practical[12] full capacity output (y_{fc}) which is computed through (6) where pr_k is capital productivity under normal conditions. Real investment is equal to desired capital growth plus depreciation rate but cannot be negative (7).

$$g_k = \gamma_0 + \gamma_1(u_{-1} - u^T) \tag{4}$$

$$u = \frac{y}{y_{fc}} \tag{5}$$

$$y_{fc} = k\ pr_k \tag{6}$$

$$i = \max[g_k + \delta, 0]k_{-1} \tag{7}$$

2.3.4 Costs

Unit costs are determined by unit labor costs and unit electricity costs. Unit costs thus depend on the price of labor, which is different for each industry, price of electricity, and both the productivities of labor and electricity. Nominal wages are fixed in each productive sector based on previous period targeted and prevailing real wages.

2.3.5 Prices

Prices are Kaleckian markup prices based on unit cost[13]. The markup is endogenously determined so that the expected profit rate net of interests is equal to its target value (Lavoie, 1992). Expected profits depend on expected sales and on unit costs. That is, they depend on the capacity utilization rate[14]. If the

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[10]In this paper, we follow Robinson (1969) in that firms might make mistakes in their estimation of output growth creating unwanted excess capacity; and Lavoie (1992) as firms also plan some excess capacity in order to avoid to constrain demand in case of large growth in demand.

[11]We use here a simplified version of Fazzari and Mott (1986-1987), and Lavoie and Godley (2001-2002), since we assume that firms have fixed targeted leverage level and return rates. The effect of these normally non-fixed variables is thus contained in γ_0. The formulation of the investment function is similar to Lavoie et al. (2004)

[12]*Practical* or *engineer-rated* full capacity is the maximum level of production such that it allows normal maintenance and renovation of machinery to take place without impeding production (Eichner, 1976), (Steindl, 1952).

[13]For more information on post-Keynesian pricing theory, see Lee (1998)

[14]For more details on this topic, see Missaglia (2007)

capacity utilization is expected to rise (due to higher demand), the markup will decrease, leading to a decrease in prices. Profits are divided between dividends and retained earnings where dividends are a fixed share of profits.

2.3.6 Finance

Investments are financed via retained earnings at first and then equities emission and loans. We assume that equities emission is a fixed share of the expected needs for finance, defined as the difference between investments and expected retained earnings. As for households, expectations are backward looking over the last 4 periods with a learning term. Loans are then determined as the residual.

2.4 Banking sector

Banks are not supposed to hold any reserves; they balance the stock of deposits with the stock of loans plus the stock of government bonds. We assume that banks respond positively to all loans demand and that loans are always repaid. Bonds' holding is then a residual choice. Profits are made of interests from loans and bonds minus interest on deposits paid to households.

2.5 Government sector

Public sector revenues are given by tax receipt while expenditures are composed of energy consumption, widget consumption and unemployment subsidies. We assume, at first and with no loss of generality, fixed total real public consumption of energy and widget. Bonds' demand is determined by banks while bonds' supply is equal to the budget deficit.

3 Results

Several simulation were conducted using Mathematica[15], this section contains the analysis of the results obtained. A list of the endogenous variable and of the value of the exogenous parameters may be found in appendix B.

3.1 Job Guarantee vs. Keynesian Demand Spur

The first set of scenarios compares the structural change the economy undergoes when two different shocks are applied. The first shock is the creation of a JG scheme where the prevailing wage is such that the increase in total government spending is of 3%, given the level of unemployment. The JG wage is equal to 14 961 while the dole was equal to 11 882. The assumption being that all unemployed workers start working for the JG and thus that unemployment disappears. As we are interested by the comparison between the JG and KDS

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[15]The code may be requested from the author.

policies, we assume away all eventual output of the JG scheme[16] and thus only concentrate on the impact the JG might have on aggregate demand.

The second shock is a Keynesian Demand Spur (KDS hereafter), or, in other words, is an increase of real government spending in energy and consumption goods such that the increase in total government spending is of 3%, given the prices of energy and consumption goods. These quantities remain fixed afterwards, regardless of the variation of prices for each good. The assumption of this shock is that the government tries to reduce unemployment by increasing the aggregate demand.

Five sets of simulations have been run for both shocks. Each scenario is distinguished by the level of capacity utilization of the different productive sectors. The goal of these simulation is to observe how the results are affected if one or more sector reaches full capacity output. When a sector reaches full capacity output, it reacts by increasing its prices so that the market clears. However, all actors do not have the same purchasing power: indeed since we assume that the government has real consumption targets, market clearing prices only impact their nominal consumption. On the other hand, market clearing prices impact households and productive sectors since their consumption/investment decision are nominal.

3.1.1 Without output constraints

Figure 3 shows the results for the first scenario. That is, all capacity utilization rates at the steady state are low enough so that all sectors may respond to the increase of demand due to each shock. The solid lines are for the JG shock while the dashed ones are for the KDS. All results are relative to the initial steady state. The results show that the KDS has a stronger effect on total private employment than the JG scheme. This leads to higher income and wealth for wage earners in the KDS case. However, the JG scheme has a stronger impact on unemployed workers/JG workers. Indeed, in the JG case, all those that do not find a job in the private market, can work for the JG scheme and enjoy a larger income. The JG scheme is thus more efficient in terms of poverty alleviation. As a matter of fact, the Gini coefficient[17] for the income distribution passes from 0.247 to 0.234 in the JG case while it passes from 0.247 to 0.236 in the KDS case. This clearly shows that both policies have a positive impact on aggregate demand (and thus on aggregate private employment) and on income distribution. However, the KDS has a more important impact on the aggregate demand while the JG improves more the income distribution. The Government deficit graph shows the government deficit to government spending ratio, the peak of deficit occurs when either policies are enabled (that is period

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[16]It is obvious that the JG scheme should be developed so that its output are useful and needed by the population. For an example of Guaranteed Green Jobs, see Godin (Forthcoming).

[17]The Gini coefficient is a measure of statistical dispersion, in our case income dispersion. It is computed for all households having an income, that is the labor force plus capitalists (assumed to be 5% of the population). We use 10 deciles to compute the Gini coefficient following the formula explained in appendix C. The lower the Gini, the more equal the distribution.

10). Interestingly while the targeted increase in spending was of 3% it leads only to a 2% deficit indicating that taxation revenue increase as well. The KDS case shows a slightly longer deficit than the JG case but the trends are very similar.

