Towards a Competitive Thailand: The Role of Market Power and Business Dynamism[*]

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Abstract

We use administrative data of Thai registered firms, both public and private, to study aggregate impacts of market power and firm dynamism. Over the past decade, the dynamism of Thai businesses has been decreasing while the market power of Thai firms has been increasing. Our results suggest that firms within the same ownership network tend to have higher market power as measured by markups. In addition, we find that market power is negatively associated with firm's investment, propensity to export, diversification of export products, and likelihood of product upgrade. It also has a non-linear relationship with productivity growth. Our findings have policy implications on competitive policies and competitiveness of the economy.

Keywords: Market power, ownership, network, markup, competition, business dynamism, competitiveness

1. Introduction

Competition has long been an important issue in economics. Although competition alone does not guarantee an optimal allocation of resources in the economy as in many environment markets do not operate perfectly, a lack of competition has been widely associated with inefficient resource allocation. Over the past decades, concerns over rising dominance of large business conglomerates in several economies and its consequences on macroeconomic performance are also at the center of academic, public, and policymaking debate. Many vocal critiques associate the rising dominance of business conglomerates with rising market power and reduced competition. Relatedly, there has been a growing interest on whether, and how, the lack of local competition affects national competitiveness of a country in the global economy. Insights on these issues are of particular importance and have relevant policy implications as they help prescribe appropriate competition policies that would enhance aggregate productivity and competitiveness of the country. This study contributes to the literature by analyzing the relationship between corporate ownership, market power, and macroeconomic consequences in the context of a developing country.

This study is related to three strands of literature. First, there have been extensive studies on competition and market power. Traditionally, researchers and policy makers often rely on market concentration as a proxy for the competition, or the lack thereof. The benefit of using market concentration is that it is easy to compute and does not require detailed data. However, there are several criticisms on the use of concentration as a proxy for competition. For example, the lack of a well-defined boundary of the market often make the concentration measures inaccurate. Also, as being pointed out by researchers in the field of industrial organization, the concentration is a market outcome, not a market primitive. While there are situations in which declining competition leads to increasing concentration, one can think of other situations where increasing competition leads to increasing concentration as well. Finally, this approach ignores heterogeneity across firms within the same industry or market even though they may command different market power. Because of these reasons, the industrial organization researchers often rely on detailed carefully-collected firm-level data and focus on analyzing the market power within a specific industry, such as retail trade, hospital, or ready-mixed concrete.

The topics of competition and market power have recently regained the attention of macroeconomists and policy makers alike. This is partly due to the estimation method proposed by De Loecker and Warzynski (2012), which allows researchers to estimate markups—the most theoretically direct measure of market power (Syverson, 2019)—for the wide range of firms in the economy. One of the first papers that use this method to analyze the markup of the whole economy is De Loecker and Eeckhout (2017), which shows that markups of firms in the United States have increased by 40 points

between 1980 and 2016. Since then, there are a number of studies investigating markups trends in U.S. and other advanced economies (e.g., Cavalleri et al., 2019; De Loecker and Eeckhout, 2018; De Loecker, Eeckhout, and Unger, 2018; Díez, Leigh, and Tambunlertchai, 2018; Díez, Fan, and Villegas-Sánchez, 2019; and Haldane, 2018). However, most of existing literature has focused on advanced countries while studies on developing economies have been limited. Given that developing economies are likely to have different competitive environment from that of advanced economies, our study contributes to this literature by providing estimates of market power at the firm level over time for an emerging economy.

The second related area of research is on the aggregate impact of increasing market power. High market power of the incumbent firms could lower business dynamism because the potential new firms are discouraged from entering the market and the incumbent firms, enjoying high profit level, are less likely to be forced to exit. Excessive market power could also lower aggregate investment level. Since incumbent firms face lower threat from potential entrants and have incentive to restrict output, this could lead to lower investment rate. Both low business dynamism and low investment rate could, in turn, lead to lower productivity growth. Gutierrez and Philippon (2017a and 2017b) find that declining competition in the U.S. can partially explain why the U.S. businesses have been under-invested in the past decades. Díez, Leigh, Tambunlertchai (2018) find an inverted-U shape relationship between market power and investment and innovation rates in developed economies. Our study contributes to this literature by focusing on macroeconomic consequences of market power in a small, open, developing economy where corporate investment and exports are crucial driving forces of economic growth.

Finally, this study is related to extensive literature on corporate ownership and how it affects firm's behaviors. In particular, recent studies have linked common ownership and the diminished role of firms as the decision units, arguing that industry concentration measured at the firm level might not reflect the level of competition in the industry. For example, if institutional investors own shares of stock in firms in the same industry, these institutional investors might want to maximize the value of their portfolio rather than the value of individual firms. Again, most of existing studies have focused on the U.S. and other advanced economies while literature on developing economy is limited. Our paper contributes to this literature by analyzing the relationship between firm's markup and common ownership within business networks, which is a common organization structure in developing economies.

This paper uses administrative data of registered firms in Thailand, both public and private, to study aggregate impacts of market power and firm dynamism. Thailand serves as an appropriate setting for a study of this issue as it represents several developing countries in several dimensions. First, it

exhibits high degree of ownership concentration the business sector where many firms are connected through ownership networks; specifically, 47 percent of total corporate profit in Thailand in 2017 come from firms that belong to business groups. Second, the Thai economy has experienced increasing concentration in market concentration, especially in the wholesale and retail trade industries in which the concentration as measured by the average CR4 increased from approximately 30% to 40% during 2006-16. Third, the country has experienced declining business dynamism—entry and exit rates of firms has dropped and the average age of firms has increased from 18 to 22 years during 2011-2016. Fourth, Thailand is facing a serious challenge on persistently low investment. Investment rate has averaged at around 6% since 2006, a level far below the rate in the 1990s. Fifth, the Thai economy highly depends on exports—exports account for 55.8% of GDP during 2006-2016. The country is notorious for its lack of innovation and ability to climb up the value chain—in 2015 only 15% of Thai exporting firms export products in the top complexity quartile.

We find that firms within the same ownership network tend to have higher market power as measured by markups. In addition, we find that market power is negatively associated with firm's investment, propensity to export, diversification of export products, and likelihood of product upgrade. It also has a non-linear relationship with productivity growth. Our findings have policy implications on competitive policies and competitiveness of the economy, especially for the economies that highly depends on exports.

The remainder of the paper is as follows. Section 2 describes the data and provides some relevant stylized facts about the corporate sector in Thailand. Section 3 discusses business dynamism of Thai firms. Section 4 focuses on the calculation of concentration and markups as well as discussing markups over time and across industries. Section 5 analyzes the determinants of markups. Section 6 studies markups and macroeconomic consequences by looking at firms' behaviors.

2. Data Sources and Stylized Facts

This study uses micro data from three sources: (1) corporate profile and financial statement data, (2) ownership data, and (3) export data. This section describes each data source and some relevant stylized facts.

