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Common Ownership and the Secular Stagnation Hypothesis†

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Alvin Hansen (1938) put forward the secular stagnation hypothesis in the 1930s as a persistent decline in growth or, in more modern terms, the fact that no attainable interest rate will allow the balance of savings and investment at full employment. The experience of Japan and the low recovery in Western economies postcrisis have revived its predicament. Recent work by Gutiérrez and Philippon (2016) has shown that investment by US firms is low relative to measures of profitability and valuation, such as Tobin's Q. This fact is even more puzzling given that real interest rates have been at historic lows for over a decade (Summers 2016). At the same time, both the labor and capital shares have declined in recent decades (Barkai 2016, Karabarbounis and Neiman 2018). Several observers have suggested that, at least in part, this pattern of "secular stagnation" can be explained by an increase in market power (Summers 2016; Brun and González 2017; Gutiérrez and Philippon 2017; Eggertsson, Robbins, and Getz Wold 2018), and the case has been bolstered with evidence of increasing markups (De Loecker and Eeckhout 2017). Market power may have been fostered by the important rise of common ownership patterns across industries as a consequence of the increase in institutional investment (Azar, Schmalz, and Tecu 2018).

In this paper, we explore this hypothesis by extending the work in Azar and Vives (2018) in a very stylized macroeconomic model in which higher effective market concentration (including common ownership) leads to lower equilibrium real interest rates and a depressed economy. Our model is different from the ones that have been generally used in the literature on market power and macroeconomic outcomes in that it builds on models of oligopolistic competition from the industrial organization literature (e.g., Vives 1999), as opposed to the monopolistic competition model (e.g., Dixit and Stiglitz 1977). Thus, changes in markups in our model are driven by changes in market structure, such as market concentration, or the level of common ownership among firms. In contrast, the macroeconomic literature has generally relied on changes in preference parameters (in particular, the elasticity of substitution parameter of the Dixit-Stiglitz utility function) to generate changes in market power over time.

Another new feature of our model is that firms are large and have market power in both product and factor markets, including labor and capital markets. This implies that the wedge between the marginal product of labor and the wage is not necessarily the same as the wedge between the marginal product of capital and the real interest rate, since the level of market power can be different in the two markets.

We calibrate our model and find results that suggest that, without accounting for common ownership, measured increases in concentration cannot explain (under plausible values for elasticity parameters) the decline in labor and capital shares in recent decades. However, when taking common ownership into account, the model implies a decline in the labor share that is similar to the actual decline and a decline in the capital share that is somewhat larger than the actual decline. Proofs (following Azar and Vives 2018) are gathered in the online Appendix.

I. A One-Sector Economy

We develop a general equilibrium oligopoly model with two factors of production: labor and capital. The economy has a finite number J of

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firms and three types of people: workers, owners, and savers. We denote the set of workers I_W, the set of owners I_O, and the set of savers I_S, each of measure one. There are two periods: an initial period, which we call period 0 ("the past"), in which the savers have an endowment of output which they can consume or lend to the firms so that they can transform it into capital, and another period ("the present") in which the firms produce by combining the capital with labor that they buy from the workers. All three types of agents consume in period 1. There are four goods: consumption in the past, consumption in the present, leisure, and capital. The owners are divided uniformly into J groups, one per firm, with owners in group j owning $1-\phi+\phi/J$ of firm j and ϕ/J of the other firms; here, $\phi \in [0,1]$ represents the investment in an index fund. The utility of the owners is simply their consumption of the present period good, which they purchase with the profits that they receive from their ownership of the firms.

The workers have preferences over consumption in the present and leisure given by

$$U(C_{1,i}, L_i) = \frac{C_{1,i}^{1-\sigma}}{1-\sigma} - \chi\frac{L_i^{1+\xi}}{1+\xi},$$

where $\chi, \xi > 0$ and σ in $(0,1)$. They sell their labor to the firms at a wage w, and use it to buy the present consumption good that the firms produce and sell at price p . Therefore, they face the budget constraint $pC_{1,i} \le wL_i$.

