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Market Imperfections and Income Distribution

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Abstract: This paper aims to search links between market imperfections and functional income distribution. For this purpose we construct a two-sector model – wage goods and luxury goods producing sectors – incorporating imperfections of the product and labor markets under income inequality. In a structure with interdependent and partially monopolistic and competitive markets, we analytically trace up the effects of the changes in power relations proxied by the degree of mark-ups in the product and labor market. The model shows that price and wage mark-ups in two sectors have crucial income distribution implications for the agents in the economy to varying extents. It also demonstrates the effect of the existence of the differentiated consumption patterns arising from income inequality on income distribution. Furthermore, it seems that unemployment level creates externalities on wage rate and on corporate taxes of firms.

Keywords: market power, income distribution

JEL codes: D30, D40

1 Introduction

Kalecki's theory of income determination is notable for linking the theory of distribution, on the one side, and the theory of income determination, on the other. The theory of income distribution is based on the main idea that the structure of distribution in a market economy depends on the structure of market imperfections and of market power. This is an important idea which leads to a deep understanding of the way the capitalist economy actually works and which constitutes a lasting contribution to modern economics.

Neo-Kaleckian models of growth and distribution were initiated by Asimakopulos (1975). Key early contributions include Dutt (1984), Rowthorn (1982), Taylor (1985), and Bhaduri and Marglin (1990). Blecker (2002) provides a critical survey of later extensions. Key features of these models include demand-driven output and growth, a role for profitability in the accumulation

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process, and the importance of income distribution and imperfect competition for macroeconomic outcomes. Bertola (1993) also, although himself not from neo-Kaleckian tradition, argues that heterogeneity of income sources across individuals can have important effects on economic growth and the economic performance can be devised by redistributive policies. Similar to this study he also shows the importance of imperfect competition on income distribution.

In this paper we present a model that is closely tied with the Kaleckian theory of income distribution and price determination and is related with the view that modern capitalism is characterized by market imperfections both on the labor market and on the product market. Taking into account these market imperfections, we develop a simple two-sector model of monopolistic competition to search links between market imperfections and income distribution.

In the model we look at a hypothetical economy divided into two classes of individuals, wealthy (firm owners-capitalists) and non-wealthy (workers and the unemployed) agents. Agents' consumption preferences for wage goods or luxury goods are based on income distribution, thus the income dispersion differentiates the products they consume. While the wealthy buy luxury goods (the highest qualified products), not-wealthy agents buy wage goods (the lower qualified products). In short, the preferences of the workers and the capitalists are different.

Luxury items represent a very specific group of goods and their supply is addressed to a particular type of consumers, consumers from the top of income distribution, which are firm owners (capitalists) in our model. Unlike wage goods which are bought by workers and the unemployed, individuals buy luxuries not only for their intrinsic quality but also to confirm social status (Veblen effect). In parallel to our assumption here, in the studies by Bils and Klenow (2001) and Broda and Romalis (2009), wealthier households typically consume goods of higher quality. Similarly Fajgelbaum, Grossman, and Helpman (2009), and Latzer and Mayneris (2012) also associate demand for quality goods with income inequality. Foellmi and Zweimueller (2006) also analytically show that income inequality leads to differentiated consumption patterns between the rich and the poor in a two-sector model. Furthermore, some studies empirically support the view that as income inequality increases, the consumption of luxury goods increases. For example, a study by Bain & Company (2012) shows that the individuals in emerging markets with higher income inequality tend to consume more luxury goods.

Our analysis aims to explore the interactions between market power and income determination within the following general framework:

(i) We develop a simple two-sector model in which the first sector produces wage goods and the second sector produces luxury goods. The two sector assumption

simply allows us to elaborate the main trends regarding the issues we want to search in a more comprehensible and tractable manner. (ii) Consumers (workers, the unemployed and firm owners) are unequally endowed with factors of production and consume in different sectors, which means that while wage is cost in one sector, it is demand for products in another sector. (iii) Firms in each sector have a monopoly position on the market of their particular products, but the firms are small relative to the aggregate economy. (iv) Labor market in the first sector (wage goods producing sector) is unionized but the labor market in the second sector (luxury goods producing sector) is Walrasian. This is compatible with the well-known empirical fact that the workers in the necessities producing sectors are traditionally more unionized. (v) We assume that technology and preferences are symmetric in each sector. By this we mean that the various products that are supplied on the market have identical production technologies and that also preferences are symmetric with respect to the various products. We also assume that there is no labor mobility between sectors due to the existence of differential skill requirements in each sector and their attainment requires time. Thus the model has a short-run analysis. (vi) In the model we impose a kind of corporate capital tax on firm owners rather than workers to finance the unemployment insurance. Such a tax mechanism can be thought of as a kind of severance payment paid to the unemployed not by the firm itself but by a common pool financed by firms.

In the model, we treat the pricing behavior of firms in each sector in a standard neo-Kaleckian fashion: price is mark-up over unit labor costs, reflecting an oligopolistic market structure (e. g., Harris (1974), Asimakopulos (1975)). However we allow wage-setting behavior to differ in two sectors. While there is wage mark-up in the first sector due to the existence of unionization (unions impose a mark-up over the reservation wage of workers), a competitive wage is determined in the second sector.