2.1 Corporate Profile and Financial Statement

All registered firms in Thailand are required to submit annual financial statement to the Department of Business Development (DBD) at the Ministry of Commerce. The database consists of a basic profile and annual financial statements of each business. The data include information on registration year,

registration type, current status, main industry, assets, liabilities, equities, revenues and expenses, and net income. Our study includes the data from 2006 to 2016.

Figure 1 shows the number and the total revenue of Thai registered firms in the data. During 2006–2016, the number of Thai registered firms has increased on average by 5.5% per year, and their revenue has increased by 7.1% per year. Figure 2 reports the shares of firm number and total revenue by industry in 2016. In terms of firm number, trade and service are the two biggest sectors, while manufacturing and trade are the two biggest sectors in terms of total revenue. Table 1 presents descriptive statistics of firms in our data.[1]
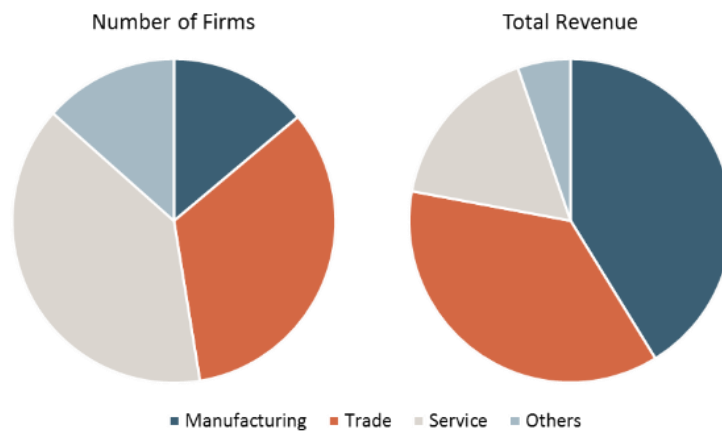
Figure 1: Number of firms and total revenue
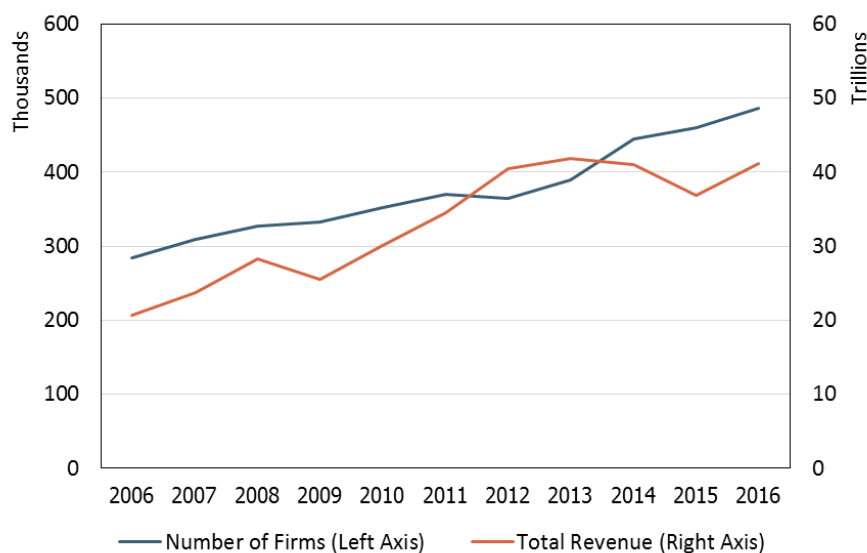
Remarks: Authors' calculation based on data from the Department of Business Development, Ministry of Commerce. Total revenue is in trillion baht and unadjusted for inflation.

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[1] For more information about the CPFS data and the financial analysis of Thai firms, see Banternghansa, Paweenawat, and Samphantharak (2019).

Figure 2: Industry share in 2016

Remarks: Authors' calculation based on data from the Department of Business Development, Ministry of Commerce. Industries are classified based on the 2-digit ISIC classification into Manufacturing (10–33), Trade (45–47), Service (49–99), and Others.

Table 1 Descriptive statistics of Thai firms

| Variables	N	Mean	S.D.	P25	Median	P50
Fixed asset	1,778,400	29,733,603	788,235,510	24,464	354,778	2,568,684
Total asset	1,821,381	90,462,446	2,475,348,848	1,771,616	4,812,988	16,286,342
Total liability	1,821,221	50,207,960	1,397,787,392	144,913	1,475,865	9,010,893
Total revenue	1,821,381	139,529,413	5,294,992,629	2,090,673	7,661,146	30,126,026
EBIT	1,814,980	8,215,308	283,049,913	32,761	333,245	1,154,857
Net profit	1,821,381	5,681,030	224,445,881	10,359	260,199	822,496
CGS	1,821,381	117,780,929	4,943,110,060	1,248,869	5,343,782	23,496,746
Age	1,821,381	10.33	9.58	3	8	15

2.2 Ownership

Ownership information is also from the Department of Business Development at the Ministry of Commerce. Our data cover a snapshot of ownership as of 2017.[2] It consists of names, nationality, and type of each owner, as well as the number of shares owned by each of them. Owners could be ordinary or juristic persons. Juristic persons include other domestic firms registered with DBD, foreign firms (multinational enterprises), other forms of organizations, and investment funds.[3]

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[2] We also exclude firms established after 2015 due to the high exit rate of firms during their first two years of operation.

[3] Other forms of organizations include public and state agencies (such as Ministry of Finance, state-owned enterprises, and the Crown Property Bureau), universities, cooperatives, and foundations. Investment funds also include mutual funds and pension funds, among others.

We construct networks of firms based on the information of corporate shareholding. Ownership between firms could be pyramidal, where one firm owns shares of the other, or cross-shareholding, where two (or more) firms own share of each other.[4] In this study, if firm A owns shares of stock in firm B, we consider that firms A and B belong to the same ownership network or the same business group.[5] Figure 3 shows examples of ownership networks of Thai firms. Figure 4 presents the extent of the networks in the entire Thai corporate sector.

Figure 3: Examples of ownership networks of Thai firms
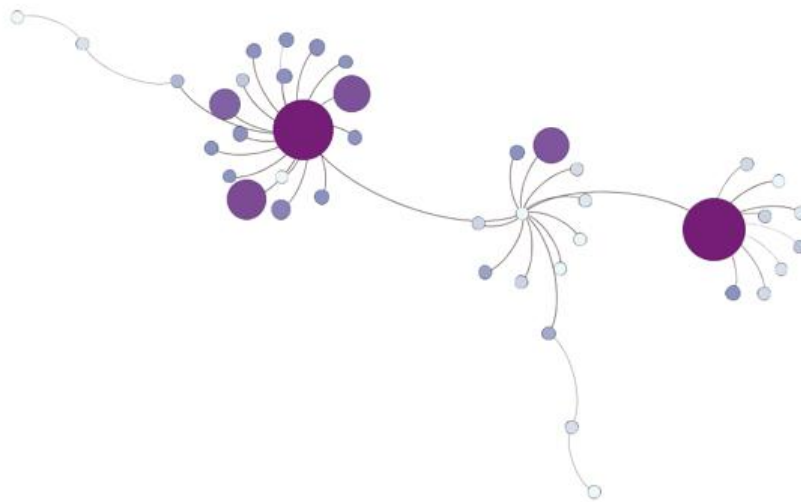
Source: Banternghansa and Samphantharak (2019). Node size represents total asset. Firm A owning Firm B represents by a clockwise edge from A to B.

