Tax Policy Under Keeping Up with the Joneses and Imperfectly Competitive Product Markets*

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Abstract

This paper examines the optimal (first-best) fiscal policy in a stochastic representative agent model that exhibits a "keeping up with the Joneses" utility function and imperfectly competitive product markets. We find that the optimal labor tax is a constant, whose sign is determined by the relative strength of consumption externality and monopoly power. Moreover, the optimal capital tax is unambiguously negative and affects the economy countercyclically. Our analysis shows that models with capital accumulation, imperfect competition, and "keeping up with the Joneses" preferences call for traditional Keynesian demand-management policies that are designed to mitigate business cycle fluctuations.

Keywords: *Fiscal Policy, Keeping Up with the Joneses, Imperfect Competition.*

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1 Introduction

Recently, Ljungqvist and Uhlig (2000) have examined the optimal (first-best) tax policy in a stochastic, infinite-horizon representative agent model without capital accumulation and with a "keeping up with the Joneses" utility function.[1] In particular, the household utility depends on the difference between an individual's own consumption and a fraction of the current level of aggregate consumption in the economy.[2] This utility specification postulates a positive consumption externality that can be corrected by a tax policy, governed by the social planner's marginal rate of substitution between consumption and labor hours, to achieve the Pareto optimal allocations. It turns out that in this no-capital setting, the first-best tax on (labor) income is a constant that equals the strength of consumption externality, and is independent of the technology shock.[3]

This paper incorporates capital accumulation and imperfectly competitive product markets into the Ljungqvist-Uhlig framework. These extensions allow us to identify some additional model features and parameters that govern the optimal fiscal policy. Specifically, capital accumulation introduces dynamic interdependence between macroeconomic aggregates, and imperfect competition adds a second market failure to the analysis. Our production environment, drawn from the work of Dixit and Stiglitz (1977) and applied recently by Guo and Lansing (1999), consists of two sectors: intermediate and final goods. Producers of intermediate goods possess a degree of monopoly power, whereas a unique final good is produced in a perfectly competitive market. As owners of all firms, households receive profits in the form of dividends that are taxed at the same rate as capital income.[4]

Under "keeping up with the Joneses" and imperfect competition, we find that as in Ljungqvist and Uhlig (2000), the first-best tax on labor income is a constant that is inde-

[1] "Keeping up with the Joneses" was first introduced in Duesenberry's (1952) relative consumption model. In recent years, it has been incorporated into asset pricing models as one way to partially resolve the equity premium puzzle of Mehra and Prescott (1985). See, for example, Abel (1990, 1999), Galí (1994), Kocherlakota (1996), among others .

[2] Since there is no capital accumulation and given the contemporaneous nature of consumption spillovers, Ljungqvist and Uhlig only need to analyze a simple one-period model.

[3] Ljungqvist and Uhlig also derive the first-best tax policy under "catching up with the Joneses" whereby past aggregate consumption enters the representative household's utility function. Under this formulation of consumption externality, these authors show that the optimal labor tax varies procyclically with productivity disturbances.

[4] By solving the dynamic version of the deterministic Ramsey problem, Guo and Lansing (1999) are mainly concerned with the steady-state optimal (second-best) capital tax in an otherwise standard neoclassical growth model with imperfectly competitive product markets. The first-best tax policy is also derived to provide a useful benchmark.

pendent of productivity disturbances. Since contemporaneous aggregate consumption enters the household utility that affects the *intra*temporal trade-off between consumption and leisure, the benevolent social planner can choose the optimal labor tax period by period. Moreover, there are two opposing factors that interact to determine the sign of the optimal tax on labor income. First, households' hours worked are lower than the socially optimal level because the wage rate that governs their labor supply decision is less than the social marginal product of labor. A negative tax rate on labor income can help eliminate this monopoly inefficiency. Second, the level of consumption in equilibrium is higher compared to that at the Pareto optimum because households attempt to keep up with the Joneses. A positive tax rate on labor income can help correct this consumption externality. As a result, the optimal labor tax can be positive, negative or zero, depending on the difference between the strength of consumption externality and the degree of intermediate firms' monopoly power.