There are several studies that attempt to relate the changes in income distribution to the changes in some economic parameters in the short run as in this study. Schultze (1964) is one of the pioneer authors who try to explain changes in income distribution in the short run. Schultze's basic hypothesis is that the share of profits in produced income is positively related to the level of capacity utilization. Pothier and Puy (2014) emphasize the role played by changes in the composition of demand over the business cycle in explaining income dynamics in the short run. Similarly Mani (2001) examines the dynamic interaction between the income distribution in an economy and patterns of demand in the short run. Another study by Jin and Li (2012) finds that labor-intensive sectors expand disproportionately more than capital-intensive sectors during booms, which leads to income inequality. Similar to these studies, we

also, in this study, search for the effects of markup on income distribution in the short run.

In the paper we make the following contributions to the existing literature: (i) The framework, first of all, provides a tractable and parsimonious tool for understanding the income distributional implications of changes in imperfections of the markets in the existence of income inequality. In such a structure with interdependent and partially monopolistic and competitive market structures, we can analytically trace up the effects of the changes in power relations proxied by the degree of mark-ups in the product and labor market. (ii) In Kaleckian models, distribution factors are mainly arising from mark-ups in product markets. However, in this model, we also introduce an imperfection to labor markets by placing an important labor market institution, which is unions. The existence of unions creates wage mark-ups. Hence income distribution is determined by a mix of unions and firms' powers. In fact these subjects are studied separately too much but there is little research on their interactions. (iii) As seen in recent studies as mentioned above, the issue that point outs the differentiated consumption patterns arising from income inequality has begun to gain its deserved interest. We look at another aspect of this issue. We search for the effect of the existence of the differentiated consumption patterns arising from income inequality on income distribution. (iv) Lastly we search for the implications of unemployment which is endogenously determined in the model and to construct a link between unemployment and taxation. We impose a kind of progressive capital tax structure that just taxes firm owners rather than workers to finance the unemployment insurance.¹ Hence the unemployment level in the economic system creates a kind of externality on corporate taxes of firms. Although there are some studies, though not many, on the labor market implications of corporate taxation (e. g., Sorenson (2006), Nickell, Nunziata, and Ochel (2005)), there is little research on the effect of unemployment on taxation. This paper tries to show some basic trends on this issue.

The remainder of the paper is organized as follows. In Section 2, we lay out the basic structure and assumptions of our model. In Section 3, we analyze the equilibrium and make comparative statics. Section 4 concludes.

¹ In fact there are more complicated redistributive models based on taxation. Boone and Bovenberg (2004) have developed an optimal redistributive taxation framework depending on workers' skills. Engström (2009) extends the Stiglitz (1982) two-skill model of optimal taxation by introducing search unemployment. Two recent papers (Hungerbühler and Lehmann (2009) and Lehmann, Parmentier, and Van der Linden (2009)) propose a theory of optimal redistributive taxation with an endogenous risk of being unemployed.

2 Model

We consider a closed economy which is divided into two sectors, each producing with one factor of production, labor. The first sector in which there are firms each producing wage goods consumed by only the workers of the first and second sectors. In the second sector there exist firms each producing luxury goods consumed by the firm owners of the first and second sectors (thus capitalists). Hence we distinguish between the production of consumer goods for capitalists and consumer goods for workers. We also assume that while the workers in the first sector are assumed to be organized in a trade union, the workers in the second sector are assumed not to be organized in a trade union, i. e., the labor market is competitive in this sector. Hence the whole economy is partially unionized. Our model is a short run model hence each parameter is taken as given.

2.1 The First Sector

Households who work in the first sector are indexed by j . Each of them sells a homogenous labor. Consider a representative household j in the first sector who has a utility over the consumptions, Q_{1j} , ..., Q_{nj} of n different commodities

$$U_j(Q_{1j}, \dots, Q_{nj}) = n \left(\frac{1}{n} \sum_{i=1}^n Q_{ij}^{(\epsilon-1)/\epsilon} \right)^{\epsilon/(\epsilon-1)} \quad [1]$$

The utility function above is a consumption index that shows the effect of the consumption of goods on utility. Q_{ij} denotes the consumption of good i by household j in the first sector. All types of consumption goods enter utility symmetrically. The parameter $\epsilon \in (1, \infty)$ is the elasticity of substitution between goods in utility. Note that the first term in eq. [1] on the right-hand side is the aggregator of the total consumption and for simplicity can be normalized to 1.

Households maximize utility subject to a budget constraint. Utility maximization implies that the consumptions, Q_{1j} , ..., Q_{nj} are chosen as follows:

$$\max U_j(Q_{1j}, \dots, Q_{nj}) \quad \text{s.t.} \quad P_{11}Q_{1j} + \dots + P_{n1}Q_{nj} \leq W_jL_j, \quad [2]$$

where P_{11} , ..., P_{n1} show prices of the n commodities in the first sector, W_j is labor wage (per hour) and L_j is total hours employed.

The first-order condition of the utility maximization problem in [2] results in

$$Q_{ij}^*(\cdot) = \left(\frac{P_{i1}}{P_1} \right)^{-\epsilon} \frac{W_jL_j}{P_1},$$

where $P_1 = P(P_{11}, \dots, P_{n1})$ defines the price index of the goods produced in the first sector.