Figure 4: The extent of ownership networks in the Thai corporate sector
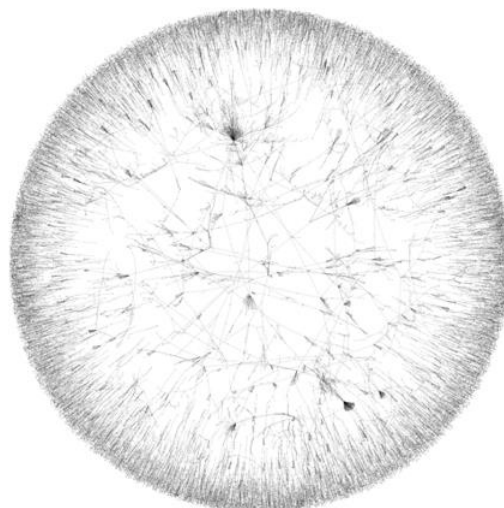
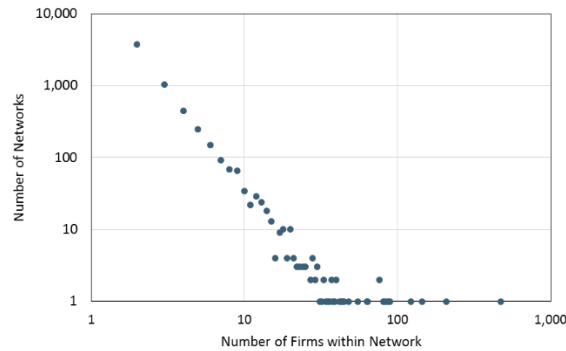Source: Banternghansa and Samphantharak (2019).

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[4] See Figure A.1 in the Appendix of illustrative examples of pyramidal shareholding and cross-shareholding.
[5] See Banternghansa and Samphantharak (2019) for the details on network construction and description.

Figure 5 presents the distribution of the number of firms within networks. We find that most networks are small: more than 60 percent of the networks consist of only two firms, and almost 90 percent of the networks consist of five firms or less. However, there are some very big networks. The biggest network consists of more than 400 firms, and over 1,000 firms belong to the biggest five networks.

Figure 5: The number of firms within networks

Source: Banternghansa and Samphantharak (2019); authors' calculation.

Regarding industry diversification within a network, while more than 1,300 networks consist of firms in only one industry, most networks consist of firms in more than one industry. For example, more than 70% of two-firm networks consist of firms in two different industries, and almost 85% of three-firm networks consist of firms in two or three industries. Figure 6 shows the number of industries, at 4-digit ISIC level by network size as measured by the number of firms in the network. The figure shows that although a large number of networks tend to diversify their business activities across various industries (those located close to the 45-degree line), there are several business groups that are not diversified (those having the number of firms much higher than the number of industries).

Figure 6: The number of industries within networks
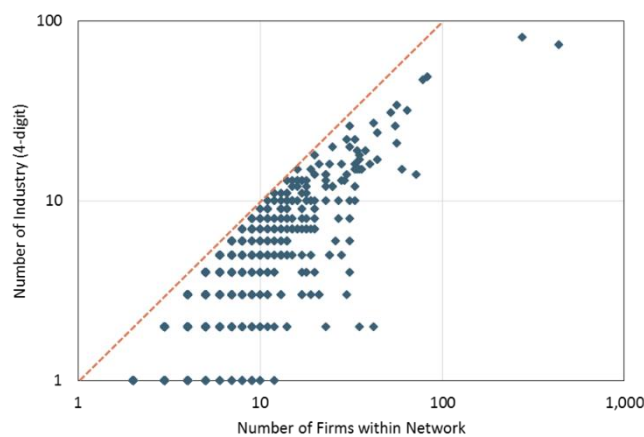
Source: Banternghansa and Samphantharak (2019); authors' calculation.

2.3 Export and Product Complexity

One of the main outcomes in our study is exports. We use the data of all trade transactions collected by the Thai Customs Department at the Ministry of Finance. These data cover all shipments of goods that crossed out of Thailand between 2006 and 2016. The key information available include firm identification, destination, commodity, value, currency, shipping method, and point of exit. We aggregate the information into annual data.[6]

We follow an idea proposed by Hidalgo and Hausmann (2009) and Hausmann and Hidalgo (2011) that allow us to gauge an economy's intrinsic capability by looking at the composition of its exported goods. To be able to export a certain product with revealed comparative advantage (RCA), a country needs to possess the necessary capabilities.[7] The more-capable countries export more-diversified baskets of goods, and the less-ubiquitous products (i.e., exported by fewer countries) require more exclusive capabilities. Thus, by looking at trade data, one can use a fixed-point theorem to construct the complexity measures for products (i.e., PCI) based on diversity and ubiquity. For more details, see Hausman and Hidalgo (2011).

To construct the Product Complexity Index (PCI), we incorporate additional data on international trade flow from BACI database, provided by CEPII, to our transaction-level trade data of all Thai exporters from the Thai Customs Department. The international trade flow data provide bilateral values and quantities of exports at the HS 6-digit product disaggregation of more than 200 countries since 1995. Our analysis is based on HS2007 classification. The custom data beyond 2012, which are reported in HS2012 classification, are converted to HS2007 classification. The matched sample leaves us with 21,825 firms exporting in 2016, of which 7,895 firms are manufacturing firms.[8]

Figure 7 presents the distribution of PCI for each exporting firm, computed as average PCI of all exports by the firm (weighted by export values). The figure shows that only 15% of all exporting firms export products in the top complexity quartile. In other words, exporting firms in Thailand tend to focus on low complexity products.

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[6] See Apaitan, Disyatat, and Samphantharak (2016 and 2019) for further details on exports of Thai firms.

[7] The RCA of country c in product p is defined as $RCA_{c,p} = \left(\frac{X_{c,p}}{\sum_p X_{c,p}}\right) / \left(\frac{\sum_c X_{c,p}}{\sum_c \sum_p X_{c,p}}\right)$ where $X_{c,p}$ is the export value of product p from country c.

[8] For further details on export complexity, see Ananchotikul, Apaitan, and Disyatat (2017).