Private employment

Government deficit

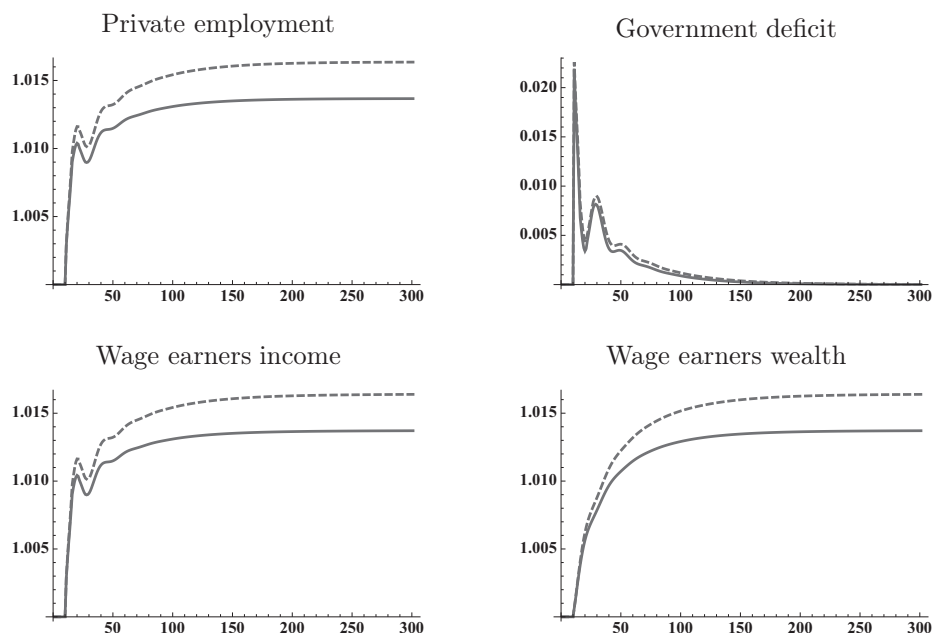Wage earners income

Wage earners wealth

Figure 3: Scenario 1: Private employment, government deficit to government spending ratio, wage earners income and wealth for the JG policy (solid) and the KDS policy (dashed).

3.1.2 The case of excess demand

Figure 4 shows the results for the second scenario, for the KDS case only (results for the JG have identical trends but lower magnitude). That is, the capacity utilization rate of the consumption good sector before the shock is such that the increase in demand resulting from the policy shock implies to reach the limit of full capacity utilization. Since consumption goods output is constrained, consumption price rises so that the market clears while the prices of energy and capital decreases due to the sudden increase in demand in those sector, implying an increase in capacity utilization and thus a decrease in the markup. This increase in price in the consumption good sector implies larger profits and thus larger dividends and retained earnings. This impacts market capitalization and loans. Once the capital stock in the consumption sector has increased allowing for excess capacity, consumption price decreases, profits follow the same trends and the market capitalization returns to level similar to the two other sectors.

Nevertheless, the stock of loans in the consumption industry is irremediably under the levels of the other sectors.

The conclusions of this first experiment are that an increase in demand coming from either the government spending or from higher households consumption may lead to inflationary phase, especially in those sectors that are close to full capacity utilization before the shock. Because the consumption good is not an input for the two other sector, its increase in price does not have any direct impact on their prices, however it does impact them indirectly via wages. Yet, this inflationary impact is countered by the deflationary impact due to the increase in capacity utilization and thus of profits rates that all sectors observe. The second conclusion is that the structure of the production sector matters, indeed the scenario shows that the stock of loans in the consumption sector is lower than its initial values while the stocks of loans have increased in the two other sectors. This shows that fiscal policies have impacts on the structure of the economy and that policy makers should try to foresee these impacts.
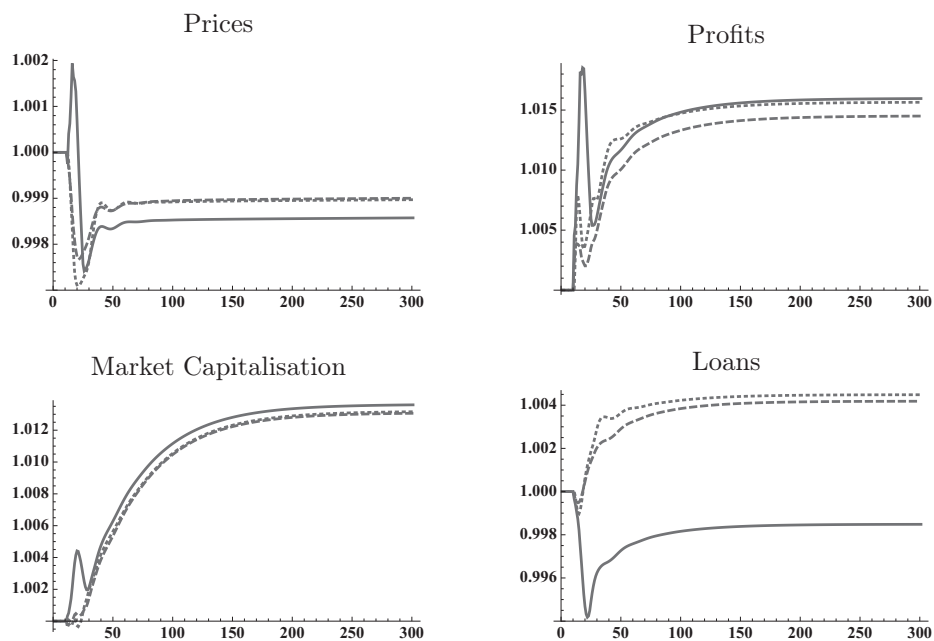

Figure 4: Scenario 2: Prices, Profits, Market capitalization and Loans for the consumption good sector (solid), the energy sector (dashed) and capital good sector (dotted) for the KDS shock when the initial steady state has a capacity utilization rate of 99.5% in the consumption good sector.

3.1.3 Constrained output

Figure 5 shows the results for the third scenario, for the JG case (solid) and the KDS case (dashed) when the initial steady state capacity utilization rates

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are of 99.5% in all sectors. This scenario is very similar to the second scenario except that all prices increase due to full capacity utilization in all sectors. The economy undergoes a phase of strong turbulences as all actors are competing to obtain capital goods, energy and consumption goods. We only show the capacity utilization rates and prices for the capital goods industry, as it is the sector which undergoes the longest period of full capacity utilization. This is due to the fact that investments in all sectors remains positive when the capacity utilization is above its steady state value, even if lower than one. It is thus only when both the energy and consumption goods sectors are close to their steady state capacity utilization rates that investments decrease and that the demand of capital goods decreases under full capacity supply. We observe that the inflationary period is longer in the KDS case than in the JG one. This is caused by the fact that excess demand in the KDS case is less subject to inflationary impacts. Indeed, in the KDS case, the government fixes a real demand, regardless of the prices. On the other hand, the increased demand coming from household sectors both in the KDS case and in the JG case is eroded by inflation due to wealth and income effects. The demand shock due to the JG policy is thus less persistent.

This scenario thus shows that, as previously noted, all demand-related employment policies might have inflationary impacts, depending on the current structure of production. However, households' income and wealth is more subject to inflationary erosion than government spending and thus leads to shorter inflationary periods. Furthermore, while the KDS policy leads to a higher private employment level, it does not tackle the issue of full employment and, above all has a lower impact on poverty. Indeed, the increase in real income for unemployed workers is around 0.3% for the KDS case, because of the price decrease, while it is of 36% in the JG case both because of price deflation and because of increased income. The Gini coefficient at the end of the scenario is equal to 0.204 in the JG case and to 0.205 in the KDS case, starting from a 0.213 value.
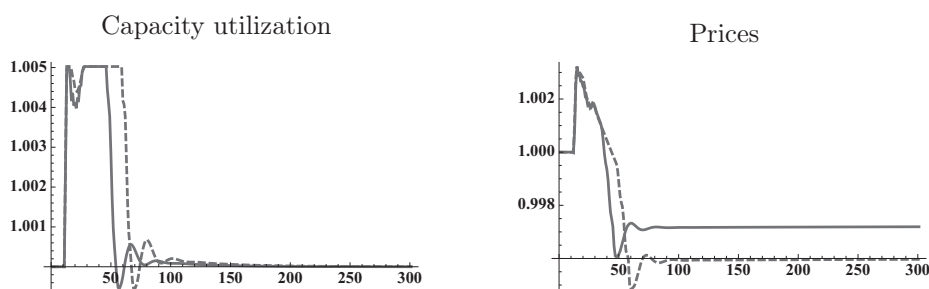

Figure 5: Scenario 3: Capacity utilization and Prices for the capital good sector in the case of the GJ (solid) and the KDS (dashed) when the initial steady state has a capacity utilization rate of 99.5% in all productive sectors.