The total expenditure made for the commodities in the first sector, E_1 , is

$$E_1 = \sum_{i=1}^n W_i L_i + \sum_{k=1}^m W_k L_k + T, \quad [3]$$

where W_i and L_i denote wage per hour paid and total hours employed by the firm i in the first sector and W_k and L_k denote wage per hour paid and total hours employed by the firm k in the second sector. And in eq. [3], T represents total demand of unemployed households supported by unemployment insurance payments financed by taxes imposed on the firm owners in both sectors, which is defined as

$$T = \sum_{i=1}^n (\bar{L}_i - L_i) t P_1, \quad [4]$$

where t is real unemployment payment per hour financed by taxes, L_i is existing hours employed and $\bar{L}_i$ is total labor hours that workers can work, taken as fixed. Hence the difference of $(\bar{L}_i - L_i)$ represents unemployed hours for the firm i in the first sector.

Due to the homogeneity of demand function, the total demand function for commodity i can be written as

$$Q_i(\cdot) = \left(\frac{P_{i1}}{P_1} \right)^{-\epsilon} \frac{E_1}{P_1} \frac{1}{n} \quad [5]$$

This demand curve has a constant price elasticity of demand equal to $\epsilon > 1$. And $1/n$ is the market share captured by each firm if they all charge the same prices ($P_{i1} = P_1$).

The workers in the first sector are organized in a trade union which monopolizes the supply of labor to all the firms in the sector. The union simply tries to maximize the expected utility of its members. With identical union members, it is natural to assume that in any period where the rate of unemployment is u , the individual member's probability of becoming unemployed is also u . The union sets the real wage rate w_i for any firm i , to maximize the expected income of each and every union member in the period

$$\Omega(w_i) = (1 - u(w_i))w_i + u(w_i)v, \quad [6]$$

where $w_i = W_i/P_1$ is the real wage rate (per hour) and v reflects a mix of what can be earned in the economy in general via alternative work opportunities, home production, etc.

If the trade union sets a real wage rate w_i larger than competitive wage rate, w^c , total employment will be determined by labor demand, that is $L_i^*(w_i)$ and there will be $n(\bar{L}_i - L_i^*)$ unemployed (hours). Since all the firms are symmetric, the rate of unemployment can be written as

$$u = 1 - \frac{L_i^*}{\bar{L}_i} \text{ if } w_i > w^c \text{ and } u(w_i) = 0 \text{ otherwise} \quad [7]$$

where $\bar{L}_1$ denotes the maximum labor supply for each firm in the first sector.

Plugging eq. [7] into eq. [6], we get

$$\Omega(w_i) = \frac{1}{\bar{L}_i} (w_i - v) L_i^*(w_i) + v, \quad [8]$$

where $L_i^*(w_i)$ is labor demand of firm i in the first sector. Since the trade union takes $\bar{L}_i$ and v as given, an interior solution is simply a w_i^* that maximizes $(w_i - v)L_i^*(w_i)$, where $w_i^* > w^c$. Note that the term of $(w_i - v)L_i^*(w_i)/\bar{L}_i$ is simply the excess of the expected income that union ensures for a worker over what a worker could get in the general economy.

On the other hand, the representative firm i in the first sector uses a technology described by the following production function

$$Q_i = AL_i^{1-\alpha}, \quad 0 < \alpha < 1 \quad [9]$$

where L_i is the total labor hours employed by the firm i , Q_i is the volume of real output produced and sold in the first sector by the firm i , and A is a technology parameter.

The profit of firm i in the first sector is defined as follows

$$\Pi_i = P_{i1} \left(\frac{P_{i1}}{P_1} \right)^{-\epsilon} \frac{1}{n} \frac{E_1}{P_1} - W_i L_i - \frac{T}{n+m}, \quad [10]$$

where the variable E_1 is an indicator of total demand in the first sector and taken as given by the individual firm, since each firm is small relative to the economy. The first term of the eq. [10] represents the total revenue ($TR_i = P_i Q_i$) and the second term is total variable cost ($W_i L_i$) and the last term denotes total tax paid by each firm, which is imposed on all the firms in the first and second sector (totaling $n + m$ —the number of firms in the first sector and the second sector are n and m respectively), which is used for financing unemployment insurance.

The first-order condition for maximization of profits requires the equality of $MR_i = MC_i$. The firm's marginal revenue is

$$\Pi_i = P_{i1} \left(\frac{P_{i1}}{P_1} \right)^{-\epsilon} \frac{1}{n} \frac{E_1}{P_1} - W_i L_i - \frac{T}{n+m}, \quad [10]$$

Since labor is the only variable factor of production, marginal cost is equal to the price of an extra unit of labor-nominal wage rate W_i , divided by labor's marginal product, $MPL_i = A(1 - \alpha)L_i^{-\alpha}$, thus

$$MC_i = \frac{W}{MPL_i}.$$

The necessary condition for maximization of profits, $MR_i = MC_i$, therefore gives

$$P_{i1} = m^p \left(\frac{W}{(1 - \alpha)AL_i^{-\alpha}} \right), \quad [11]$$

where $m^p = \frac{\epsilon}{\epsilon - 1} > 1$ is price mark-up.