**Figure 7: Product complexity of Thai exporting firms**
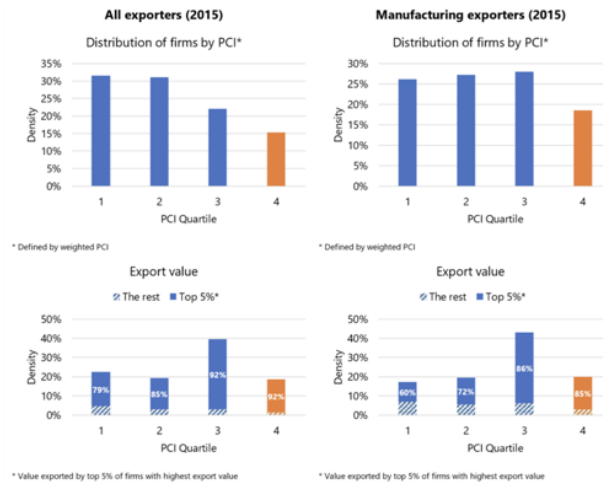
Source: Ananchotikul, Apaitan, and Disyatat (2017)

3. Business Dynamism

Business dynamics is generally defined as the process of business birth, growth, decline and exit (Decker et al., 2018). Decker et al. (2016) find that business dynamism in the United States has been declining since 2000. The slowdown in job reallocation from the low-productivity firms to the high-productivity firms or from the low-growth mature firms to the high-growth young firms also results in the slowdown in aggregate productivity growth. Bijnens and Konings (Forthcoming) find similar pattern for businesses in Belgium.

Figure 8 reports the entry and exit rates of Thai registered firms during 2006–2016. Similar to those in the U.S. and Belgium, business dynamism of Thai firms has been declining in the past ten years. The declining trend in business dynamism also happens across all sectors; see Figures A.2 and A.3 in the Appendix. Figures A.4 and A.5 further show the revenue-weighted average age of firms in manufacturing industries and trade and service industries, respectively. As expected, the average age of registered firms in Thailand has increased over the past ten years.

Figure 8: Entry and exit rates of Thai registered firms
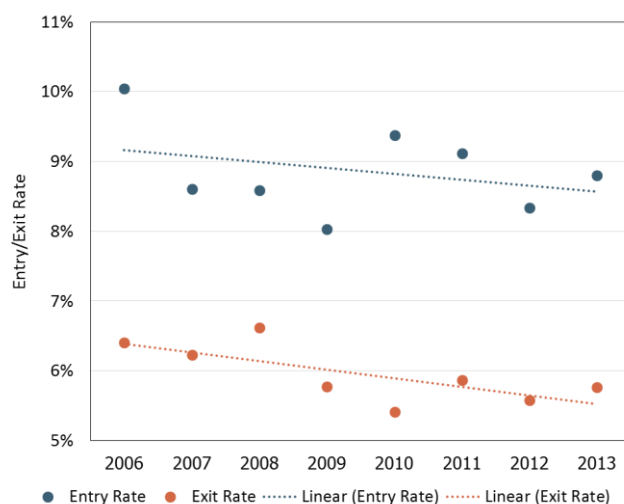
Source: Ministry of Commerce; Author's calculation.

4. Market Concentration and Market Power

In this section, we consider the evolution of market concentration and market power of registered firms in Thailand.

4.1 Market Concentration

There are two commonly-used measures for market concentration: the concentration ratio and the Herfindahl-Hirschman Index (HHI). The n-firm concentration ratio (CRn) measures the combined market share of the n largest firms in the industry. Two most commonly-used concentration ratios are CR4 and CR20. The HHI measures the sum-squared of market share of all firms in the industry. Thus, placing more weight on firms with larger market share.

Figures A.6 and A.7 in the Appendix show the four-firm concentration ratio (CR4) of manufacturing industries and trade and service industries[9], respectively. On the one hand, the CR4 of wholesale trade, retail trade, and some manufacturing industries (e.g., apparel) have been increasing over the past ten years. On the other hand, the CR4 of other manufacturing and service industries have been either rather stable or decreasing. We get similar results whether when we use the CR20 or when we use HHI to measure the market concentration.

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[9] For the results showed in this paper, we drop industries with less than 50 firms. However, the results remain unchanged if we include all industries.

4.2 Markup and Market Power

We estimate the firms' markup using the method developed in De Loecker and Warzynski (2012). Consider the decision of a firm i with the following production technology

$$Y_{it} = F(X_{it}, K_{it}, \Omega_{it})$$

where Y_{it} is the output of firm i at time t, X_{it} is the variable input, K_{it} is capital, Ω_{it} is the total factor productivity, and $F(\cdot)$ is the production function. We assume that $F(\cdot)$ is continuous and twice-differentiable.

We can write the Lagrangian for the firm's cost-minimizing problem as

$$L(X_{it}, K_{it}, \Omega_{it}) = P_{it}^X X_{it} + r_{it} K_{it} + \lambda_{it}[Y_{it} - F(X_{it}, K_{it}, \Omega_{it})]$$

where P_{it}^X is the price of variable input and r_{it} is the cost of capital. The first-order condition for variable input is

$$\frac{\partial L_{it}}{\partial X_{it}} = P_{it}^X - \lambda_{it} \frac{\partial F_{it}}{\partial X_{it}} = 0.$$

By rearranging the above equation and multiplying X_{it}/Y_{it} on both sides, we get

$$\frac{X_{it}}{Y_{it}} \frac{\partial F_{it}}{\partial X_{it}} = \frac{1}{\lambda_{it}} \frac{P_{it}^X X_{it}}{Y_{it}}.$$

The left-hand side of the above equation is the output elasticity of the variable input. The Lagrange multiplier λ_{it} reflects the marginal cost of output. Define the markup μ_{it} as the price-marginal cost fraction, i.e.,

$$\mu_{it} = \frac{P_{it}}{\lambda_{it}}.$$

Then, we can rewrite the elasticity equation as

$$\beta_{it}^X \equiv \frac{X_{it}}{Y_{it}} \frac{\partial F_{it}}{\partial X_{it}} = \mu_{it} \frac{P_{it}^X X_{it}}{P_{it} Y_{it}}.$$

Given the elasticity of the variable input, β_{it}^X, we can estimate the markup from

$$\mu_{it} = \beta_{it}^X \frac{P_{it} Y_{it}}{P_{it}^X X_{it}}.$$

To estimate the production function, we follow the procedures in De Loecker and Warzynski (2012) and Ackerberg, Caves, and Frazer (2015). First, we assume that a firm's production function is Cobb-Douglas and estimate the following equation:

$$y_{it} = \beta_x x_{it} + \beta_k k_{it} + \omega_{it} + \epsilon_{it}$$

where y_{it} is the revenue of firm i at time t, x_{it} is the value of variable inputs, k_{it} is the value of capital, and ω_{it} is the total factor productivity (TFP). All variables are in logarithmic form.