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3.2 Balanced budget

Some critiques of JG regards the impact that the scheme would have on the government budget and above all on the government deficit (Aspromourgos, 2000; Sawyer, 2003). This is why we endogenize government spending and tax rate. The government reacts to a budget deficit (resp. surplus) by increasing (resp. decreasing) the tax rate and/or decreasing (resp. increasing) government spending in the next period, targeting a balanced budget. We run four sets of simulation where the decisions made to balance differ between impacting: (i) only taxes, (ii) only spending, (iii) taxes and spending in the same magnitude. The last set of simulations is a replication of case (iii) but where the productive sectors have higher capacity utilization rate targets.

Figure 6 shows the results for the fourth scenario. This scenario is identical to scenario 3 but the government responds to a budget deficit by increasing taxes and reducing spending. We assume that 50% of the budget deficit is reduced by tax increase and the remaining 50% are covered by reduced spending. The first observation to be made is that the overall impact of each policy is seriously dampened by the balancing policy. This results in much lower impact on aggregate private employment (around 0.3% increase for both policies in this scenario compared to 13% (resp. 18%) increase in the case of the JG (resp. KDS) for the third scenario). However, the balancing policy implies that the transition phase is much shorter in this scenario.

The second observation regards the structural impact that each policy has. The output graph shows that while the level of capital output (dotted lines) is roughly identical in the JG case (black) and in the KDS case (gray), output level for the consumption (solid) and energy (dashed) industries are completely different. This can be explained by the different "preferences" parameters between government consumption and households' consumptions. This shows again the importance of evaluating the structural impact of policies.

The last observation to be made regards the impact that each policy has on the budget deficit and on the level of public debt. The peak of government deficit relative to government budget is of around 2.5% for both policies while the impact on the debt level is of around 0.1%. However, the impact on poverty and employment are radically different. In the case of the KDS, the spur of demand when the policy is enabled is rapidly compensated by the balancing budget policy. This shows that it is possible to obtain full employment trough a JG scheme and a balanced budget. The resulting higher employment is due to the wealth effect of households' consumption that the increased public debt implies. However, in the JG case, unemployed workers are now working for the JG scheme and earn an income much larger than the unemployment subsidy. The JG policy implies a redistributive process where the increase in output benefits almost only to JG workers while in the KDS case this is not the case. In this scenario, the Gini coefficient is much smaller in the JG case (0.208) than in the KDS case (0.212) indicating the better redistributive performance of the JG policy.
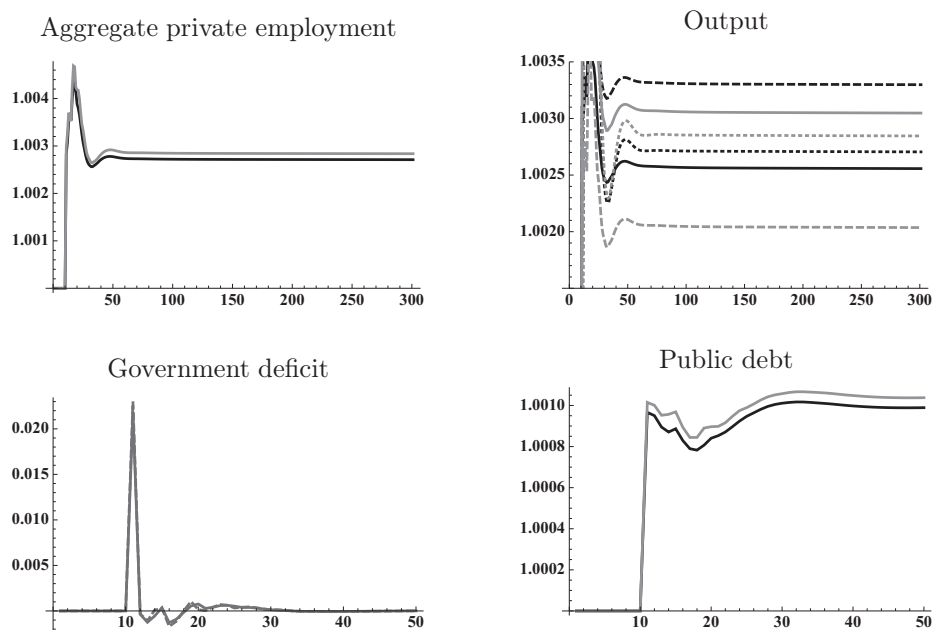
Figure 6: Scenario 4: Aggregate private employment, government deficit relative to government spending and public debt in the case of GJ (black) and KDS (gray) when the initial steady state has a capacity utilization rate of 99.5% in all productive sectors. Output for the consumption (solid), energy (dashed) and capital (dotted) sectors in the case of JG (black) and KDS (gray).

3.3 Endogenous labour supply

Seccareccia (2004) offers a different critique of JG schemes. In substance, the objections Seccareccia sees are that the JG wage would drag private sectors wages and that this would lead the economy to a low-wage full employment equilibrium. His analysis is based on a particular labor supply curve. We thus introduce two modifications to the model in order to account for Seccareccia's framework.

The average wage prevailing in the economy is now defined by (28.A), that is it now accounts for the JG wage. This average wage then impacts in turn the targeted real wage for each sector (1)

$$W_m = \frac{W_c N_c + W_e N_e + W_k N_k + W_{JG} N_{JG}}{N_c + N_e + N_k + N_{JG}} \tag{28.A}$$

$$w_x^T = \Omega_{0,x} + \Omega_{1,x} \log(pr_{n,x}) + \Omega_{2,x} \log(1-u) + \Omega_{3,x} \left(\frac{W_{m,-1}}{cpi_{w,-1}} - \frac{W_{x,-1}}{cpi_{w,-1}} \right) \tag{1}$$

The second modification regards the labor supply. We assume that the number of worked hours is a function of the average wage prevailing in the productive sectors (that is without the JG wage). Empirically, the correlation between average wage and average number of hours worked is very strong (see appendix D). This does not mean that we have in mind a sort of utility function of leisure and income but merely that households have a satisfying level of income as target and reduce their number of hours according to their income level. Furthermore, we assume that the participation rate is a function of the logarithm of the unemployment rate and of the average wage prevailing in the productive sector. As for the average number of hours worked, the empiric correlation of the proposed participation rate function is good (see appendix D).

$$hours = hours_A + hours_B \frac{W_m}{cpi_w} \tag{8}$$

$$part = part_A + part_B \log(u_{-1}) + part_C \frac{W_m}{cpi_w} \tag{9}$$

$$LF = Pop.part \tag{10}$$

Figure 7 shows the results for a JG policy combined or not with a balancing budget policy (black without, gray with balancing policy). These scenarios show that Seccareccia's critique is valid in certain cases and not valid in others. The wage reducing impact of the JG policy trough the average wage component of equation (1) might be countered by a decrease of unemployment. If the private employment creation of the JG scheme trough increased aggregate demand is high enough, the private sector wages will increase even if the aggregate wage drops suddenly due to the introduction of the JG wage (see graph Wages in figure 7).