The savers do not work or own the firms. They have an endowment E of output in the period 0 (i.e., in the past) and can decide whether to consume the output or lend it to the firms so they can use it as capital in period 1 (i.e., in the present). The savers lend to the firms at a gross real interest rate r, so that a firm has to pay back r units of the period 1 good in period 1 for each unit of period 0 good that they borrowed. Thus, the inter-temporal budget constraint of the savers is $C_{0,i} + \frac{C_{1,i}}{r} = E$. Their preferences exhibit constant elasticity of substitution $1/\gamma$ between present and future consumption (with γ and β in $(0,1)$):

$$U(C_{0,i}, C_{1,i}) = \frac{C_{0,i}^{1-\gamma}}{1-\gamma} + \beta\frac{C_{1,i}^{1-\gamma}}{1-\gamma}.$$

The firms transform the output that they purchase from the savers into productive capital at a 1:1 rate. They combine the capital with labor that they buy from the workers to produce in period 1 using a constant-returns-to-scale Cobb-Douglas production function $Y_j = F(K_j, L_j) = AK_j^{1-\alpha}L_j^{\alpha}$, with $A > 0$ and $\alpha \in (0,1)$. The capital stock depreciates at a rate δ, and the firms can transform the capital that is left $(1-\delta)K_j$ into the consumption good in the present at a 1:1 rate. Thus, the profits of firm j (in terms of the consumption good in the present period) are

$$\frac{\pi_j}{p} = F(K_j, L_j) - \frac{w}{p}L_j - (r-1+\delta)K_j.$$

We assume that the objective function of the firm is to maximize a share-weighted average of the utilities of its shareholders assuming weights are proportional to shareholdings. That implies that the objective of firm j is to maximize $\left(\pi_j + \lambda\sum_{k\neq j}\pi_k\right)/p$, where $\lambda = \frac{(2-\phi)\phi}{(1-\phi)^2 J + (2-\phi)\phi}$ is the Edgeworth sympathy coefficient or weight on rivals' profits (Azar and Vives 2018) It is increasing in ϕ and decreasing in J.

We use the concept of Cournot-Walras equilibrium with shareholder representation from Azar and Vives (2018), adapted from Gabszewicz and Vial (1972) to a context in which firms maximize a weighted average of shareholder utilities instead of maximizing profits. This solves the issue of dependence of the equilibrium on the choice of price normalization, since utilities depend only on relative prices. The idea of the Cournot-Walras equilibrium is the following: each possible vector of production plans (i.e., labor and capital demands) of the firms implies a competitive-equilibrium allocation and relative price vector. Given this mapping from production plans to price vectors, the Cournot-Walras equilibrium (with shareholder representation) is a vector of production plans for the firms that are mutual best responses (that is, a Nash equilibrium).

A. *Competitive Equilibrium Conditional on Firms' Production Plans*

The competitive-equilibrium real wage (relative to the price of present consumption) is a function of the total employment plans by the firms and is given by the aggregate inverse labor-supply function $\omega(L) = \chi^{\frac{1}{1-\sigma}} L^{\frac{\xi+\sigma}{1-\sigma}}$ with elasticity $\eta = (1-\sigma)/(\xi+\sigma)$. Combining the Euler equation and the budget constraint for savers yields an expression for the level of savings as an increasing function of the real interest rate r (since $0 < \gamma < 1$): $S = E\left(1 + \beta^{-\frac{1}{\gamma}} r^{-\frac{1-\gamma}{\gamma}}\right)^{-1}$. Market clearing implies that $S = K$, where K is the total investment of the firms. The inverse of the savings function determines the competitive-equilibrium real interest as a function of K, which is given by $\rho(K) = \left(\frac{K}{E-K}\right)^{\frac{\gamma}{1-\gamma}} \beta^{-\frac{1}{1-\gamma}}$ with elasticity $\varepsilon(K) = \frac{\rho(K)}{\rho'(K)K} = \frac{1-\gamma}{\gamma}(1-s)$, where $s = K/E$ is the saving rate. The competitive-equilibrium real interest rate is increasing in K, tending to 0 as $K \to 0$, and to ∞ as $K \to E^-$.