We also show that the first-best tax on capital income is unambiguously negative, that is, the optimal capital subsidy is set to encourage investment by removing the wedge between the private and social marginal products of capital. In addition, the first-best capital subsidy does not depend on consumption spillovers. The intuition for this result is straightforward. The capital subsidy affects the *inter*temporal trade-off between consumption at different dates, whereas consumption spillovers are contemporaneous in nature. It follows that the consumption externality can be corrected by the optimal labor tax without any intertemporal considerations. On the other hand, we find that the optimal capital subsidy operates like a classic automatic stabilizer which moves positively with the technology shock because the social planner now needs to address the dynamic linkage between macroeconomic aggregates. Therefore, the first-best policy involves a countercyclical capital subsidy, e.g., "cooling down" the economy with a lower subsidy on capital income when it is "overheating" due to a positive productivity disturbance.

Finally, when the intermediate sector is perfectly competitive, the optimal capital tax/subsidy turns out to be zero since monopoly inefficiency no longer exists. In this case, the first-best policy only consists of a time-invariant labor tax that corrects the consumption externality. This implies that adding capital accumulation *alone* to the Ljungqvist-Uhlig model does not alter their main result. In sum, our analysis shows that models with capital accumulation, imperfect competition, and a "keeping up with the Joneses" utility function create an opportunity for Keynesian-type stabilization policies that are designed to mitigate business cycle fluctuations.

This paper is related to recent work of Aloso-Carrera, Caballe and Raurich (2001*a*) who also study the first-best tax policy in the Ljungqvist-Uhlig economy with capital accumulation. Our analysis differs from theirs in three important aspects. First, in their model, labor supply is fixed and households derive utility from their own consumption in comparison with a reference level. This reference level is determined by the representative household's past consumption ("habit formation"), together with the current and lagged levels of aggregate consumption ("keeping up" and "catching up" preferences, respectively). By contrast, variable labor supply is allowed in our model, and the household utility is only subject to spillovers generated by contemporaneous aggregate consumption. Second, in their model, there is one production sector under perfect competition, whereas our model includes two production sectors, one is perfectly competitive and the other is monopolistically competitive. Third, Aloso-Carrera et. al. consider a deterministic model with consumption and capital taxes, whereas our analysis is conducted within a stochastic framework with taxes on labor and capital income.[5]

The remainder of this paper is organized as follows. Section 2 presents the model and the conditions that characterize a competitive equilibrium and the Pareto optimum. Section 3 derives and discusses the first-best fiscal policy. Section 4 concludes.

2 The Model

The model is comprised of three types of agents: households, firms and the government. Households' preferences are defined over their own consumption and leisure, as well as the current level of aggregate consumption in the economy. The production side of the economy consists of two sectors: intermediate and final goods. In the intermediate-good sector, monopolistically competitive firms operate with a Cobb-Douglas technology that uses capital and labor as factors of production, subject to an aggregate productivity shock. A homogeneous final good (GDP) is produced from the set of intermediate inputs in a perfectly competitive environment. The government balances its budget each period and chooses the first-best fiscal policy.

[5] Aloso-Carrera, Caballe and Raurich (2001*b*) examine the first-best income taxation policy in a deterministic AK model of endogenous growth where the household utility function exhibits habit formation and "keeping up with the Joneses".