The second set of results regards the average hours worked and the participation rates graph of figure 7. Each of these series has opposite effect on the

unemployment rate. When the number of average hours worked drops, firms need to hire more workers for the same quantity of output, implying a decrease of unemployment. On the other hand an increase of the participation rate expands the labor forces, which thus inflates the unemployment rate for a given level of aggregate employment. We observe that the JG policy implies in both scenarios a decrease of average hours worked and an increase in the participation rate. This shows the inclusive effect of the scheme: because aggregate private employment increases citizen that would otherwise not even bother to search for a job, enter the labor force. Furthermore, the increase in private wages implies a drop in hours worked, implying that even more people find a job. However, we see that this impact is seriously dampened when a balancing budget policy is enabled (gray lines in the graphs). Indeed, by increasing taxes or by decreasing government spending, the balancing policy reduces aggregate demand and thus employment.
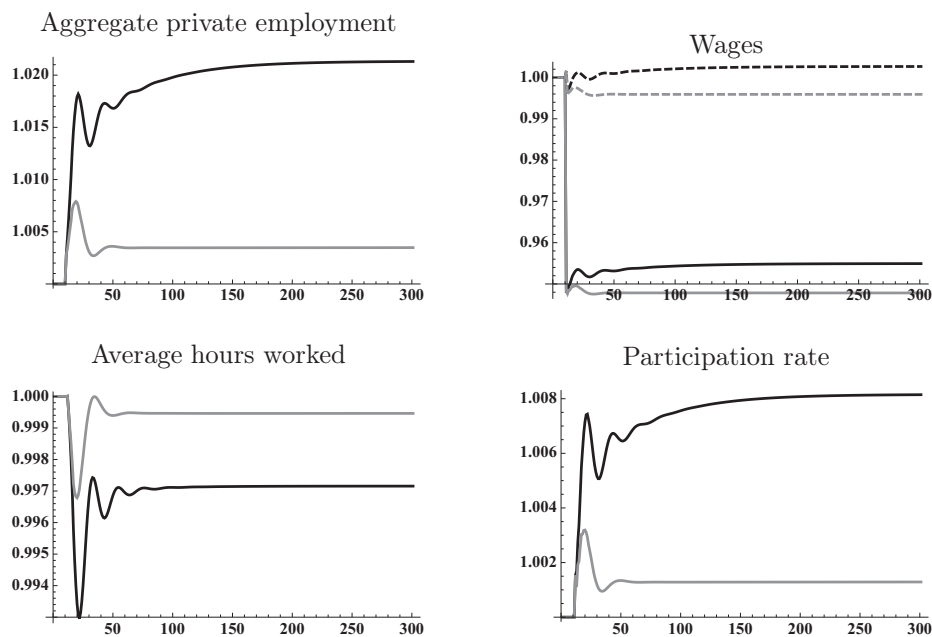
Figure 7: Scenario 5 and 6: Aggregate private employment, average wage (solid lines) and sectorial wage (dashed lines), average hours worked and participation rate in the case of a JG policy combined or not with a balancing budget policy (black without, gray with balancing policy).

4   Conclusion

This paper proposed a structuralist analysis of Job Guarantee and Keynesian Demand Spur policies. The model described accounted for price and structural

interdependencies. We also introduced a more elaborated modeling of the labor market by endogenizing the labor supply curve. Finally, we explored the more elaborated fiscal policies combining each of the analyzed policy with a balancing budget policy.

The exercises conducted in this paper show a variety of results. First of all, contrary to what Sawyer (2003) sustains, a JG program is more efficient at tackling poverty and income inequality than a traditional KDS. As a matter of fact, in all scenarios, the Gini coefficient decreased more in the JG case than in the KDS case. However, the KDS policy is more effective when the goal is to attain growth. Clearly, this shows that KDS and JG are not the same thing and should be used according to the targets one has.

The second conclusion drawn from the experiments is that the structure of the economy matters, joining Kadmos and O'Hara (2000). Indeed, depending on the initial situation, each policy might have inflationary pressure. We have observed that, when inflation arises, the JG scheme is more flexible and leads to lower inflation rates. This is due to the fact that the spur in aggregate demand comes from households' consumption, which is more sensible to inflationary pressure. On the other hand, the KDS policy spurs directly real government expenditure and thus have a stronger impact on inflation.

When implementing a balancing policy, we observe that the impacts of both the JG and the KDS policy are seriously dampened. However, the goal of full employment trough a JG scheme might be obtained while still having balanced budgets and without having inflationary pressures.

Finally, we have observed that the critiques of Seccareccia (2004) on the risk of attaining low-wage full employment are founded. However, we mitigate these results by showing that both high-wage full employment and low-wage full employment are possible outcome of a JG policy. We observed that the combination of JG and balancing policies led to a low-wage full employment while when there was no balancing policy, the JG scheme moved the economy towards a high-wage full employment.

Further work includes the analysis of such schemes in an open economy. Indeed, increased consumption by households are likely to impact trade (im)balances. Furthermore, austerity measures such as wage containment or balanced budget are within an open economy could be analyzed. Finally, this paper is a first step towards the use of SFC models with a structuralist approach; the model could be enlarged in a growth model.

References

Aspromourgos, A., 2000: Is an employer-of-last-resort policy sustainable? a review article. *Review of Political Economy*, **12 (2)**, 141–155.

Eichner, A. S., 1976: *The Megacorp and Oligopoly: Micro Foundations of Macro Dynamics.* Cambridge University Press.

Fazzari, S. M. and T. L. Mott, 1986-1987: The investment theories of kalecki

and keynes: An empirical study of firm data, 1970-1982. *Journal of Post Keynesian Economics*, **9 (2)**, 171–187.

Forstater, M., 1998: Flexible full employment: Structural implications of discretionary public sector employment. *Journal of Economic Issues*, **32 (2)**, 557–563.

Forstater, M., 2006: Green jobs: Public service employment and environmental sustainability. *Challenge*, **49 (4)**, 58–72.

Godin, A., Forthcoming: Green jobs for full employment, a stock flow consistent analysis. *The Job Guarantee: Toward True Full Employment.*, M. J. Murray and M. Forstater, Eds., Palgrave MacMillan.

Godley, W. and M. Lavoie, 2007: *Monetary Economics An Integrated Approach to Credit, Money, Income, Production and Wealth.* Palgrave MacMillan, New York.

Haig, R., 1921: The concept of income - economic and legal aspects. *The Federal Income Tax*, New York: Columbia University Press, 1–21.

Kadmos, G. and P. A. O'Hara, 2000: The taxes-drive-mney and employer of last resort approach to government policy. *Journal of Economic and Social Policy*, **5 (1)**.

Kostzer, D., 2008: Argentina: A Case Study on the Plan Jefesy Jefas de Hogar Desocupados, or the Employment Road to Economic Recovery. Working Paper 534, The Levy Economic Institute of Bard College.

Lavoie, M., 1992: *Foundations of Post-Keynesian Economic Analysis.* Aldershot, UK: Edward Elgar.

Lavoie, M. and W. Godley, 2001-2002: Kaleckian models of growth in a coherent stock-flow monetary framework: A kaldorian view. *Journal of Post Keynesian Economics*, **24 (2)**, 277–311.