Dividing by P_1 on both sides of eq. [11] gives the relative price, P_{i1}/P_1 , of the first sector's i product. Inserting this P_{i1}/P_1 into eq. [5] then gives production, Q_i , in sector i . Finally, we can use eq. [9] to compute how much employment, L_i , is needed to produce that level of output. Performing these operations, we get

$$L_i^* = \left(\frac{E_1/P_1}{nA} \right)^{\gamma/\epsilon} \left(\frac{A(1 - \alpha)}{m^p} \right)^{\gamma} \left(\frac{W_i}{P_1} \right)^{-\gamma}, \quad [12]$$

where $\gamma = \frac{\epsilon}{1 + \alpha(\epsilon - 1)} > 0$ is the wage elasticity of labor demand. From the expression for γ one may verify that a higher price elasticity of product demand, ϵ , (tougher competition in product markets) increases the wage elasticity of labor demand, γ . This is intuitive: a rise in price elasticity of output demand, the greater is the fall in sales and output, so the greater is the resulting fall in labor demand.

Taking labor demand defined in eq. [12], the union will then choose the real wage w_i as to maximize $\Omega(w_i)$ given by eq. [8], which yields

$$1 + \frac{(w_i - v)}{w_i} \left(\frac{dL_i^*}{dw_i} \frac{w_i}{L_i} \right) = 0 \quad [13]$$

Using the fact that $(dL_i/dw_i)(w_i/L_i) = -\gamma$ (from eq. [12], we can rewrite as

$$w_i^* = m^w v, \quad [14]$$

where $m^w = (1 + \gamma)/\gamma$ is wage mark-up.

As a result, putting the real wage given by eq. [14] into the labor demand eq. [12] gives the equilibrium labor amount for the firm i , which is equal to

$$L_i^* = \left(\frac{E_1/P_1}{nA} \right)^{\gamma/\epsilon} \left(\frac{A(1 - \alpha)}{m^p} \right)^{\gamma} (m^w v)^{-\gamma} \quad [15]$$

Since as mentioned previously the agents are symmetric, all the firms use the same level of labor at the same wage $w_i^* = w_1$. Using the definitions of the total

expenditure of $E_1 = nP_1Q_i$, the total production of $Q_i = AL_i^{1-\alpha}$ and the definition of labor demand elasticity of $\gamma = \frac{\epsilon}{1+\alpha(\epsilon-1)}$, we derive the total labor level in symmetric equilibrium

$$L_1 = nL_i^* = n \left(\frac{A(1-\alpha)}{m^p m^w v} \right)^{1/\alpha}. \quad [16]$$

Notice that while labor level is affected by other factors in the system in addition to wage mark-up, its price (wage) is determined by only wage mark-up due to unionization. And as it is clear that the total real income of workers in the first sector can be written out as follows

$$w_1 L_1 = n(m^w v)^{(\alpha-1)/\alpha} \left(\frac{A(1-\alpha)}{m^p} \right)^{1/\alpha}. \quad [17]$$

2.2 The Second Sector

The labor market in the second sector that produces luxury goods is more competitive, thus there is no union influence on labor market in this sector. The labor supply for the second sector comes from the households who consume the wage products in the first sector. Consider a representative household j who consumes in the first sector provides labor to firms in the second sector, having a utility over the consumptions, $Q_{1j}, \dots, Q_{nj}$ of n different commodities in the first sector and labor L_j

$$U_j(Q_{1j}, \dots, Q_{nj}, L_j) = n \left(\frac{1}{n} \sum_{i=1}^n Q_{ij}^{(\epsilon-1)/\epsilon} \right)^{\epsilon/(\epsilon-1)} - L_j^\beta, \quad [18]$$

where the term $\beta \in [1, \infty)$ captures the marginal disutility of labor.

We assume that the labor supply is not fixed in the second sector as opposed to the first sector. The workers negotiate with firms individually so that the market clears instantly, in contrast to the labor markets in the first sector where there is bargaining power denoted by the labor union, which leads to the unemployment.

Since we assume that there exists a competitive labor market in the second sector, the household's labor supply is simply derived from maximizing utility given by eq. [18] subject to a budget constraint, $W_j L_j$, as described in the problem [2]. It is

$$L_j = (1/\beta)^{1/(\beta-1)} \left(\frac{W_j}{P_1} \right)^{1/(\beta-1)}. \quad [19]$$

On the other hand, the consumers of the second sector are firm owners (capitalists) of the first and second sectors. A representative firm owner in the first sector and second sector, s , has a utility over the consumptions, $Q_{1s}, \dots, Q_{ms}$ of m different commodities. Then the objective of any firm owner s is to choose the consumptions, $Q_{1s}, \dots, Q_{ms}$, thus trying to solve the following problem

$$\max m \left(\frac{1}{m} \sum_{i=1}^m Q_{is}^{(\eta-1)/\eta} \right)^{\eta/(\eta-1)} \quad \text{s. t. } P_{12}Q_{1s} + \dots + P_{m2}Q_{ms} \leq \Pi_s, \quad [20]$$

where $P_{12}, \dots, P_{m2}$, are the prices of the m commodities produced by m different firms in the second sector.

The firm-owner's demand for goods in this market is simply derived from the above problem expressed in eq. [20]. And summing the demand function for commodity k by all of the firm owners, we get the total demand function for commodity k produced by the firm k in the second sector,

$$Q_k(\cdot) = \left(\frac{P_{k2}}{P_2} \right)^{-\eta} \frac{1}{m} \frac{E_2}{P_2}, \quad [21]$$

where η is the elasticity of substitution among goods in the second sector, $P_2 = P(P_{12}, P_{m2})$ defines the price index of the goods produced in the second sector and

$$E_2 = \sum_{i=1}^n \Pi_i + \sum_{k=1}^m \Pi_k, \quad [22]$$

denotes the total demand coming from all the profits of firm owners.