2.1 Firms

There are two production sectors in the economy. A unique final good y_t is produced from a continuum of intermediate inputs y_{it}, $i \in [0,1]$, using the following Dixit-Stiglitz technology that exhibits constant returns-to-scale:

$$y_t = \left(\int_0^1 y_{it}^{1-\eta} di \right)^{\frac{1}{1-\eta}}, \ \ \eta \in [0,1). \tag{1}$$

We assume that the final-good sector is perfectly competitive, thus final-good producers make zero profits in equilibrium. The first-order condition for the final-good producer's profit maximization problem is

$$y_{it} = p_{it}^{-\frac{1}{\eta}} y_t, \tag{2}$$

where p_{it} denotes the relative price of the ith intermediate good, and the price elasticity of demand for y_{it} is given by $-\frac{1}{\eta}$. Notice that when $\eta = 0$, intermediate goods are perfect substitutes in producing the final good, and the intermediate sector is also perfectly competitive. When $\eta > 0$, intermediate-good producers face a downward sloping demand curve that can be exploited to manipulate prices. In this case, intermediate firms earn an economic profit that is distributed to households in the form of dividends.

Each intermediate good is produced by the same technology given by

$$y_{it} = z_t k_{it}^{\theta} h_{it}^{1-\theta}, \ \ 0 < \theta < 1, \tag{3}$$

where z_t is an aggregate technology shock. In addition, k_{it} and h_{it} are capital and labor inputs employed by the ith intermediate-good producer. Under the assumption that factor markets are perfectly competitive, the first-order conditions for the intermediate-good producer's profit maximization problem are

$$r_t = \frac{\theta (1-\eta) p_{it} y_{it}}{k_{it}}, \tag{4}$$

$$w_t = \frac{(1-\theta)(1-\eta) p_{it} y_{it}}{h_{it}}, \tag{5}$$

where r_t is the capital rental rate and w_t is the real wage rate.

In what follows, we restrict the analysis to a symmetric equilibrium in which $p_{it} = p_t$, $k_{it} = k_t$ and $h_{it} = h_t$, for all i. It follows that (1) and (3) imply that the aggregate production function is

$$y_t = z_t k_t^{\theta} h_t^{1-\theta}. \tag{6}$$

Moreover, substituting (2) into the final-good producer's zero-profit condition and imposing symmetry yields

$$p_{it} = p_t = 1, \text{ for all } i. \tag{7}$$

Using equations (4)-(7), we obtain the following expressions for equilibrium rental rate and real wage:

$$r_t = \frac{\theta (1-\eta) y_t}{k_t}, \tag{8}$$

$$w_t = \frac{(1-\theta)(1-\eta) y_t}{h_t}. \tag{9}$$

Notice that when $\eta > 0$, the equilibrium factor prices r_t and w_t are lower than the corresponding social marginal products $\frac{\theta y_t}{k_t}$ and $\frac{(1-\theta) y_t}{h_t}$ implied by the social technology (6). Finally, profits π_t in the intermediate sector are given by

$$\pi_t = \eta y_t. \tag{10}$$

Therefore, the parameter η not only indexes the degree of monopoly power, but also represents the equilibrium profit share of national income.

2.2 Households

The economy is populated by a unit measure of identical, infinitely-lived households. Each household is endowed with one unit of time and maximizes

$$E_o \sum_{t=0}^{\infty} \beta^t \left[\frac{(c_t - \alpha C_t)^{1-\sigma}}{1-\sigma} - A \frac{h_t^{1+\gamma}}{1+\gamma} \right], \tag{11}$$

$$0 < \beta < 1, \ 0 \leq \alpha < 1, \ \sigma > 0, \ \sigma \neq 1, \ A > 0, \ \gamma \geq 0,$$

where c_t and h_t are the individual household's consumption and hours worked, and C_t is the contemporaneous aggregate consumption that is taken as given by the representative household. In addition, the parameters α, β, γ and σ govern the relative importance of aggregate consumption, the discount factor, the intertemporal elasticity of substitution in labor supply, and the curvature of the utility function, respectively.[6]

Notice that the standard preferences correspond to the case of $\alpha = 0$ whereby households derive utility from their own consumption. When $\alpha > 0$, the marginal utility of an individual household's own consumption increases with the aggregate consumption. In this case, the household utility is said to exhibit a positive consumption externality, or the "keeping up with the Joneses" feature since an addition to its own consumption becomes more valuable to the society as a whole. This implies that other households' consumption behaves as a complement to the representative household's consumption.