Lavoie, M., G. Rodriguez, and M. Seccareccia, 2004: Similitudes and discrepancies in post-keynesian and marxist theories of investment: A theoretical and empirical investigation. *International Review of Applied Economics*, **18 (2)**, 127–149.

Lee, F., 1998: *Post Keynesian Theory.* Cambridge: Cambridge University Press.

Mastromatteo, G., 2011: H.p. minsky and policies to countervail crises. Quaderni Dell'Istituto di Economia e Finanza 102, Università Cattolica del Sacro Cuore.

Missaglia, M., 2007: Demand Policies for Long-Run Growth: Being Keynesian Both in the Short and in the Long Run? *Metroeconomica*, **58 (1)**, 74–94.

Missaglia, M., 2010: Neoclassical and keynesian macro models: thinking about the "special case". Tech. rep., University of Pavia.

Missaglia, M., 2011: Multisectoral Keynesian/Kaleckian Models. *From crisis to growth? The challenge of imbalances, debt, and limited resources*, Berlin (Germany).

Mitchell, W., 2007: Why public sector jobs creation should be fashionable. *Background paper for Decent Work Forum*, **29**.

Moudud, J., 2006: How state policies can raise economic growth. *Challenge*, **49 (2)**.

Murray, M. J. and M. Forstater, Forthcoming: *The Job Guarantee: Toward True Full Employment*. Palgrave MacMillan.

NewEconomicPerspective, 2012: New Economic Perspective, http://neweconomicperspectives.org/.

Ocampo, J. A., 2005: The Quest for Dynamic Efficiency: Structural Dynamics and Economic Growth in Developing Countries. *Beyond Reforms: Structural Dynamics and Macroeconomic Vulnerability*, J. A. Ocampo, Ed., Santiago: Economic Commission for Latin America and the Caribbean and Stanford University Press World Economic and Social Survey,New York.

OECD, 2012: Oecd employment outlook. OECD Employment Outlook 2012, Organization for Economic Co-operation and Development.

Palley, 2012: Economics for Democratic and Open Societies, http://www.thomaspalley.com.

Palley, T. I., 2001: Government as employer of last resort: Can it work? 53rd Annual Preceedings 2001, Industrial Relation Research Association.

Papadimitriou, D. P., 1999: Full employment has not been achieved. *The Levy Economics Institute of Bard College Public Policy Brief*, **53**.

Rada, C. and R. von Arnim, 2011: Structural transformation in china and india: The role of macroeconomic policies. Department of Economics Working Paper Series 2011-05, University of Utah.

Ramsay, A., 2002-3: The jobs guarantee: a post keynesian analysis. *Journal of Post Keynesian Economics*, **25 (2)**, 273–292.

Robinson, J., 1969: A further note. *The Review of Economic Studies*, **36 (2)**, 260–262.

Sawyer, M., 2003: Employer of last resort: Could it deliver full employment and price stability? *Journal of Economic Issues*, **37 (4)**, 881–907.

Seccareccia, M., 2004: What type of full employment? a critical evaluation of governement as the employer of last resort. *Investigacion Economica*, **43 (247)**, 5–43.

Simons, H. C., 1938: *Personal Income Taxation: The Definition of Income as a Problem of Fiscal Policy*. Chicago, Il: Chicago University Press.

Steindl, J., 1952: *Maturity and stagnation in American capitalism*. Blackwell.

Taylor, L., 1983: *Structuralist Macroeconomics: Applicable Models for the Third World*. Basic Books, New York.

Taylor, L., 1990: *Socially Relevant Policy Analysis: Structuralist Computable General Equilibrium Model for the Developping World*. Cambridge, Massachusets, MIT Press.

Taylor, L., 2004: *Reconstructing Macroeconomics: Structuralist Proposals and Critiques of the Mainstream*. Harvard University Press.

Taylor, L. and C. Rada, 2006: Structural Change, Economic Policy, and Development. *Nordic Journal of Political Economy*, **32**, 51–71.

Taylor, L. and R. von Arnim, 2006: *Computable General Equilibrium Models of Trade Liberalization: The Doha Debate*. Oxford: Oxfam GB.

UNCTAD, 2010: Trade and Development Report. Employment, Globalization and Development. Tech. rep., United Nations Conference on Trade And Development, Geneva.

Wisman, J. D., 2008: The moral imperative and social rationality of government- guaranteed employment and reskilling. Department of Economics Working Paper Series 2008-20, The American University.

Wray, L. R., 1998: *Understanding Modern Money: They Key to Full Employment and Price Stability*. Cheltenham and Northampton, Edward Elgar.

Wray, L. R., 2007a: The employer of last resort programme: Could it work for developing countries? Tech. rep., Economic and Labour Market Papers International Labour Office.

Wray, L. R., 2007b: Minsky's approach to employment policy and poverty: Employer of last resort and the war on poverty. *The Levy Economics Institute of Bard College Working Paper*, **515**.

Wray, L. R., 2012: The Euro Crisis and the Job Guarantee: A Proposal for Ireland. Working Paper Series 707, The Levy Economics Institute of Bard College.

A Model equations

A.1 Households

A.1.1 Unemployed workers

$$YD_u = d.U \tag{11}$$

$$C_u = YD_u \tag{12}$$

$$c_{u,e} = \beta_u \frac{C_u}{p_e} \tag{13}$$

$$c_{u,c} = (1 - \beta_u) \frac{C_u}{p_c} \tag{14}$$

A.1.2 Wage earners

$$YD_w = (1 - \theta_w) \left[W_e N_e + W_c N_c + W_i N_i \right] + i_d D_{w,-1} \tag{15}$$

$$cpi_w = \beta_w p_e + (1 - \beta_w) p_c \tag{16}$$

$$\pi_w = \frac{cpi_w - cpi_{w,-1}}{cpi_{w,-1}} \tag{17}$$

$$yd_w = \frac{YD_w}{cpi_w} - \frac{\pi_w V_{w,-1}}{cpi_w} \tag{18}$$

$$c_w = \alpha_{w,1} yd_w^e + \alpha_{w,2} v_{w,-1} \tag{19}$$

$$C_w = c_w cpi_w \tag{20}$$

$$c_{w,e} = \beta_w \frac{C_w}{p_e} \tag{21}$$

$$c_{w,c} = (1 - \beta_w) \frac{C_w}{p_c} \tag{22}$$

$$\Delta V_w = YD_w - C_w \tag{23}$$

$$D_w = V_W \tag{24}$$

$$W_c = W_{c,-1} + \Omega_{4,c} \left(w_{c,-1}^T + \frac{W_{c,-1}}{cpi_{w,-1}} \right) \tag{25}$$

$$W_e = W_{e,-1} + \Omega_{4,e} \left(w_{e,-1}^T + \frac{W_{e,-1}}{cpi_{w,-1}} \right) \tag{26}$$

$$W_k = W_{k,-1} + \Omega_{4,k} \left(w_{k,-1}^T + \frac{W_{k,-1}}{cpi_{w,-1}} \right) \tag{27}$$

$$w_c^T = \Omega_{0,c} + \Omega_{1,c} \log(pr_{n,c}) + \Omega_{2,c} \log(1 - u) \dots$$

$$\dots + \Omega_{3,c} \left(\frac{W_{m,-1}}{cpi_{w,-1}} - \frac{W_{c,-1}}{cpi_{w,-1}} \right) \tag{1.C}$$