Next, we assume that the firm's productivity follows an AR(1) process, i.e.,

$$\omega_{it} = \omega_{it-1} + \xi_{it}.$$

We also assume that the demand for variable inputs is a function of productivity and capital, $x_{it} = f(\omega_{it}, k_{it})$. By taking an inverse of the function f, we can write the productivity level as a function of variable inputs and capital, $\omega_t = f^{-1}(x_t, k_t)$. Then, we replace the productivity term in the production function to get

$$y_{it} = \beta_x x_{it} + \beta_k k_{it} + f^{-1}(x_{it}, k_{it}) + \varepsilon_{it} = \phi(x_{it}, k_{it}) + \varepsilon_{it}.$$

In the first stage, we use a polynomial function to estimate $\phi(x_{it}, k_{it})$ in the following moment condition:

$$\mathbf{E}[\varepsilon_{it}|I_{it}] = \mathbf{E}[y_{it} - \phi(x_{it}, k_{it})|I_{it}] = 0.$$

Let $\hat{\phi}(x_{it}, k_{it})$ denote an estimate of $\phi(x_{it}, k_{it})$ from the first-stage estimation. Then, in the second stage, we estimate the following conditional moment condition:

$$
\begin{aligned}
0 &= \mathbf{E}[\xi_{it} + \varepsilon_{it}|I_{it-1}] \\
&= \mathbf{E}[y_{it} - \beta_x x_{it} - \beta_k k_{it} - \omega_{it-1}|I_{it-1}] \\
&= \mathbf{E}[y_{it} - \beta_x x_{it} - \beta_k k_{it} - (\hat{\phi}(x_{it-1}, k_{it-1}) - \beta_x x_{it-1} - \beta_k k_{it-1})|I_{it-1}].
\end{aligned}
$$

We use the CPFS data to estimate the firms' markups in Thailand. For capital and output, we use the values of firms' total assets and total revenue. For variable inputs, we follow the literature and use cost of goods sold (CGS). We drop the firm-year observations with less than 30,000 Baht (approximately 1,000 USD) worth of capital or output.

Figure 9 shows the expenditure-weighted average markup of Thai registered firms.[10] The result suggests that the market power of Thai firms was relatively stable during 2006–2011 and has been increasing since. Though the magnitude of the change is smaller than the findings in other studies that consider only listed firms, it is comparable to the findings in Díez, Fan, and Villegas-Sánchez (2019) which uses the data of both private and public firms.

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[10] We exclude the extreme outliers by winsorizing the top and bottom 10%. However, the overall trend does not change even if we include all observations.

Figure 9: Average markup of Thai registered firms
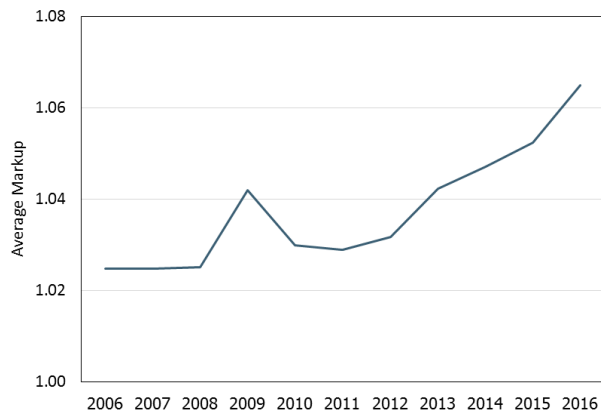
Source: Ministry of Commerce; Author's calculation.

Figure 10 presents the changes in markups for selected industries in the manufacturing sector (left panel) and the trading and service sectors (right panel). It shows that most industries experienced rising markups during 2006-2016, with a notable exception of the telecommunication industry where markup dropped markedly. The figure also shows that markups in the service sector tends to be higher than those in the manufacturing sector, reflecting the fact that services are non-tradable and thus more likely to entertain local market power. Figures A.8 and A.9 in the Appendix show the expenditure-weighted average markups of manufacturing industries and trade and service industries, respectively. For most industries, the average markup has been increasing in the past ten years. In addition, Figures A.10 and A.11 shows the distribution of firm-level markups in manufacturing industries and trade and service industries, respectively.

Figure 10: Change in average markup for selected industries
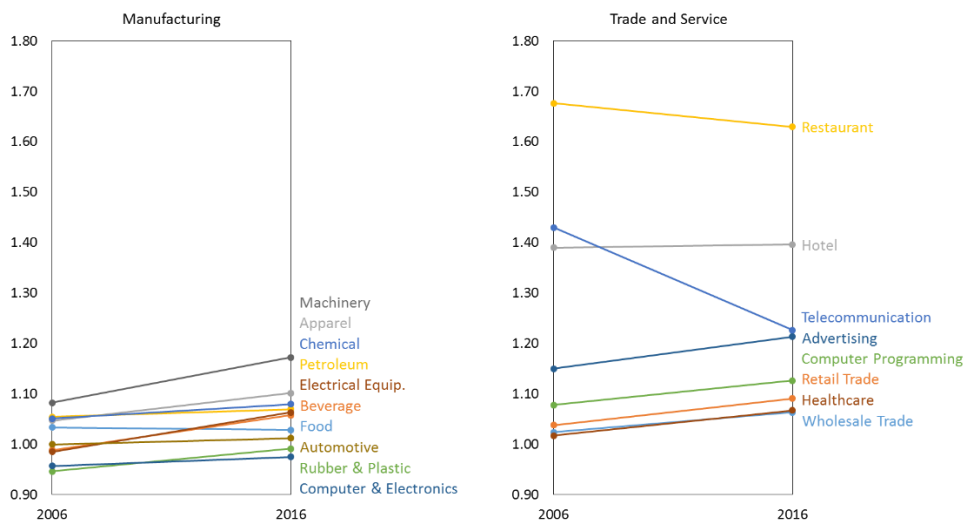
Source: Authors' calculation

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Next, we use the decomposition method in Haltiwanger (1997), to decompose the change in industry-level markups. Define the average markup of industry j in year t as

$$\overline{Markup}_{jt} = \sum_i \theta_{it} Markup_{it}$$

where θ_{it} denotes the expenditure share of firm i in industry j in year t. Following Haltiwanger (1997), we decompose the change in industry-level markup between year t and year $t - k$ as

$$
\begin{aligned}
\overline{Markup}_{jt} - \overline{Markup}_{j,t-k} = {} & \sum_{i \in S} \theta_{i,t-k} \Delta Markup_{it} && \text{``Within effect''} \\
& + \sum_{i \in S} \Delta \theta_{it} \left(Markup_{i,t-k} - \overline{Markup}_{j,t-k} \right) && \text{``Between effect''} \\
& + \sum_{i \in S} \Delta \theta_{it} \Delta Markup_{it} && \text{``Covariance effect''} \\
& + \sum_{i \in N} \theta_{it} \left(Markup_{it} - \overline{Markup}_{j,t-k} \right) && \text{``Entry effect''} \\
& + \sum_{i \in X} \theta_{i,t-k} \left(\overline{Markup}_{j,t-k} - Markup_{i,t-k} \right) && \text{``Exit effect''}
\end{aligned}
$$

where S is the set of firms that stayed in business from year $t - k$ to year t, N is the set of entering firms, and X is the set of firms that exited. Figures 15 and 16 show the decomposition of markup changes by industry for manufacturing industries and trade and service industries, respectively. The "between" bars show the combination of "between effect" and "covariance effect", while the "entry-exit" bars show the combination of "entry effect" and "exit effect".