The budget constraint faced by the representative household is given by

$$c_t + k_{t+1} - (1-\delta)k_t = (1-\tau_{ht})\, w_t h_t + (1-\tau_{kt})\,(r_t k_t + \pi_t) + \tau_{kt}\delta k_t + T_t, \tag{12}$$

where k_t is the household's capital stock, and $\delta \in (0,1)$ denotes the capital depreciation rate. Households derive their income from supplying labor and capital services to intermediate firms at rates w_t and r_t, and pay taxes on labor and capital income at rates τ_{ht} and τ_{kt}, respectively. Three additional sources of household income are intermediate firms' after-tax profits $(1-\tau_{kt})\,\pi_t$, the depreciation allowance $\tau_{kt}\delta k_t$ that is built into the U.S. tax code, and a lump-sum transfer T_t.[7] The government sets τ_{ht}, τ_{kt} and T_t, subject to the following constraint that balances its budget each period:

$$T_t = \tau_{ht} w_t h_t + \tau_{kt}(r_t k_t + \pi_t - \delta k_t). \tag{13}$$

Combining (8)-(10), (12) and (13) yields the aggregate resource constraint for the economy[8]

[6] For the convenience of analytical tractability, Ljungqvist and Uhlig (2000) examine the model with indivisible labor as described by Hansen (1985) and Rogerson (1988). In this formulation, the household utility is linear in hours worked, i.e., $\gamma = 0$.

[7] As is common in the literature, we postulate a "standard" depreciation allowance where the tax depreciation rate is the same as the rate of economic depreciation δ. Guo and Lansing (1999) also consider the case of "accelerated depreciation" whereby the tax depreciation rate exceeds the rate of economic depreciation. In this case, the depreciation expenses that are tax deductible become $\tau_{kt}\phi\delta k_t$, where $\phi > 1$.

[8] As in Ljungqvist and Uhlig (2000), government spending on goods and services does not enter the analysis because we focus on the first-best fiscal policy in this paper.

$$c_t + k_{t+1} - (1-\delta)k_t = y_t. \tag{14}$$

2.3 Competitive Equilibrium

In a competitive equilibrium, each household maximizes (11) subject to its budget constraint (12), while taking factor prices, tax rates and consumption spillovers (or aggregate consumption) as given. The first-order conditions for the household's optimization problem are

$$(c_t - \alpha C_t)^{-\sigma} = \lambda_t, \tag{15}$$

$$\frac{Ah_t^{\gamma}}{\lambda_t} = (1 - \tau_{ht})\, w_t, \tag{16}$$

$$\lambda_t = \beta E_t \left\{ \lambda_{t+1} \left[1 + (1 - \tau_{kt+1}) (r_{t+1} - \delta) \right] \right\}, \tag{17}$$

$$\lim_{t \to \infty} E_0 \left[\beta^t \lambda_t k_{t+1} \right] = 0, \tag{18}$$

where λ_t denotes the Lagrangian multiplier associated with the household's budget constraint (12), (16) equates the slope of the household's indifference curve to the after-tax wage rate, (17) is the standard Euler equation for intertemporal consumption choices, and (18) is the transversality condition. Substituting the aggregate consistency condition $c_t = C_t$ into (15) yields the following expression for λ_t in equilibrium:

$$\lambda_t = \left[(1-\alpha)\, c_t \right]^{-\sigma}. \tag{19}$$

2.4 Pareto Optimum

At the Pareto optimum, the social planner internalizes the consumption externality by setting $c_t = C_t$ in the utility function (11), subject to the social technology (6) and the aggregate resource constraint (14). The first-order conditions for the planner's optimization problem are