B. *Cournot-Walras Equilibrium*

The equilibrium is characterized by the markdown of the real wage (interest rate) relative to the marginal product of labor (capital, including the capital that is left over after depreciation) being equal to the elasticity of the competitive-equilibrium real wage (interest rate) with respect to firms' employment plans, multiplied by the modified Herfindahl-Hirschman index (MHHI) H, which in this model is the same in the labor and capital markets and which is the augmented HHI due to common ownership. The following proposition states the result.

PROPOSITION 1: *A unique symmetric equilibrium exists and is characterized by the markdowns:*

$$\mu_L^* \equiv \frac{F_L\left(\frac{K}{J},\frac{L}{J}\right) - \omega(L)}{\omega(L)} = \frac{H}{\eta},$$

$$\mu_K^* \equiv \frac{F_K\left(\frac{K}{J},\frac{L}{J}\right) - \rho(K) + (1-\delta)}{\rho(K) - (1-\delta)} = \frac{H}{\varepsilon(K)}\left(1 - \frac{1-\delta}{\rho(K)}\right)^{-1},$$

where $H = 1/J + \lambda(J - 1/J)$.

The comparative statics of the equilibrium show the depressing effect of a higher effective concentration H and its impact on labor and capital shares.

PROPOSITION 2: *Suppose* $\phi < 1$. *Then either a decline in the number of firms* J *or an increase in the common ownership parameter* ϕ *leads to an equilibrium with lower:*

- *capital stock* K^*,
- *employment* L^*,
- *real interest rate* r^*,
- *real wage* $(w/p)^*$,
- *output*;
- *labor share of income* $\left(\frac{\alpha}{1+\mu_L^*}\right)$,
- *capital share of income* $\left(\frac{1-\alpha}{1+\mu_K^*}\right)$ *provided*

that the elasticity of (equilibrium) capital with respect to H is not too high.

II. Multiple Sectors

In this section, we extend the model to the case of multiple sectors. This case is similar to the one-sector case, except that the present consumption good is an aggregate of N goods $c_{1,ni}$:

$$C_{1,i} = \left[\left(\frac{1}{N}\right)^{1/\theta} \sum_{n=1}^{N} c_{1,ni}^{(\theta-1)/\theta}\right]^{\theta/(\theta-1)},$$

where $\theta > 1$ is the elasticity of substitution indicating a preference for variety. Each good is produced by one sector, each with J firms. We assume that both workers and savers have mass N. The savers can now provide a firm with a unit of the period 0 good in exchange for r units of the composite good in period 1. As in the one-sector model, firm j can transform the period 0 good into capital at a 1:1 rate. In period 1, the firm uses capital and labor to produce the good in its sector n according to the production function $Y_{jn} = AK_{jn}^{1-\alpha} L_{jn}^{\alpha}$, and then each unit of capital after production can be transformed into $1-\delta$ units of the composite good. We assume that the ownership structure of the firms is as in Azar and Vives (2018), with the initial owners divided into NJ groups and the initial owner group nj owning a fraction $1 - \phi - \tilde{\phi} \geq 0$ in firm nj, an index holding a fraction $\tilde{\phi}/J$ in each firm in sector n and an index holding ϕ/NJ in every firm in the economy.

We can show that the equilibrium markdowns of wages relative to the marginal product of labor and of the real interest rate relative to the marginal product of capital include two wedges: one that reflects the level of product market power, and one that reflects the level of market power in each factor market. We denote by $H_{labor} = H_{capital} = \frac{1}{JN} + \lambda_{intra}\frac{J-1}{JN} + \lambda_{inter}\frac{N-1}{N}$, and $H_{product} = \frac{1}{J} + \lambda_{intra}\frac{J-1}{J}$ the modified Herfindahl-Hirschman indices in the labor, capital, and product market, respectively, where λ_{intra} and λ_{inter} are, respectively, the intra- and inter-industry Edgeworth sympathy coefficients.

PROPOSITION 3: *At a symmetric equilibrium, markdowns of wages and the return to capital are*

$$1+\mu_L^* = \frac{1+H_{labor}/\eta}{1-\left(H_{product}-\lambda_{inter}\right)\left(1-1/N\right)/\theta},$$

$$1+\mu_K^* = \frac{1+H_{capital}/(\varepsilon(K)(1-(1-\delta)/\rho(K)))}{1-\left(H_{product}-\lambda_{inter}\right)\left(1-1/N\right)/\theta}.$$

In the multi-sector economy, the effect of the MHHIs in factor and product markets is modulated by a pro-competitive intersector pecuniary externality, which depends on the level of λ_{inter} (see Azar and Vives 2018).