First, the results (as shown in Figures A.12 and A.13 in the Appendix) support the findings that for most industries, markups were relatively stable during 2006–2011, but sharply increased during 2011–2016. Next, the increase in industry-level markups comes mainly from the within-firm increase. Lastly, the between-firm reallocation tends to lower the industry-level markups. That is, during that period, firms with low markups became relatively bigger, while firms with high markups became relatively smaller. Our findings are in contrast to those of De Loecker, Eeckhout, and Unger (2018) and Baqaee and Farhi (2019), who find that the increase in aggregate markup come mainly from the reallocation toward high-markup firms.

5. Determinants of markups

To examine the determinants of markups, we estimate the following equation:

$$
\begin{aligned}
Markup_{ijt} = {} & \beta_1 Network_{ijt} + \beta_2 Bangkok_{ijt} + \beta_3 JV_{ijt} + \beta_4 Rev_{ijt} + \beta_5 Rev_{ijt}^2 + \beta_6 Age_{ijt} \\
& + \beta_7 Age_{ijt}^2 + \delta_{jt} + \varepsilon_{ijt}
\end{aligned}
$$

where $Markup_{ijt}$ denotes the markup of firm i in industry j in year t, $Network_{ijt}$ is a dummy variable equal one if firm i belongs to an ownership network, $Bangkok_{ijt}$ is a dummy variable equal to one if firm i is located inside Bangkok and vicinity (i.e., located in a less urban area), JV_{ijt} is a dummy variable equal to one if firm i is a joint-venture firm, Rev_{ijt} is the log of firm i's total revenue, and Age_{ijt} is the age of firm i. Table 2 reports the estimation results. We find that firms in an ownership network tend to have higher markups.

Table 2: Ownership networks, location, and firm markups

$Markup_{ijt}$	All	Manufacturing	Wholesale Trade	Retail Trade	Service
$Network_{ijt}$	0.0474***	0.0323***	0.0431***	0.0704***	0.0662***
	(0.0007)	(0.0008)	(0.0011)	(0.0015)	(0.0018)
$Bangkok_{ijt}$	−0.0010	−1.65e−05	−0.0004	−0.0021*	−0.0009
	(0.0007)	(0.0009)	(0.0010)	(0.0012)	(0.0020)
JV_{ijt}	−0.0050*	−0.0039	−0.0130***	0.0116**	−0.0096
	(0.0026)	(0.0029)	(0.0041)	(0.0056)	(0.0064)
Rev_{ijt}	−0.4021***	−0.3186***	−0.3182***	−0.3654***	−0.5946***
	(0.0010)	(0.0011)	(0.0015)	(0.0019)	(0.0034)
Rev_{ijt}^2	0.0104***	0.0080***	0.0081***	0.0096***	0.0160***
	(3.07e−05)	(3.34e−05)	(4.44e−05)	(0.0006)	(0.0001)
Age_{ijt}	0.0042***	0.0024***	0.0036***	0.0028***	0.0077***
	(3.83e−05)	(4.58e−05)	(5.08e−05)	(6.01e−05)	(0.0001)
Age_{ijt}^2	−6.80e−05***	−3.69e−05***	−5.20e−05***	−3.86e−05***	−0.0001***
	(9.43e−07)	(1.09e−06)	(1.19e−06)	(1.45e−06)	(3.50e−06)
Industry-year F.E.	Yes	Yes	Yes	Yes	Yes
R^2	0.5657	0.6093	0.4529	0.4970	0.5178
Number of obs.	1,459,263	349,967	389,633	291,592	428,071

Note: Robust standard errors in parentheses. Drop firms with markup in the top or the bottom 10 percentiles.

We also use consider the effect of the network characteristics on the firm's market power.

$$Markup_{ijt} = \beta_1 FirmNum_{ijt} + \beta_2 IndusNum_{ijt} + \beta_3 NtwRev_{ijt} + \beta_4 Bangkok_{ijt} + \beta_5 JV_{ijt}$$
$$+\beta_6 Rev_{ijt} + \beta_7 Rev_{ijt}^2 + \beta_8 Age_{ijt} + \beta_9 Age_{ijt}^2 + \delta_{jt} + \varepsilon_{ijt}$$

where $FirmNum_{ijt}$ is the number of firms within the network, $IndusNum_{ijt}$ is the number of industries within the network, $NtwRev_{ijt}$ is the network's total revenue[11].

Table 3 reports the estimation results. Firms in the bigger or the more concentrated networks are more likely to have higher markup.

Table 3: Network Characteristics and firm market share

$Markup_{ijt}$	All	Manufacturing	Wholesale Trade	Retail Trade	Service
$FirmNum_{ijt}$	0.0107***	0.0023*	–0.0018	0.0031	0.0251***
	(0.0014)	(0.0013)	(0.0021)	(0.0037)	(0.0031)
$IndusNum_{ijt}$	–0.0173***	–0.0049***	–0.0034	–0.0021	–0.0372***
	(0.0019)	(0.0017)	(0.0028)	(0.0049)	(0.0043)
$NtwRev_{ijt}$	0.0033***	0.0016***	0.0016***	–0.0002	0.0067***
	(0.0004)	(0.0004)	(0.0006)	(0.0011)	(0.0010)
$Bangkok_{ijt}$	0.0013	–0.0073**	–0.0089	0.0450***	0.0059
	(0.0041)	(0.0035)	(0.0060)	(0.0109)	(0.0096)
JV_{ijt}	–0.0041	0.0002	–0.0168***	0.0223***	–0.0089
	(0.0034)	(0.0029)	(0.0048)	(0.0081)	(0.0082)
Rev_{ijt}	–0.2657***	–0.2604***	–0.1844***	–0.2164***	–0.3882***
	(0.0048)	(0.0047)	(0.0072)	(0.0105)	(0.0127)
Rev_{ijt}^2	0.0064***	0.0062***	0.0041***	0.0052***	0.0098***
	(0.0001)	(0.0001)	(0.0002)	(0.0003)	(0.0004)
Age_{ijt}	0.0019***	0.0002***	0.0025***	0.0029***	0.0020***
	(0.0002)	(0.0002)	(0.0003)	(0.0005)	(0.0005)
Age_{ijt}^2	–1.22e–05***	6.93e–06***	–2.45e–05***	–1.62e–05	5.27e–06
	(3.80e–06)	(3.15e–06)	(4.78e–06)	(1.17e–05)	(1.07e–05)
Industry-year F.E.	Yes	Yes	Yes	Yes	Yes
R^2	0.6642	0.6304	0.3436	0.3760	0.6346
Number of obs.	54,198	17,577	11,366	5,603	19,652

Note: Robust standard errors in parentheses. Drop firms with markup in the top or the bottom 10 percentiles.