The representative firm k in the second sector uses a technology described by the following production function

$$Q_k = BL_k^{1-\theta}, \quad 0 < \theta < 1, \quad [23]$$

where Q_k is the volume of real output produced and sold in the second sector by the firm k , L_k is working hours demanded by the firm k . And B is a technology parameter.

The profit of the firm k in the second sector is

$$\Pi_k = Q_k(\cdot)P_{k2} - W_kL_k - \frac{T}{n+m},$$

which can be rewritten more explicitly

$$\Pi_k = P_{k2} \left(\frac{P_{k2}}{P_2} \right)^{-\eta} \frac{1}{m} \frac{E_2}{P_2} - W_kL_k - \frac{T}{n+m} \quad [24]$$

Following the same optimization procedure as in the behavior of the firms in the first sector (thus imposing the optimality condition $MR_k = MC_k$), we get

$$P_{k2} = m^q \frac{W_k}{(1 - \theta)BL_k^{-\theta}}, \quad [25]$$

where the term m^q in eq. [25] is price mark-up in the second sector, which is equal to η ($\eta - 1$). Dividing by P_1 on both sides of eq. [25] gives the relative price, P_{k2}/P_1 , of sector k 's product and then deriving real wage $\frac{W_k}{P_1}$ from eq. [25] and inserting it to eq. [19], and considering the fact that all prices in the second sector are equal to each other in the symmetric equilibrium, we get

$$L_k^* = (pX)^{1/(\theta + \beta - 1)}, \quad [26]$$

where L_k^* is optimal labor demand by each firm, $p = P_2/P_1$ is the relative price of goods in the second sector with respect to the price of goods in the first sector and $X = \left(\frac{(1 - \theta)B}{\beta m^q} \right)$.

Substituting eq. [26] into eq. [25] gives the equilibrium nominal wage rate in the second sector,

$$W_k^* = P_2^{(\beta - 1)/(\theta + \beta - 1)} P_1^{\theta/(\theta + \beta - 1)} X^{(\beta - 1)/(\theta + \beta - 1)}. \quad [27]$$

Since the workers in the second sector consume in the first sector like the workers in the first sector, the real wage of these workers in the second sector should be defined in terms of price level in the first sector, P_1 , hence we write it as

$$w_k^* = \frac{W_k^*}{P_1} = (pX)^{(\beta - 1)/(\theta + \beta - 1)} \quad [28]$$

Notice that in symmetric equilibrium we have $w_k^* = w_2$.

Since the total labor in the second sector is

$$L_2 = mL_k^* = m(pX)^{1/(\theta + \beta - 1)}, \quad [29]$$

the total real income of workers in the second sector is simply

$$w_2 L_2 = m(pX)^{\beta/(\theta + \beta - 1)}. \quad [30]$$

3 The Equilibrium and Comparative Statics

Since all the firms in both sectors are faced with identical demand curves and have identical production functions, the optimal prices they set in equilibrium will be identical within each sector, and hence the value of the price index will

be equal to the common price in each sector. Thus the equilibrium values of endogenous variables are

$$W_i^* = W_1, P_{i1}^* = P_1, nL_{i1}^* = L_1, \forall i \text{ and } W_k^* = W_2, P_{k2}^* = P_2, mL_k^* = L_2, \forall k.$$

From the national accounts of a closed economy, where the value of aggregate output in the first sector is equal to the summation of total expenditure, which includes the expenditure of workers in the first and second sector and the unemployed. The total expenditure in the first sector, E_1 , in equilibrium from eq. [3] is equal to

$$E_1 = W_1L_1 + W_2L_2 + T \quad [31]$$

Due to the equilibrium in the first sector, which requires the equality between the value of total output, $P_1Q_1 = P_1AL_1^{1-\alpha}$, given by eq. [9] and total value of expenditure, E_1 given by eq. [31], and using $W_1 = w_1P_1$ and

$$T = P_1(\bar{L}_1 - L_1)t, = P_1u\bar{L}_1t$$

where $\bar{L}_1 = n\bar{L}_i$, we obtain

$$P_1 = \frac{L_2W_2}{AL_1^{1-\alpha} - w_1L_1 - (\bar{L}_1 - L_1)t}. \quad [32]$$

Substituting eqs [29] and [27] into eq. [32] yields the relative price,

$$p = \frac{P_2}{P_1} = X^{-1} \left[\frac{1}{m} (AL_1^{1-\alpha} - w_1L_1 - (\bar{L}_1 - L_1)t) \right]^{\frac{(\theta + \beta - 1)}{\beta}} \quad [33]$$

or

$$p = X^{-1} \left[\frac{1}{m} (AL_1^{1-\alpha} - w_1L_1 - u\bar{L}_1t) \right]^{\frac{(\theta + \beta - 1)}{\beta}} \quad [34]$$

since $(\bar{L}_1 - L_1)t = u\bar{L}_1t$. As can be seen from the above equation, unemployment level (u) and the degree of monopoly power in the product and labor markets, which is represented by parameters within the variables L_1 , w_1 and X , have an impact on the relative price.

Plugging the relative price, p , defined in eq. [34] into eqs [28] and [30], we can rewrite the real wage of workers in the second sector and their total labor income more explicitly

$$w_2 = \left[\frac{1}{m} (AL_1^{1-\alpha} - w_1L_1 - u\bar{L}_1t) \right]^{\frac{(\beta - 1)}{\beta}}$$

and

$$w_2 L_2 = [AL_1^{1-\alpha} - w_1 L_1 - u\bar{L}_1 t]. \quad [35]$$

As can be seen from eq. [35], the labor income of the workers in the second sector is totally determined by the parameters in the first sector.