$$(1-\alpha) \left[(1-\alpha)\, c_t \right]^{-\sigma} = \mu_t, \tag{20}$$

$$\frac{Ah_t^{\gamma}}{\mu_t} = (1-\theta)\, \frac{y_t}{h_t}, \tag{21}$$

$$\mu_t = \beta E_t \left\{ \mu_{t+1} \left[1 - \delta + \theta \frac{y_{t+1}}{k_{t+1}} \right] \right\}, \tag{22}$$

$$\lim_{t \to \infty} E_0 \left[\beta^t \mu_t k_{t+1} \right] = 0, \tag{23}$$

where μ_t denotes the Lagrangian multiplier associated with the aggregate resource constraint (14), and (21) equates the slope of the planner's indifference curve to the social marginal product of labor, (22) is the consumption Euler equation, and (23) is the transversality condition.

Notice that since the utility function (11) with $c_t = C_t$ and the aggregate production function (6) both are strictly concave, equations (20)-(23) are necessary and sufficient conditions for characterizing the unique Pareto optimal allocations.

3 First-Best Fiscal Policy

There are two kinds of market imperfections in our model economy. First, when $\alpha > 0$, the consumption externality generates a higher level of consumption in equilibrium compared to that at the Pareto optimum. Second, when $\eta > 0$, the presence of monopoly power leads to lower levels of equilibrium hours worked and investment in comparison to those in a perfectly competitive economy. Therefore, these environments create an incentive for government intervention to address the sources of market failures because competitive equilibrium does not yield an efficient (first-best) allocation of resources.

Proposition. The first-best fiscal policy that implements the planner's allocations as a decentralized equilibrium is

$$\tau_{ht}^{*} = \frac{\alpha-\eta}{1-\eta}, \tag{24}$$

$$\tau_{kt}^{*} = \frac{-\eta}{1-\eta}\left(\frac{r_t}{r_t-\delta}\right), \tag{25}$$

$$T_t^{*} = \left\{\alpha\left(1-\theta\right)-\eta\left[1+\frac{\eta}{1-\eta}\left(\frac{r_t}{r_t-\delta}\right)\right]\right\}y_t, \tag{26}$$

for all t, where r_t is given by (8) and y_t is given by (6) .

Proof. We note that equations (15)-(19) are necessary and sufficient conditions for a competitive equilibrium. On the other hand, as mentioned earlier, equations (20)-(23) are necessary and sufficient conditions for the Pareto optimum. To derive the first-best fiscal policy, we need to show that when the policy rules (24) and (25) are implemented, the resulting equilibrium allocations, characterized by (15)-(19), satisfy the Pareto optimality conditions as in (20)-(23).

By comparing (19) and (20), we find that the marginal utility of consumption in equilibrium is proportional to its efficient counterpart where

$$\mu_t = (1-\alpha)\,\lambda_t. \tag{27}$$

Substituting this condition, together with the equilibrium wage rate (9) and the proposed $\tau_{ht}^* = \frac{\alpha-\eta}{1-\eta}$ into (16) shows that the social planner's first-order condition for labor hours (21) is satisfied. Similarly, substituting (27), together with the period-$t+1$ equilibrium capital rental rate $r_{t+1} = \frac{\theta(1-\eta)y_{t+1}}{k_{t+1}}$ and the proposed $\tau_{kt+1}^* = \frac{-\eta}{1-\eta}\left(\frac{r_{t+1}}{r_{t+1}-\delta}\right)$ into (17) shows that the social planner's consumption Euler equation (22) is satisfied. Finally, the optimal lump-sum transfer T_t^* is obtained by substituting (8)-(10), (24) and (25) into the government budget constraint (13). ■