III. Calibration of the Multi-Sector Economy

Where possible, we follow the calibration in Azar and Vives (2018). We calculate average product, labor, and capital market HHIs using Compustat data for US public companies. We calibrate the average MHHI delta (increase over HHI) in product and labor markets as $\lambda_{intra}(1-HHI)$ (using the respective HHI), based on our estimate of the average intra-industry Edgeworth sympathy coefficient λ_{intra}.[1] For capital market MHHI delta, we do the same but using $\lambda_{inter}(1-HHI)$.

We calibrate θ to 3 following Hobijn and Nechio (forthcoming), $N = 453$ (number of sectors in Compustat), and η to 0.59 based on estimates from Chetty et al. (2011). We calibrate γ to one-half, based on the estimate of the inter-temporal elasticity of substitution by Gruber (2013). We calibrate the savers' endowment E and productivity A to match the real interest rate of 1.071 in 1985 and the level of capital per worker in that year. We calibrate χ to match the employment-population ratio in 1985. We use $\alpha = 2/3$, $\delta = 0.1$, and $\beta = 0.99$, which are values commonly used in the literature.

The results are shown in Figure 1. The increase in product market concentration without taking into account common ownership implies almost no decline in the labor or capital share. Adding labor market concentration yields a decline that is only a fraction of the actual decline. However, the full model including common ownership implies a decline in the labor share that is roughly the observed decline. The model implies a decline in the capital share that is somewhat higher than the actual decline in the nonresidential capital share according to Karabarbounis and Neiman (2018) and Barkai (2016). The effect of common ownership is large in our calibration because, while the HHIs have increased little, the modified HHIs have increased substantially, and the impact is important because the elasticities of labor and capital supply are low.

IV. Conclusion

Our results suggest that potentially the increase in common ownership that has occurred in the last decades can help explaining reduced output and declining labor and capital shares. However, our model and calibration are extremely stylized (with a simplified exogenous ownership structure, for example) and should be understood as an illustration. Indeed, the empirical debate on the effects of common ownership is raging and much further work is needed. Among other things, we need to know much more on how changes in ownership structure translate into firm decisions before passing final judgment.

[1] While in the model there is an integrated labor market for the whole economy, in the calibration, we use segmented labor markets by industry.

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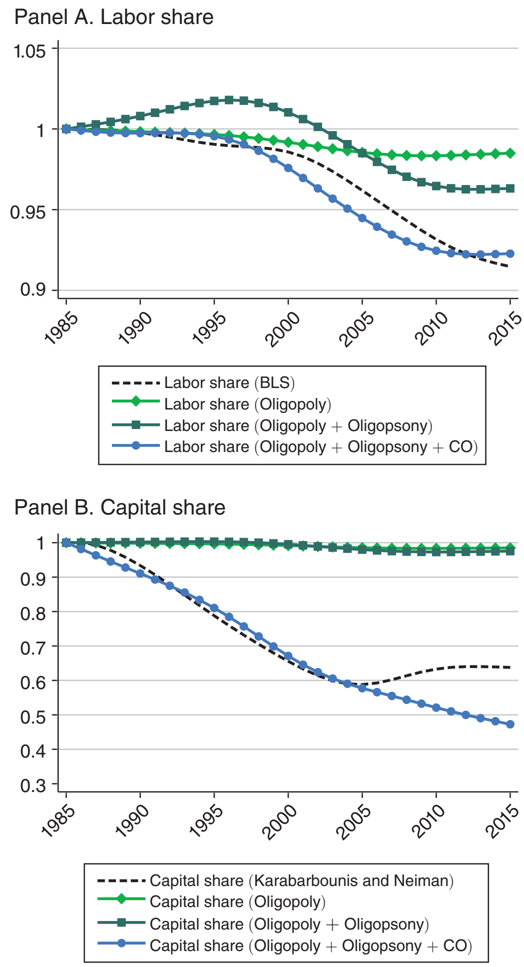

Figure 1. Model Calibration Results

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