In equilibrium we can find out the profit level of each firm in each sector. Using eqs [10] and [31], the profit of any firm in the first sector will be

$$\Pi_1 = \frac{1}{n} W_2 L_2 + \frac{m}{n(n+m)} T \quad [36]$$

or more explicitly

$$\Pi_1 = \frac{1}{n} W_2 L_2 + \frac{m}{n(m+n)} u\bar{L}_1 t P_1, \quad [37]$$

Notice that the profit of each firm in the sector is labor income of the workers in the second sector plus transfer payments made to the unemployed who spend in the first sector.

The real profit of any firm in the first sector is defined as $\pi_1 = \Pi_1/P_2$ because the firms' owners spend in the second sector. Benefiting from eqs [26] and [27], we get

$$\pi_1 = \frac{1}{n} p^{\frac{(1-\theta)}{(\theta+\beta-1)}} X^{\frac{\beta}{(\theta+\beta-1)}} + \frac{m}{n(m+n)} u\bar{L}_1 t p^{-1}. \quad [38]$$

Plugging the relative price p in eq. [34] into eq. [38] yields

$$\pi_1 = \frac{1}{n} X \left[\frac{1}{m} (AL_1^{1-\alpha} - w_1 L_1 - (\bar{L}_1 - L_1)t) \right]^{\frac{(1-\theta)}{\beta}} + \frac{m}{n(m+n)} u\bar{L}_1 t p^{-1}.$$

As it is apparent from eqs [36] and [38], there are two effects of a change in relative price on the real profit of the firm owners in the first sector. One effect stems from the fact that a change in relative price leads to a change in payments made to the workers working in the second sector but consuming in the first sector. Another effect is that a change in relative price affects real expenditure made by the unemployed in the first sector, thus influencing real transfers to the unemployed.

On the other hand, we can also derive the equilibrium profit level of any firm in the second sector. Since all the firms in this sector are faced with identical demand curves and are assumed to have identical production functions, the optimal prices they set in equilibrium will be identical. From eqs [21], [22], [24], we simply obtain

$$\Pi_2 = \frac{1}{m}(Q_2(\cdot)P_2 - W_2L_2) - \frac{T}{n+m}$$

where Q_2 is the total production in the second sector.

Using eqs [23], [26] and [27], we get the real profit of each firm in the second sector, $\pi_2 = \Pi_2/P_2$, will be

$$\pi_2 = \frac{1}{m}(pX)^{\frac{(1-\theta)}{(\theta+\beta-1)}}[B-X] - u\bar{L}_1tp^{-1} \quad [39]$$

Notice that B is technology parameter in production function in eq. [23]. And using eq. [33], eq. [39] becomes

$$\pi_2 = \left(\left[\frac{1}{m}(AL_1^{1-\alpha} - w_1L_1 - (\bar{L}_1 - L_1)t) \right] \right)^{\frac{(1-\theta)}{\beta}} \left[B \left(1 - \frac{(1-\theta)}{\beta m^q} \right) \right] - u\bar{L}_1tp^{-1} \quad [40]$$

The eq. [39] or [40] also implies that the profit in the second sector is a function of relative price, p . This mainly stems from the fact that the profit of firms in the second sector is related to profit of firms in the first sector due to linkages connected through demand pass-through, i.e., while workers in the second sectors are customers of the firms in the first sector, the firms in the first sector are customers of the second sector. Also notice that an increase in unemployment rate in the first sector has an effect on both the profits of the second sector firms and the profits of the first sector firms.

Proposition 1: Only price and wage mark-ups in the first sector affect the unemployment rate in the equilibrium.

Proof: The unemployment rate in the equilibrium is

$$u^* = 1 - \frac{L_1}{L_1}$$

where $L_1 = L_1 = (m^w v)^{-1/\alpha} \left(\frac{A(1-\alpha)}{m^p} \right)^{1/\alpha}$.

The change in unemployment rate with respect to wage mark-up in the first sector is

$$\frac{du^*}{dm^w} = \frac{1}{\alpha} \frac{1}{m^w} (1 - u^*) > 0$$

The change in unemployment rate with respect to price mark-up in the first sector is

$$\frac{du^*}{dm^p} = \frac{1}{\alpha} \frac{1}{m^p} (1 - u^*) > 0$$

However there is no change in unemployment rate with respect to price mark-up in the second sector,

$$\frac{du^*}{dm^q} = 0.$$

■

The proposition simply indicates that while mark-ups in the first sector are effective on unemployment rate, the mark-up in the second sector does not have any effect on unemployment. This basically stems from the fact that the unemployment rate is determined only by the variables of the first sector because it is isolated from the effects of the second sector due to unionization in the first sector, Walrasian structure of labor market in the second sector and immobility of workers among sectors in the short run. This result is in fact what the post-Keynesian approach mainly points out. This also implies that the changes in mark-ups in the first sector are influential on the transfer payments made to the unemployed ($T = u^* t \bar{L}_1$). Thus increases in these mark-ups lead to higher unemployment rate and hence higher transfer payments.