$$w_e^T = \Omega_{0,e} + \Omega_{1,e} \log(pr_{n,e}) + \Omega_{2,e} \log(1-u) \dots$$
$$\dots + \Omega_{3,e} \left(\frac{W_{m,-1}}{cpi_{w,-1}} - \frac{W_{e,-1}}{cpi_{w,-1}} \right) \tag{1.E}$$

$$w_k^T = \Omega_{0,k} + \Omega_{1,k} \log(pr_{n,k}) + \Omega_{2,k} \log(1-u) \dots$$
$$\dots + \Omega_{3,k} \left(\frac{W_{m,-1}}{cpi_{w,-1}} - \frac{W_{k,-1}}{cpi_{w,-1}} \right) \tag{1.K}$$

$$W_m = \frac{W_c N_c + W_e N_e + W_k N_k}{N_c + N_e + N_k} \tag{28}$$

A.1.3 Capitalists

$$YD_{ca} = (1 - \theta_{ca}) \left[F_e + F_c + F_i + F_b \right] + i_d D_{ca,-1} \tag{29}$$

$$cpi_{ca} = \beta_{ca} p_e + (1 - \beta_{ca}) p_c \tag{30}$$

$$\pi_{ca} = \frac{cpi_{ca} - cpi_{ca,-1}}{cpi_{ca,-1}} \tag{31}$$

$$yd_{ca} = \frac{YD}{cpi_{ca}} - \frac{\pi_{ca} V_{ca,-1}}{cpi_{ca}} \tag{32}$$

$$c_{ca} = \alpha_{ca,0} + \alpha_{ca,1} yd_{ca}^e + \alpha_{ca,2} v_{ca,-1} \tag{33}$$

$$C_{ca} = c_{ca} cpi_{ca} \tag{34}$$

$$c_{ca,e} = \beta_{ca} \frac{C_{ca}}{p_e} \tag{35}$$

$$c_{ca,c} = (1 - \beta_{ca}) \frac{C_{ca}}{p_c} \tag{36}$$

$$V_{ca}^e = V_{ca,-1} + YD_{ca}^e - C_{ca} \tag{37}$$

$$D_{ca}^d = (\gamma_{10} + \gamma_{11} r_{id} - \gamma_{12} r_c - \gamma_{13} r_e - \gamma_{14} r_k) V_{ca}^e \tag{38}$$

$$p_{e,c} E_c = (\gamma_{20} - \gamma_{21} r_{id} + \gamma_{22} r_c - \gamma_{23} r_e - \gamma_{24} r_k) V_{ca}^e \tag{39}$$

$$p_{e,e} E_e = (\gamma_{30} - \gamma_{31} r_{id} - \gamma_{32} r_c + \gamma_{33} r_e - \gamma_{34} r_k) V_{ca}^e \tag{40}$$

$$p_{e,k} E_k = (\gamma_{40} - \gamma_{41} r_{id} - \gamma_{42} r_c - \gamma_{43} r_e + \gamma_{44} r_k) V_{ca}^e \tag{41}$$

$$r_{id} = \frac{1 + i_d}{1 + \pi_{ca}} - 1 \tag{42}$$

$$r_c = \frac{1 + \frac{FD_c^e}{p_{e,c,-1} E_{c,-1}}}{1 + \pi_c a} - 1 \tag{43}$$

$$r_e = \frac{1 + \frac{FD_e^e}{p_{e,e,-1} E_{e,-1}}}{1 + \pi_c a} - 1 \tag{44}$$

$$r_k = \frac{1 + \frac{FD_k^e}{p_{e,k,-1} E_{k,-1}}}{1 + \pi_c a} - 1 \tag{45}$$

$$FD_c^e = \overline{FD_c} + \psi \left(FD_{c,-1} - FD_{c,-1}^e \right) \tag{46}$$

$$FD_e^e = \overline{FD_e} + \psi\left(FD_{e,-1} - FD_{e,-1}^e\right) \tag{47}$$

$$FD_k^e = \overline{FD_k} + \psi\left(FD_{k,-1} - FD_{k,-1}^e\right) \tag{48}$$

$$V_{ca} = V_{ca,-1} + YD_{ca} - C_{ca} + CG_c + CG_e + CG_k \tag{49}$$

$$D_{ca}^h = V_{ca} - p_{e,c}E_c - p_{e,e}E_e - p_{e,k}E_k \tag{50}$$

$$CG_c = E_{c,-1}(p_{e,c} - p_{e,c,-1}) \tag{51}$$

$$CG_e = E_{e,-1}(p_{e,e} - p_{e,e,-1}) \tag{52}$$

$$CG_k = E_{k,-1}(p_{e,k} - p_{e,k,-1}) \tag{53}$$

$$YD_{ca}^e = \overline{YD_{ca}} + \psi(\overline{YD_{ca}} - YD_{ca,-1}^e) + \overline{CG_c} + \overline{CG_e} + \overline{CG_k} \tag{54}$$