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[11] We exclude the firm's own revenue to avoid double counting in the regression.

6. Macroeconomic Consequences

6.1 Investment and Productivity

As discussed in Section 1, excessive market power could suppress firms' investment and innovation. Aghion et al. (2005) show that the relationship between market power and firms' innovation has an inverted-U shape. In the neck-to-neck competition, each firm has an incentive to innovate in order to move ahead. On the other hand, the laggard firms are discouraged from innovation.

To investigate the effect of markup on firms' productivity growth, we estimate the following equation:

$$\ln(TPF_{ijt}) - \ln(TPF_{ij,t-1}) = \beta_1 Markup_{ij,t-1} + \beta_2 Markup^2_{ij,t-1} + \beta_3 ROA_{ij,t-1} + \beta_4 Size_{ij,t-1}$$
$$+\beta_5 Leverage_{ij,t-1} + \beta_6 Age_{ijt} + \beta_7 Age^2_{ijt} + \delta_{jt} + \epsilon_{ijt}$$

where $Markup_{ij,t-1}$ is the markup of firm i in industry j in year $t-1$, $ROA_{ij,t-1}$ is the EBIT-to-fixed asset ratio, $Size_{ij,t-1}$ is the log value of firm's fixed asset[12], $Leverage_{ij,t-1}$ is the total liability-to-total asset ratio, and Age_{ijt} is firm's age.

Table 4 reports the estimation results. Figure 11 shows the relationship between a firm's markup and productivity growth based on the coefficients of $Markup_{ij,t-1}$ and $Markup^2_{ij,t-1}$ reported in Table 4. At the low level of markup, an increase in markup raises the productivity growth. On the other hand, when markup is high, a further increase in markup lowers the productivity growth. These results are consistent with those in Aghion et al. (2005).

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[12] The results are robust to using total asset instead of fixed asset in the calculation of ROA and $Size$.

Table 4: Markup and firm's productivity growth

	Manufacturing	Wholesale	Retail	Service
$Markup_{ij,t-1}$	0.4374***	0.1811***	0.1479***	0.2428***
	(0.0105)	(0.0046)	(0.0090)	(0.0113)
$Markup^2_{ij,t-1}$	−0.1675***	−0.0680***	−0.0533***	−0.0778***
	(0.0043)	(0.0019)	(0.0038)	(0.0039)
$ROA_{ij,t-1}$	1.40e–09	2.34e–11	1.74e–10	2.21e–10
	(1.09e–09)	(6.25e–11)	(6.77e–10)	(5.92e–10)
$Size_{ij,t-1}$	0.0007***	0.0002***	0.0002***	0.0001***
	(2.54e–05)	(1.42e–05)	(2.00e–05)	(4.73e–05)
$Leverage_{ij,t-1}$	−0.0003	−0.0005***	−0.0003***	−0.0003***
	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Age_{ijt}	−0.0001***	4.76e–05***	−7.00e–06	−2.43e–05
	(2.10e–05)	(1.16e–05)	(1.64e–05)	(4.16e–05)
Age^2_{ijt}	1.05e–06**	−9.17–07***	−3.14e–07	3.39e–07
	(4.84e–07)	(2.44e–07)	(3.38e–07)	(9.74e–07)
Industry-year fixed effect	Yes	Yes	Yes	Yes
R^2	0.0430	0.0319	0.0220	0.0537
Number of obs.	265,538	277,597	199,795	274,812

*Robust standard errors in parentheses. Drop firms with markup in the top or the bottom 10 percent.

Figure 11: Markup and productivity growth
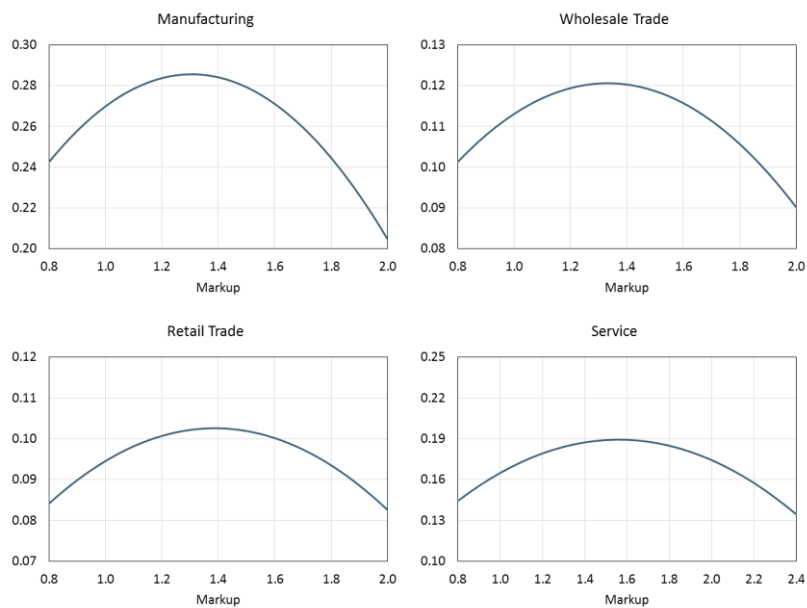
To investigate the relationship between a firm's markup and its investment in fixed assets, we estimate the following equation:

$$Investment_{ijt} = \beta_1 Markup_{ij,t-1} + \beta_2 Markup_{ij,t-1}^2 + \beta_3 ROA_{ij,t-1} + \beta_4 Size_{ij,t-1}$$
$$+\beta_5 Leverage_{ij,t-1} + \beta_6 Age_{ijt} + \beta_7 Age_{ijt}^2 + \delta_{jt} + \epsilon_{ijt}$$

where $Investment_{ijt}$ is the change in firm i's fixed asset between year $t-1$ and year t[13].

Table 5 reports the estimation results. Again, the relationships between markup and investment are non-linear. Figure 12 shows the relationship between a firm's markup and investment based on the coefficients of $Markup_{ij,t-1}$ and $Markup_{ij,t-1}^2$ reported in Table 5. For the relevant range of markups in the data, investment and markup are negatively correlated, except for manufacturing firms with very high markup.