Proposition 2: *The tax level is affected by all the mark-ups in each sector.*

Proof: The tax level is derived using eqs [4], [32], [27] and [29].

$$T = P_1(\bar{L}_1 - L_1)t = P_1 u \bar{L}_1 t = \frac{L_2 W_2}{AL_1^{1-\alpha} - w_1 L_1 - (\bar{L}_1 - L_1)t} (\bar{L}_1 - L_1)t \quad [41]$$

As can be seen from eq. [41], the tax level is affected by all the mark-ups in both sectors (m^p , m^w and m^q are inside the relevant variables in eq. [41]). However their directions are ambiguous, depending on the magnitudes of the parameters in the model. ■

In short the proposition above implies that the tax collected and distributed to the unemployed is affected by the changes in mark-ups in each sector. The magnitudes of the parameters will determine the direction of their effects. Furthermore, it indicates that an increase in unemployment level has counter-acting effects on the tax level because of its increasing effect due to increasing unemployment insurance payments and decreasing effect due to an increase in demand by the unemployed for the products in the first sector leading to a decline in unemployment. However, it can be easily proved that the net effect is in the way that an increase in unemployment increases tax level.

Proposition 3: *The real wages in the first and second sector are negatively related to each other and the real wage in the second sector is affected by price and wage mark-ups in the first sector.*

Proof: From eqs [28] and [33], it appears that

$$w_2 = f(w_1)$$

more explicitly

$$w_2 = \frac{n}{m} \left[(AL_1^{1-\alpha} - w_1 L_1 - u \bar{L} t) \right]^{\frac{\beta-1}{\beta}}, \quad [42]$$

where $L_1 = (m^w v)^{-1/\alpha} \left(\frac{A(1-\alpha)}{m^p} \right)^{1/\alpha}$, $w_1 = m^w v$ and $u = 1 - \frac{L_1}{L}$.

We can also write eq. [42] in a more compact form to make it more apparent in terms of mark-ups

$$w_2 = w_2(m^p, m^w).$$

Differentiating eq. [42] with respect to mark-ups yields

$$\frac{dw_2}{dm^w} < 0, \quad \frac{dw_2}{dm^p} < 0 \text{ and } \frac{dw_2}{dm^q} = 0$$

■

The above proposition shows that if the real labor wage of workers in the first sector increases, this reduces the real wage of the workers consuming in the first sector but working in the second sector: The change in the real wages in the first sector mainly originates from a change in wage mark-up, m^w . A higher wage mark-up, m^w , increases the real wage of the workers in the first sector. This in turn lowers the purchasing power of the workers of the second sector. This stems from two factors. One is the price effect, which is a decline in purchasing power of the second sector workers since the change in wage markup, m^w , is reflected to the price in the first sector. Another factor is profit effect: when wage mark-up increases in the first sector, this lowers the profit of the first sector's firms due to a fall in demand by the workers of the second sector, this in turn leads to a decrease in the demand for the products in the second sector and hence the firms in the second sector decrease their demand for labor. This results in a much lower wage of the workers in the second sector.

In a similar manner, an increase in price mark-up, m^p , also reduces the purchasing power of workers of the second sector. However the real wage of workers in the second sector is not affected by the price mark-up of this sector,

m^q . This result is mainly related to the fact that workers in the second sector consume in the first sector, thus they are not affected by the changes in the prices of the second sector.

As also seen from eq. [42], the existence of unemployment in the first sector is influential on the real wage rate in the second sector, thus the effect of unemployment in the former sector in which wage goods are produced spreads to the latter sector in which luxury goods are produced in terms of falling wages in the latter sector.

Proposition 4: *An increase in price and wage mark-up in the first sector lowers the welfare of all the agents except for the firm owners in the first sector. However while an increase in price mark-up in the product market of the second sector reduces the welfare of the firm owners in the first sector, it increases that of the firm owners in the second sector and does not affect the welfare of workers in both sectors.*

Proof: From eqs [17], [30], [38] and [39], we simply obtain the following

$$\frac{d(w_1L_1)}{dm^p} < 0, \frac{d(w_2L_2)}{dm^p} < 0, \frac{d\pi_1}{dm^p} \leq 0 \text{ and } \frac{d\pi_2}{dm^p} < 0$$

$$\frac{d(w_1L_1)}{dm^w} < 0, \frac{d(w_2L_2)}{dm^w} < 0, \frac{d\pi_1}{dm^w} \leq 0 \text{ and } \frac{d\pi_2}{dm^w} < 0$$

$$\frac{d(w_1L_1)}{dm^q} = 0, \frac{d(w_2L_2)}{dm^q} = 0, \frac{d\pi_1}{dm^q} < 0 \text{ and } \frac{d\pi_2}{dm^q} > 0$$

■

The proposition mainly implies that mark-ups are influential on income distribution. The profit and wage shares are influenced by conditions of product and labor market power of the relevant sectors.

The first line of the above proposition implies that a rise in price mark-up, m^p ; in the product market in the first sector leads to a fall in welfare of all the agents in the economy except for the firm owners of this sector, whose situation is ambiguous. It clearly appears from eqs [17] and [35], an increase in price mark-up in the first sector lessens the total labor income of the workers in both sectors. Even though its effect on the wage level of the workers in the first sector is isolated by unionization, labor demand decreases. Hence their total labor real income declines. The welfare of workers of the second sector is also dampened due to their declining purchasing power following an increase in the price mark-up leading to a higher price in the first sector. On the other hand, the net effect

of an increase in price mark-up on the profits of the firms in the first sector is ambiguous because while an increase in price level in the first sector reduces demand coming from the workers in the second sector (seen from eq. [37]), it increases the demand by the increased unemployed financed by the government. Hence the net effect of declining demand of the workers of the second sector and increasing demand of the unemployed on the real profits depends on their magnitudes. However an increase in price mark-up in the first sector reduces the profit of the firm owners in the second sector since the decrease in relative price, p , reduces the real profit of these firms, which can be derived from eq. [39]. Furthermore the taxes that will be paid by the second sector firms also increase due to increasing unemployment in the first sector.