A.2 Production sectors

A.2.1 Consumption sector

$$y_c = c_{u,c} + c_{w,c} + c_{ca,c} + c_{g,c} \tag{55}$$

$$c_{c,e} = \frac{y_c}{pr_{e,c}} \tag{56}$$

$$N_c = \frac{y_c}{pr_{n,c}} \tag{57}$$

$$g_{k,c} = \gamma_0 + \gamma_1(u_c - u^T) \tag{4.C}$$

$$u_c = \frac{y_c}{y_{fc,c}} \tag{5.C}$$

$$y_{fc,c} = k_{c,-1}pr_{k,c} \tag{6.C}$$

$$i_c = \max[g_{k,c} + \delta, 0]k_{c,-1} \tag{7.C}$$

$$\Delta k_c = i_c - \delta k_{c,-1} \tag{58}$$

$$UC_c = \frac{W_c}{pr_{n,c}} + \frac{p_e}{pr_{e,c}} \tag{59}$$

$$p_c = (1 + \phi_c)UC_c \tag{60}$$

$$\phi_c = \frac{r^T p_{k,-1}k_{c,-1} + i_l L_{c-1}}{UC_c y_c^e} \tag{61}$$

$$F_c = y_c p_c - W_c N_c - p_e c_{c,e} - i_l L_{c,-1} \tag{62}$$

$$FD_c = \mu_c F_c \tag{63}$$

$$FU_c = (1 - \mu_c)F_c \tag{64}$$

$$\Delta L_c = i_c p_k - FU_c - p_{e,c}\Delta E_c \tag{65}$$

$$\Delta E_c = \frac{i_c p_k - FU_c^e}{p_{e,c,-1}} \tag{66}$$

$$y_c^e = \overline{y_c} + \psi\left(y_{c,-1} - y_{c,-1}^e\right) \tag{67}$$

$$FU_c^e = \overline{FU_c} + \psi\left(FU_{c,-1} - FU_{c,-1}^e\right) \tag{68}$$

$$V_c = p_k k_c - L_c \tag{69}$$

A.2.2 Energy sector

$$y_e = c_{u,e} + c_{w,e} + c_{ca,e} + c_{c,e} + c_{k,e} + c_{g,e} \tag{70}$$

$$N_e = \frac{y_e}{pr_{n,e}} \tag{71}$$

$$g_{k,e} = \gamma_0 + \gamma_1(u_e - u^T) \tag{4.E}$$

$$u_e = \frac{y_e}{y_{fc,e}} \tag{5.E}$$

$$y_{fc,e} = k_{e,-1} pr_{k,e} \tag{6.E}$$

$$i_e = \max[g_{k,e} + \delta, 0]k_{e,-1} \tag{7.E}$$

$$\Delta k_e = i_e - \delta k_{e,-1} \tag{72}$$

$$UC_e = \frac{W_e}{pr_{n,e}} + \frac{p_e}{pr_{e,e}} \tag{73}$$

$$p_e = (1 + \phi_e)UC_e \tag{74}$$

$$\phi_e = \frac{r^T p_{k,-1} k_{e,-1} + i_l L_{e-1}}{UC_e y_e^e} \tag{75}$$

$$F_e = y_e p_e - W_e N_e - i_l L_{e,-1} \tag{76}$$

$$FD_e = \mu_e F_e \tag{77}$$

$$FU_e = (1 - \mu_e)F_e \tag{78}$$

$$\Delta L_e = i_e p_k - FU_e - p_{e,e}\Delta E_e \tag{79}$$

$$\Delta E_e = \frac{i_e p_k - FU_e^e}{p_{e,e,-1}} \tag{80}$$

$$y_e^e = \overline{y_e} + \psi\left(y_{e,-1} - y_{e,-1}^e\right) \tag{81}$$

$$FU_e^e = \overline{FU_e} + \psi\left(FU_{e,-1} - FU_{e,-1}^e\right) \tag{82}$$

$$V_e = p_k k_e - L_e \tag{83}$$

A.2.3 Capital sector

$$y_k = i_c + i_e + i_k \tag{84}$$

$$c_{k,e} = \frac{y_k}{pr_{e,k}} \tag{85}$$

$$N_k = \frac{y_k}{pr_{n,k}} \tag{86}$$

$$g_{k,k} = \gamma_0 + \gamma_1(u_k - u^T) \tag{4.K}$$

$$u_k = \frac{y_k}{y_{fc,k}} \tag{5.K}$$

$$y_{fc,k} = k_{k,-1} pr_{k,k} \tag{6.K}$$

$$i_k = \max[g_{k,k} + \delta, 0]k_{k,-1} \tag{7.K}$$

$$\Delta k_k = i_k - \delta k_{k,-1} \tag{87}$$

$$UC_k = \frac{W_k}{pr_{n,k}} + \frac{p_e}{pr_{e,k}} \tag{88}$$

$$p_k = (1 + \phi_k)UC_k \tag{89}$$

$$\phi_k = \frac{r^T p_{k,-1} k_{k,-1} + i_l L_{k-1}}{UC_k y_k^e} \tag{90}$$

$$F_k = y_k p_k - W_k N_k - p_e c_{k,e} - i_l L_{k,-1} \tag{91}$$

$$FD_k = \mu_k F_k \tag{92}$$

$$FU_k = (1 - \mu_k)F_k \tag{93}$$

$$\Delta L_k = i_k p_k - FU_k - p_{e,k}\Delta E_k \tag{94}$$

$$\Delta E_k = \frac{i_k p_k - FU_k^e}{p_{e,k,-1}} \tag{95}$$

$$y_k^e = \overline{y_k} + \psi\left(y_{k,-1} - y_{k,-1}^e\right) \tag{96}$$

$$FU_k^e = \overline{FU_k} + \psi\left(FU_{k,-1} - FU_{k,-1}^e\right) \tag{97}$$

$$V_k = p_k k_k - L_k \tag{98}$$

A.3 Banking sector

$$\Delta D = \Delta D_w + \Delta D_{ca} \tag{99}$$

$$\Delta L = \Delta L_c + \Delta L_e + \Delta L_k \tag{100}$$

$$\Delta B_b = \Delta M - \Delta L \tag{101}$$

$$F_b = i_l(L_{c,-1} + L_{e,-1} + L_{k,-1}) + i_b B_{b-1} - id\left(D_w + D_{ca}\right) \tag{102}$$

A.4 Government

$$T = \theta_w\left[W_c N_c + W_e N_e + W_k N_k\right] + \theta_{ca}\left[F_c + F_e + F_k + F_b\right] \tag{103}$$

$$G = C_{g,c} + C_{g,e} + dU + i_b B_{s,-1} \tag{104}$$

$$U = LF - N_c - N_e - N_k \tag{105}$$

$$c_{g,c} = \frac{\overline{C_{g,c}}}{p_c} \tag{106}$$

$$c_{g,e} = \frac{\overline{C_{g,e}}}{p_e} \tag{107}$$

$$\Delta B_d = \Delta B_b \tag{108}$$

$$\Delta B_s = G - T \tag{109}$$

B Notation

B.1 Variables

Table 3: Variables

Symbol	Description
YD_x	Nominal disposable income of sector x
yd_x	Real disposable income of sector x
$C_{x,y}$	Nominal consumption from sector x of good y
$c_{x,y}$	Real consumption from sector x of good y
D_x	Deposits of household sector x
V_x	Nominal wealth of sector x
V_x^e	Expected nominal wealth of household sector x
v_x	Real wealth of household sector x
cpi_x	Consumer price index of sector x
π_x	Inflation related to consumer price index of sector x
Y_y	Nominal output of sector y
y_y	Real output of sector y
$y_{fc,y}$	Full capacity output of sector y
u_y	Capacity utilization rate of sector y
i_y	Real investment of sector y
$g_{k,y}$	Capital growth rate of sector y
p_y	Price of good y
F_y	Profits in sector y
FU_y	Retained earnings in sector y
FD_y	Dividends in sector y
E_y	Equities emitted by sector y
$p_{e,y}$	Equities' price for sector y
r_y	Real return rate on equities for sector y
CG_y	Capital gains in sector y
W_y	Nominal hourly wage in sector y
w_y^T	Targeted real hourly wage in sector y
UC_y	Unit cost of good y
ϕ_y	Mark-up of sector y
L_y	Total loans in sector y
V_y	Net wealth in sector y
N_y	Employment in sector y
L	Total loans
M	Total cash holding
B_b	Bonds held by banks
F_b	Banks profits
U	Total unemployment
u	Unemployment rate
LF	Labor force
$hours$	Average hours worked
$part$	Labor force participation rate

Continued on next page

Table 3: Variables

Symbol	Description
G	Total public spending
T	Total taxes receipt
T_x	Taxes of sector x
B_s	Bonds supply
B_d	Bonds demand

B.2 Parameters

Table 4: Parameters

Symbol	Description	Scenario 1
θ_w	Tax rate on wage earners	0.14
$\theta_c a$	Tax rate on capitalists	0.07
d	Dole	11882
β_u	Unemployed workers consumption preference	0.1
$\alpha_{w,0}$	Workers autonomous consumption	0
$\alpha_{w,1}$	Workers propensity to consume out of income	0.726
$\alpha_{w,2}$	Workers propensity to consume out of wealth	0.06
β_w	Workers consumption preference	0.1
$\alpha_{ca,0}$	Capitalists autonomous consumption	0
$\alpha_{ca,1}$	Capitalists propensity to consume out of income	0.66
$\alpha_{ca,2}$	Capitalists propensity to consume out of wealth	0.03
β_{ca}	Capitalists consumption preference	0.1
δ	Depreciation rate	0.06
$hours$	Average hours worked	1742
$hours_A$	Hours parameter	5585
$hours_B$	Hours parameter	$-1.6 * 10^{-6}$
$part$	Participation rate	0.45
$part_A$	Participation rate parameter	0.217474
$part_B$	Participation rate parameter	-0.02
$part_C$	Participation rate parameter	754
$pr_{n,c}$	Labor productivity in consumption	0.0004
$pr_{e,c}$	Energy productivity in consumption	5.71
$pr_{k,c}$	Capital productivity in consumption	0.571041
$pr_{n,e}$	Labor productivity in energy	0.00053
$pr_{k,e}$	Capital productivity in energy	0.798218
$pr_{n,k}$	Labor productivity in capital	0.00049
$pr_{e,k}$	Energy productivity in capital	0.134556