Equation (24) shows that, as in Ljungqvist and Uhlig (2000), the first-best tax on labor income is a constant that is independent of the productivity shock. The intuition for this finding is straightforward. The first-order condition for labor supply governs the *intra*temporal trade-off between consumption and leisure, along with the contemporaneous nature of consumption spillovers imply that the benevolent social planner can choose the optimal labor tax period by period. Moreover, the sign of τ_{ht}^* is determined by the relative magnitude of two opposing forces. Eliminating the wedge between the social and private marginal products of labor hours requires an income subsidy ($\tau_{ht}^* < 0$), whereas correcting the positive consumption externality calls for taxing labor income ($\tau_{ht}^* > 0$). As a result, τ_{ht}^* can be positive, negative or zero, depending on the difference between the strength of consumption externality α and the degree of monopoly power η.

On the other hand, since the net rate of return from investment $r_t - \delta$ is positive so that households have an incentive to invest, the optimal tax on capital income under the first-best policy, given by (25), is unambiguously negative ($\tau_{kt}^* < 0$). That is, τ_{kt}^* is set to achieve the Pareto optimal level of investment by removing the monopoly inefficiency that drives a wedge between the private and social marginal products of capital inputs. Moreover, the first-best capital subsidy does not depend on the consumption externality that is represented by the parameter α.[9] Intuitively, the capital subsidy affects the *inter*temporal trade-off between

[9] Since Guo and Lansing (1999) do not include consumption spillovers in their analysis, the expression for τ_{kt}^* in (25) is identical to the first-best capital tax in the Guo-Lansing model with standard depreciation allowance.

consumption goods at different dates, whereas the current level of aggregate consumption enters the household utility. Therefore, consumption spillovers can be corrected by the optimal labor tax (24) without any intertemporal considerations.

Next, using the chain rule leads to the following relationship between the optimal subsidy on capital income and the technology shock:

$$\frac{\partial \tau_{kt}^*}{\partial z_t} = \underbrace{\frac{\partial \tau_{kt}^*}{\partial \left(\frac{r_t}{r_t - \delta}\right)}}_{\text{negative}} * \underbrace{\frac{\partial \left(\frac{r_t}{r_t - \delta}\right)}{\partial r_t}}_{\text{negative}} * \underbrace{\frac{\partial r_t}{\partial z_t}}_{\text{positive}} > 0, \tag{28}$$

which indicates that τ_{kt}^* operates like an automatic stabilizer which moves positively with the macroeconomic conditions. With capital accumulation, the social planner needs to address the interrelations between macroeconomic aggregates of different time periods. As a result, the first-best policy involves a capital subsidy that affects the economy countercyclically, e.g., "stimulating" the economy with a higher subsidy on capital income in recessions caused by adverse productivity disturbances.

Finally, when the intermediate sector is perfectly competitive ($\eta = 0$), we recover Ljungqvist and Uhlig's result of $\tau_{ht}^* = \alpha$ whereby α percent of the labor income is taxed away. Under this policy, the household faces the correct Lagrangian multiplier (see equation 27) so that the resulting level of equilibrium consumption is Pareto optimal. Moreover, in the absence of monopoly inefficiency, there is no need to tax/subsidize capital income at all, thus $\tau_{kt}^* = 0$. This implies that adding capital accumulation *alone* to the Ljungqvist-Uhlig model does not change their main finding where the first-best policy only consists of a time-invariant labor tax that corrects the consumption externality.

In sum, our analysis illustrates that models with capital accumulation, imperfect competition, and a "keeping up with the Joneses" utility function create an opportunity for Keynesian-type stabilization policies that are designed to mitigate business cycle fluctuations. By contrast, Ljungqvist and Uhlig (2000) show that models without capital accumulation and with "catching up with the Joneses" preferences also call for traditional Keynesian demand-management policies to correct externalities that arise from past aggregate consumption in the economy.

