



# Vertical separation versus vertical integration in a macroeconomic model with imperfect competition

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## ABSTRACT

This paper develops a monopolistic competition macroeconomic model, and uses it to discuss the determination of relevant macro variables under both vertical separation and vertical integration regimes. Several main findings emerge from the analysis. First, in the market equilibrium aggregate output and consumption under the vertical integration regime are greater than under the vertical separation regime, while the product price index under the vertical integration regime is lower than that under the vertical separation regime. Secondly, the level of real aggregate profits under the vertical integration regime will be higher (lower) than that under the vertical separation regime if the degree of monopoly power is relatively large (small). Third, the welfare level under the vertical integration regime will be higher than that under the vertical separation regime regardless of the degree of monopoly power.

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## 1. Introduction

Since the mid-1980s, a growing number of studies, including Blanchard and Kiyotaki (1987), Mankiw (1988), Dixon (1987), Startz (1989), Molana and Moutos (1992), Heijdra and van der Ploeg (1996), Devereux, Head, and Lapham (2000), to mention just a few, have focused on macroeconomic policies in the presence of imperfect competition. The principal tenet of the imperfectly competitive macro model is that firms have monopoly power in the product market and set prices optimally in light of the demand curves. Based on a solid micro-foundation of optimizing behavior, these studies find that an imperfectly competitive macroeconomic model provides us with greater insight than a purely competitive one.

A common feature in the existing studies on the macroeconomic model with imperfect competition is that they anonymously confine their analysis to the perspective of *market structure*. In other words, they focus on highlighting how the degree of monopoly power will govern the determination of relevant macroeconomic variables. In a departure from the existing literature, this paper instead focuses on the issue from the perspective of *industrial structure*. To be more specific, by setting up a simple macroeconomic

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model that is able to deal with both vertical separation and vertical integration in an imperfectly competitive market, we make an effort to examine the relative macroeconomic performance between these two regimes.

Vertical separation and vertical integration are two important industrial structures in the field of industrial economics, and a large number of studies (for example, [Bonanno and Vickers \(1988\)](#), [Salinger \(1988\)](#), [Gal-Or \(1991\)](#), and [Aribu et al. \(1998\)](#)) have been devoted to each of them. In general, the price of goods in a non-integrated industry is higher than in an integrated industry. The reason for this is that vertical integration can avoid the double marginalization that occurs in the regime of vertical separation when both upstream and downstream firms add their own price-cost margin at each stage of production.<sup>1</sup> Obviously, existing studies concerning vertical separation and vertical integration are conducted in a partial equilibrium framework. To be more specific, their analysis is derived within the goods market only, and hence ignores the mutual interaction between the goods market and other markets.

Compared to the existing literature on the standard industrial organization of double marginalization, this paper has distinctive traits. First, this paper develops a simple macroeconomic model with imperfect competition, in which not only the mutual interdependence between the goods market and other markets is explicitly taken into consideration, but also both structures of vertical integration and vertical separation can be described. Second, a common feature of existing studies concerning vertical separation and vertical integration (for example, [Bonanno and Vickers \(1988\)](#), [Salinger \(1988\)](#), and [Gal-Or \(1991\)](#)) is that some of their behavioral functions, in particular the demand function for goods, are based on *ad hoc* specifications. The advantage of this paper is that it presents a general-equilibrium macroeconomic model embodying a solid micro-foundation for the behavioral functions. Third, in the standard industrial organization model, the social welfare is measured by the sum of the consumer's surplus and all firms' profits. In our imperfectly competitive macroeconomic model, as the owner of all upstream and downstream firms, the representative household receives the profits of all upstream and downstream firms in the form of dividends. Accordingly, the social welfare can be measured by the level of the representative household's utility without resorting to the sum of the consumer's surplus and all firms' profits. Equipped with these features, we hope that our analysis can serve as a useful bridge between macroeconomics and industrial organization in future studies.

The remainder of this paper proceeds as follows. In [Section 2](#), we develop a monopolistic competition macroeconomic model developed by [Heijdra and van der Ploeg \(2002, ch. 13\)](#), and use it to discuss the determination of relevant macro variables under the vertical separation regime. [Section 3](#) deals with the determination of relevant macro variables under the regime of vertical integration. In [Section 4](#), we compare the relative performance of macro variables between the two regimes. Finally, in [Section 5](#) the main findings of the analysis are summarized.

## 2. Vertical separation

The economy we consider is composed of three sectors: a household sector, a production sector, and a central bank.<sup>2</sup> In what follows, we in turn describe the behavior of each of these sectors.

### 2.1. Households

The economy is populated by a unit measure of identical, infinitely-lived households. In line with [Heijdra and van der Ploeg \(2002, p. 377\)](#), the representative household derives utility from the consumption of composite goods  $C$ , leisure  $l$ , and real money balances  $M/P$ . The optimization problem faced by the representative household can be described as follows:

$$\text{Max}_{c_i, l, M} U = \alpha \ln C + \beta \ln l + \gamma \ln \frac{M}{P}, \alpha + \beta + \gamma = 1, \tag{1a}$$

$$\text{s.t.} \sum_{i=1}^m p_i c_i + M = WN + \Pi + M_0, \tag{1b}$$

$$N + l = T, \tag{1c}$$

$$C = m \left[ \frac{1}{m} \sum_{i=1}^m c_i^{1-\mu} \right]^{\frac{1}{1-\mu}}; \quad 1 > \mu \geq 0 \tag{1d}$$

$$P = \left( \frac{1}{m} \sum_{i=1}^m p_i^{\frac{\mu-1}{\mu}} \right)^{\frac{\mu}{\mu-1}}, \tag{1e}$$

where  $U$  is the utility function,  $M$  is nominal money balances,  $P$  is the price index,  $c_i$  is the consumption of the  $i$ th good,  $p_i$  is the price of the  $i$ th consumption good,  $W$  is the nominal wage rate,  $N$  is the working time,  $T$  is the time endowment,  $\Pi$  is the distributed nominal profits from the firms,  $M_0$  is the initial endowment of money, and  $m$  is the number of consumption goods. The parameters  $\alpha$ ,  $\beta$ , and  $\gamma$  refer to the weights in terms of the utility which the representative household attaches to consumption,

<sup>1</sup> However, the upstream firm can, for example, impose a two-part tariff by choosing a franchise fee in such a way that all the profit is extracted from the downstream firm. By setting the wholesale price equal to the marginal cost, the downstream firm will produce a quantity of goods that is optimal for the upstream monopoly. Based on this observation, [Hart and Tirole \(1990\)](#) argue that double marginalization would provide no motive for integration when a two-part tariff is allowed.

<sup>2</sup> To make our analysis as simple as possible, the government's role in the economy, such as imposing taxes and goods purchases, is ignored in this paper.

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