Continued on next page

Symbol	Description	Scenario 1
$pr_{k,k}$	Capital productivity in capital	0.743182
i_l	Interest rate on loans	0.05
i_d	Interest rate on deposits	0
i_b	Interest rate on bonds	0.02
Pop	Population	307756577
u_c^T	Steady state capacity utilization in consumption	0.9
u_c^T	Steady state capacity utilization in energy	0.9
u_c^T	Steady state capacity utilization in capital	0.9
γ_{10}	Portfolio choice	0.43
γ_{11}	Portfolio choice	0.3
γ_{12}	Portfolio choice	0.1
γ_{13}	Portfolio choice	0.1
γ_{14}	Portfolio choice	0.1
γ_{20}	Portfolio choice	0.28
γ_{21}	Portfolio choice	0.1
γ_{22}	Portfolio choice	0.5
γ_{23}	Portfolio choice	0.2
γ_{24}	Portfolio choice	0.2
γ_{30}	Portfolio choice	0.18
γ_{31}	Portfolio choice	0.1
γ_{32}	Portfolio choice	0.2
γ_{33}	Portfolio choice	0.5
γ_{34}	Portfolio choice	0.2
γ_{40}	Portfolio choice	0.11
γ_{41}	Portfolio choice	0.1
γ_{42}	Portfolio choice	0.2
γ_{43}	Portfolio choice	0.2
γ_{44}	Portfolio choice	0.5
$\eta_{0,c}$	Investment decision consumption	0.
$\eta_{0,e}$	Investment decision energy	0.
$\eta_{0,k}$	Investment decision capital	0.
η_1	Investment decision	0.1
E_c	Initial number of equities in consumption	10^9
E_e	Initial number of equities in consumption	10^9
E_k	Initial number of equities in consumption	10^9
χ_c	Propensity to finance trough equities in consumption	0.6
χ_e	Propensity to finance trough equities in energy	0.6
χ_k	Propensity to finance trough equities in capital	0.6
$\omega_{0,c}$	Real wage target parameter in consumption	$3.2132 * 10^{-4}$
$\omega_{0,e}$	Real wage target parameter in energy	$3.32054 * 10^{-4}$

Table 4: Parameters

Symbol	Description	Scenario 1
$\omega_{0,k}$	Real wage target parameter in capital	$3.40381 * 10^{-4}$
ω_1	Real wage target parameter	$9.6 * 10^{-6}$
ω_2	Real wage target parameter	$1.32 * 10^{-4}$
ω_3	Real wage target parameter	0.1
ω_4	Real wage target parameter	0.1
ψ	Learning parameter	0.1
μ_c	Share of profits distributed in consumption	0.6
μ_e	Share of profits distributed in energy	0.6
μ_k	Share of profits distributed in capital	0.6

C   Computing the Gini

We use equation (110) to compute the Gini coefficient, where X_i is equal to the cumulated percentage of the population of the quantile (in our case $X_0 = 0, X_1 = 0.1, X_2 = 0.2, ...$ and Y_i is equal to the cumulated income percentage of the quantile. We are using deciles, that is $n = 10$.

$$G_1 = 1 - \sum_{k=1}^{n}(X_k - X_{k-1})(Y_k + Y_{k-1}) \tag{110}$$

For example, the cumulative income weight at the first period of the first scenario is given by table 5. In this case, the Gini index is equal to 0.243.

Decile	Proportion	Income share	Cumulative Income share
0	0%	0%	0%
1	0%	0.041%	0.041%
2	0%	0.081%	0.122%
3	0%	0.081%	0.203%
4	0%	0.081%	0.284%
5	0%	0.081%	0.365%
6	0%	0.081%	0.446%
7	0%	0.081%	0.527%
8	0%	0.081%	0.608%
9	0%	0.081%	0.689%
10	0%	0.311%	1%

Table 5: Income share and cumulative income share at the first period of scenario 1

D Empirics on hours and labor force

Figure 8 shows the average hours worked with respect to average annual wage in the USA between 1990 and 2011 (1990=1). The graph clearly highlights the strong correlation between the two time series. (111) shows the results obtain when running a OLS regression on the data, the R-square obtained is equal to 0.68.

$$Hours_t = 1902(13.51) - 2.191 * 10^{-3}(3.324 * 10^{-4})W_t \qquad (111)$$

Figure 9 shows (a) the participation with respect to average annual wage, and (b) the participation with respect to the logarithm of unemployment rate in the USA between 1990 and 2011 (1990=1 for graph a). The graph clearly highlights the correlation between the three time series. (112) shows the results obtain when running a OLS regression on the data, the R-square obtained is equal to 0.6.

$$Part_t = 52.12(0.51) + 1.563 * 10^{-5}(6.844 * 10^{-6})W_t - 1.231(0.254)\log(u_{t-1}) \qquad (112)$$
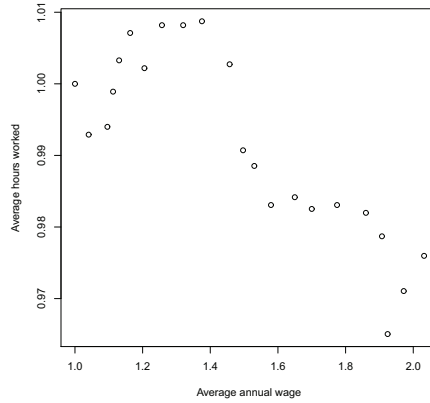

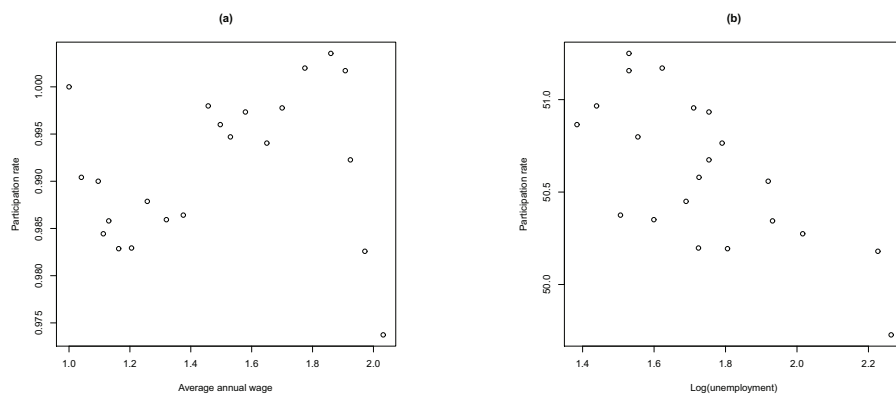Figure 8: Source: OECD (2012), USA data from 1990 to 2011, baseline=1990.

Figure 9: Source: OECD (2012), USA data from 1990 to 2011, baseline=1990.