4 Conclusion

Building on Ljungqvist and Uhlig's work, we have shown that to achieve Pareto optimality in a stochastic representative agent model with contemporaneous consumption spillovers and imperfect competition, the first-best tax on labor income is a constant that is independent of productivity disturbances. In addition, the sign of the optimal labor tax is theoretically ambiguous, determined by the relative strength of consumption externality and monopoly power. On the other hand, the first-best tax on capital income is unambiguously negative and does not depend on the consumption externality. Finally, the first-best fiscal policy stabilizes business cycle fluctuations via countercyclical capital subsidy, e.g., "cooling down" the economy with a lower subsidy on capital income when it is "overheating" due to a positive technology shock.

This paper can be extended in several directions. For example, we can consider other kinds of market imperfections that have been investigated in the optimal taxation literature, such as incomplete markets (Aiyagari, 1995), untaxed factors of production (Correia, 1996) and lack of commitment (Benhabib and Rustichini, 1997), among many others. Moreover, it would be worthwhile to incorporate productive and/or utility-generating public expenditures into our model economy, and then analyze the second-best (Ramsey) fiscal policy. This will allow us to compare and contrast the results under second-best taxation with those reported in this paper. We plan to pursue these projects in the near future.

References

[1] Aiyagari, S. Rao. (1995). "Optimal Capital Income Taxation with Incomplete Markets, Borrowing Constraints, and Constant Discounting," *Journal of Political Economy*, 103, 1158-1175.

[2] Abel, Andrew B. (1990). "Asset Prices under Habit Formation and Catching up with the Joneses," *American Economic Review Papers and Proceeding*, 80, 38-42.

[3] Abel, Andrew B. (1999)."Risk Premia and Term Premia in General Equilibrium," *Journal of Monetary Economics*, 43, 3-33.

[4] Aloso-Carrera, Jaime, Jordi Caballe and Xavier Raurich. (2001*a*). "Consumption Externalities, Habit Formation, and Equilibrium Efficiency," unpublished manuscript.

[5] Aloso-Carrera, Jaime, Jordi Caballe and Xavier Raurich. (2001*b*). "Income Taxation with Habit Formation and Consumption Externalities," unpublished manuscript.

[6] Benhabib, Jess and Aldo Rustichini. (1997)."Optimal Taxes without Commitment," *Journal of Economic Theory*, 77, 231-259.

[7] Correia, Isabel H. (1996). "Should Capital Income be Taxed in the Steady State?" *Journal of Public Economics*, 60, 147-151.

[8] Dixit, Avinash K. and Joseph Stiglitz. (1977). "Monopolistic Competition and Optimum Product Diversity," *American Economic Review*, 67, 297-308.

[9] Duesenberry, James S. (1952). *Income, Saving, and the Theory of Consumer Behavior*, Harvard University Press, Cambridge, MA.

[10] Galí, Jordi. (1994). "Keeping Up with the Joneses: Consumption Externalities, Portfolio Choice, and Asset Prices," *Journal of Money, Credit, and Banking*, 26, 1-8.

[11] Guo, Jang-Ting and Kevin J. Lansing. (1999). "Optimal Taxation of Capital Income with Imperfectly Competitive Product Markets," *Journal of Economic Dynamics and Control*, 23, 967-995.

[12] Hansen, Gary D. (1985). "Indivisible Labor and the Business Cycle," *Journal of Monetary Economics*, 16, 309-327.

[13] Kocherlakota, Narayana R. (1996). "The Equity Premium: It's Still a Puzzle," *Journal of Economic Literature*, 34, 42-71.

[14] Mehra, Rajnish and Edward C. Prescott. (1985). "The Equity Premium: A Puzzle," *Journal of Monetary Economics*, 15, 145-161.

[15] Ljungqvist, Lars and Harald Uhlig. (2000). "Tax Policy and Aggregate Demand Management Under Catching Up with the Joneses," *American Economic Review*, 90, 356-366.

[16] Rogerson, Richard. (1988). "Indivisible Labor, Lotteries, and Equilibrium," *Journal of Monetary Economics*, 21, 3-16.