The second line of the above proposition has similar implications to those in the first line. Even though an increase in wage mark-up, m^w , leads to an increase in real wage of the workers in the first sector, the demand for them falls. As can be proved from eq. [17], the net effect on their total real labor income is negative. It can also be shown from eq. [35], the real labor income of workers in the second sector also falls because the rise in wage mark-ups leading to a rise in prices of the products in the first sector reduces their purchasing power. Regarding the effect of wage mark-up, m^w , on profits of firms, it appears that while the profits of firms in the first sector depend on the magnitudes of counteracting effects as described in the first line of the proposition, the profits of the firms in the second sector fall due to a fall in the relative price, p , and increasing unemployment in the first sector which means more taxation on the firms in the second sector.

The third line in the proposition above is about the effect of a change in price mark-up, m^q , in the second sector on real wage and profit incomes of the agents in the economy. As seen in eq. [17], a change in price mark-up in this sector does not change the real labor income of workers in the first sector. From eq. [35], it can also be shown that the price mark-up, m^q , does not have any effect on the total real labor income of workers in the second sector either. As to the real profits of firms, it appears that an increase in price mark-up in the second sector raises the profit of the firms in this sector as seen in eq. [40]. However it reduces the real profits of the firm owners in the first sector, who consume luxury goods in the second sector. Hence it seems that the higher monopolistic control of firms in the second market in which luxury goods are sold is beneficial for only the firms in this sector. It implies that there is just a transfer from the firm owners in the first sector to the firm owners in the second sector without affecting the welfare of workers in both of the sectors.

On the other hand, the proposition also implies that the net effect of an increase in price mark-up (m^p) and wage mark-up (m^w) in the first sector on the

change in gap between the profit of firms and labor income of workers in both sectors, thus $(\pi_1 - w_1 L_1)$ and $(\pi_2 - w_2 L_2)$, is ambiguous, thus it is not certain whether it increases or not. However it seems that while an increase in price mark-up (m^d) in the second sector decreases the income gap in the first sector, it increases the gap in the second sector.

4 Conclusion

In this paper, we constructed a theoretical model based on an environment of coexistence of competitive and non-competitive structures and of income inequality that leads to differentiated consumption patterns. By this, we aim to characterize the main interaction channels that affect the welfare of agents who follow diverse price setting and wage-setting behavior in two different sectors that produce wage goods and luxury goods.

The model indicates that while price and wage mark-ups in the first sector (the wage goods producing sector) are effective on unemployment, the price mark-up in the second sector (luxury goods producing sector) does not have any effect on unemployment. This basically stems from the fact that the unemployment is determined only by the parameters of the first sector, which are isolated from the effects of the second sector due to the unionization in the first sector. It also seems that the existence of unemployment in the first sector is also influential on the real wage level in the second sector. Furthermore increasing unemployment leads to more taxation of firm owners.

The model also shows that the real wage of workers in the first sector is negatively related to the real wage of the workers in the second sector. Thus when there is an increase in wage mark-up of the first sector that leads to an increase in wage of these workers consuming and working in this sector, it lowers the purchasing power of workers consuming in this sector but working in other (second) sector.

Another important result we obtained is that a rise in price and wage markup in the first sector leads to a fall in welfare of all the agents in the economy except for the firm owners of the first sector, whose situation is ambiguous. However a change in price mark-up in the second sector does not change the labor income of workers in the first and second sectors, while it affects the profits of firm owners in the first and second sector, i. e., reducing the profits of the firms in the first sector and increasing the profits of the firms in the second sector. Therefore it seems that the higher the monopolistic control of firms in the second market in which luxury goods are sold is beneficial only for

the firm owners in this sector. It implies that there is just a transfer from the owners of the firms in the first sector to the owners of the firms in the second sector without distorting the welfare of workers in both sector.

Finally it indicates that the net effect of an increase in price mark-up and wage mark-up in the first sector on the change in gap between the profit of firm owners and labor income of workers in both sectors is ambiguous. However it seems that while an increase in price mark-up in the second sector decreases the income gap between workers and firm owners in the first sector, it increases the gap between them in the second sector.

Although the recent macroeconomic literature has paid increasing attention to issues of income distribution, the connection between income distribution and market imperfections is not extensively analyzed. The lack of models which integrate these two streams in the literature can limit the scope of some policy recommendations and, at the same time, account for the absence of explanations of some results at the empirical level. This paper makes a contribution in this sense. This carries some messages into policy makers, especially in the sense that they can affect the welfare of workers and the unemployed (less wealthy) and firm owners (more wealthy) by using policies which may be effective on mark-ups. Furthermore the paper urges new alternative tax attempts to both improve the conditions of the unemployed and to increase effective demand. However it is also worth emphasizing that our model does not involve wage and price rigidity. And the model can be enriched by dynamic analysis.

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