Table 5: Markup and firm's investment

	Manufacturing	Wholesale	Retail	Service
$Markup_{ij,t-1}$	−2.1320***	−1.4144***	−0.8446***	−0.4931***
	(0.2271)	(0.1256)	(0.1691)	(0.0378)
$Markup_{ij,t-1}^2$	0.6697***	0.3939***	0.2213***	0.0939***
	(0.0950)	(0.0484)	(0.0665)	(0.0114)
$ROA_{ij,t-1}$	8.13e–07***	1.54e–07***	7.36e–07***	3.94e–07***
	(1.99e–07)	(4.50e–08)	(1.21e–07)	(7.04e–08)
$Size_{ij,t-1}$	−0.0205***	−0.0328***	−0.0306***	−0.0407***
	(0.0015)	(0.0014)	(0.0016)	(0.0016)
$Leverage_{ij,t-1}$	−0.0102***	−0.0078***	−0.0072***	−0.0068***
	(0.0032)	(0.0024)	(0.0027)	(0.0011)
Age_{ijt}	−0.0175***	−0.0200***	−0.0193***	−0.0274***
	(0.0005)	(0.0006)	(0.0008)	(0.0008)
Age_{ijt}^2	0.0003***	0.0004***	0.0004***	0.0006***
	(1.15e–05)	(1.35e–05)	(1.81e–05)	(2.02e–05)
Industry-year fixed effect	Yes	Yes	Yes	Yes
R^2	0.0226	0.0156	0.0152	0.0242
Number of obs.	265,017	276,716	199,010	273,827

*Robust standard errors in parentheses. Drop firms with markup in the top or the bottom 10 percent.

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[13] The results are robust to using the change in firm i's total asset instead.

Figure 12: Markup and investment
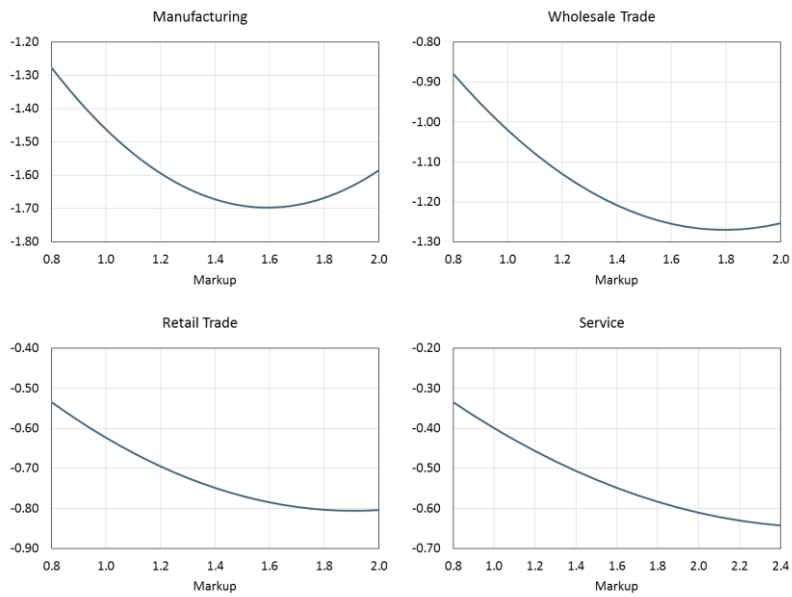
6.2 Export Status and Product Upgrade

Market power could also have negative effect on firms' export activities through two channels. First, by reaping high rent in the domestic market, firms with excessive market power might have less incentive to expand into foreign markets. Second, since firms with high market power invest less and have lower productivity growth, these firms might not be able to compete in the more-competitive foreign markets.

To investigate the effect of market power on the firm's export decisions, we start by estimating the logistic regression of a firm's export dummy on markup and firm's characteristics. Table 6 reports the estimation result for manufacturing firms. The result suggests that higher-markup firms are less likely to export. In addition, when we focus only on the exporting firms, firms with higher markups are more likely to export fewer product varieties and to export to fewer destinations; see Table 7.

Table 6: Markup and firm's export status

	$Export_{ijt}$
$Markup_{ij,t-1}$	-0.664^{***}
	(0.0286)
$ROA_{ij,t-1}$	$2.25e{-}07^{*}$
	(1.19e–07)
$Size_{ij,t-1}$	0.255^{***}
	(0.0021)
$Leverage_{ij,t-1}$	0.0132^{***}
	(0.0021)
Age_{ijt}	0.0124^{***}
	(0.0014)
Age_{ijt}^{2}	-0.0003^{***}
	(3.17e–05)
Industry fixed effect	No
Year fixed effect	No
Number of obs.	349,378

*Robust standard errors in parentheses.

Table 7: Markup and export diversification

	Number of Products	Number of Destinations
$Markup_{ij,t-1}$	−5.083***	−2.819***
	(0.476)	(0.213)
$ROA_{ij,t-1}$	5.90e−06***	3.47e−06***
	(1.15e−06)	(6.52e−07)
$Size_{ij,t-1}$	2.162***	1.425***
	(0.0420)	(0.0203)
$Leverage_{ij,t-1}$	−0.0002	0.0130
	(0.0704)	(0.0412)
Age_{ijt}	−0.0826***	0.0654***
	(0.0295)	(0.0122)
Age_{ijt}^2	0.0048***	0.0011***
	(0.0008)	(0.0003)
Industry fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
R^2	0.228	0.275
Number of obs.	57,258	349,378

*Robust standard errors in parentheses.

As shown in Apaitan, Ananchotikul, and Disyatat (2017), the export share of the least complex products has been steadily declining over the last 20 years in Thailand, China, and Vietnam. During the same period, the export share of top two quintiles in these three countries has been increasing. However, unlike China and Vietnam, the increasing trend of the share of most complex products in Thailand has tapered off since 2007.

To investigate whether the increasing trend in markup might help explaining the slowdown in product complexity, we estimate the logistic regression of a firm's product upgrade dummy on its markup and characteristics. The dummy variable $Upgrade_{ijt}$ equals one if the firm's PCI increases and equals zero otherwise. The estimation result reported in Table 8 suggests that firms with higher market power are less likely to upgrade their products.

Table 8: Markup and firm's product upgrade

	$Upgrade_{ijt}$
$Markup_{ij,t-1}$	-0.618^{***}
	(0.0359)
$ROA_{ij,t-1}$	$1.47\text{e--}07^{***}$
	$(3.38\text{e--}08)$
$Size_{ij,t-1}$	0.206^{***}
	(0.0021)
$Leverage_{ij,t-1}$	0.0159^{***}
	(0.0026)
Age_{ijt}	0.0197^{***}
	(0.0019)
Age_{ijt}^2	-0.0004^{***}
	$(4.39\text{e--}05)$
Industry fixed effect	No
Year fixed effect	No
Number of obs.	349,378

*Robust standard errors in parentheses.

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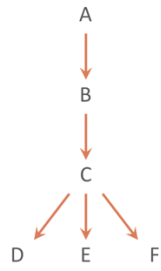
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Appendix

Figure A.1: Illustrative examples of pyramidal shareholding and cross-shareholding
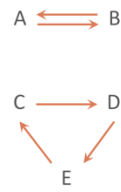
Figure A.2: Entry and exit rates of firms in manufacturing sector
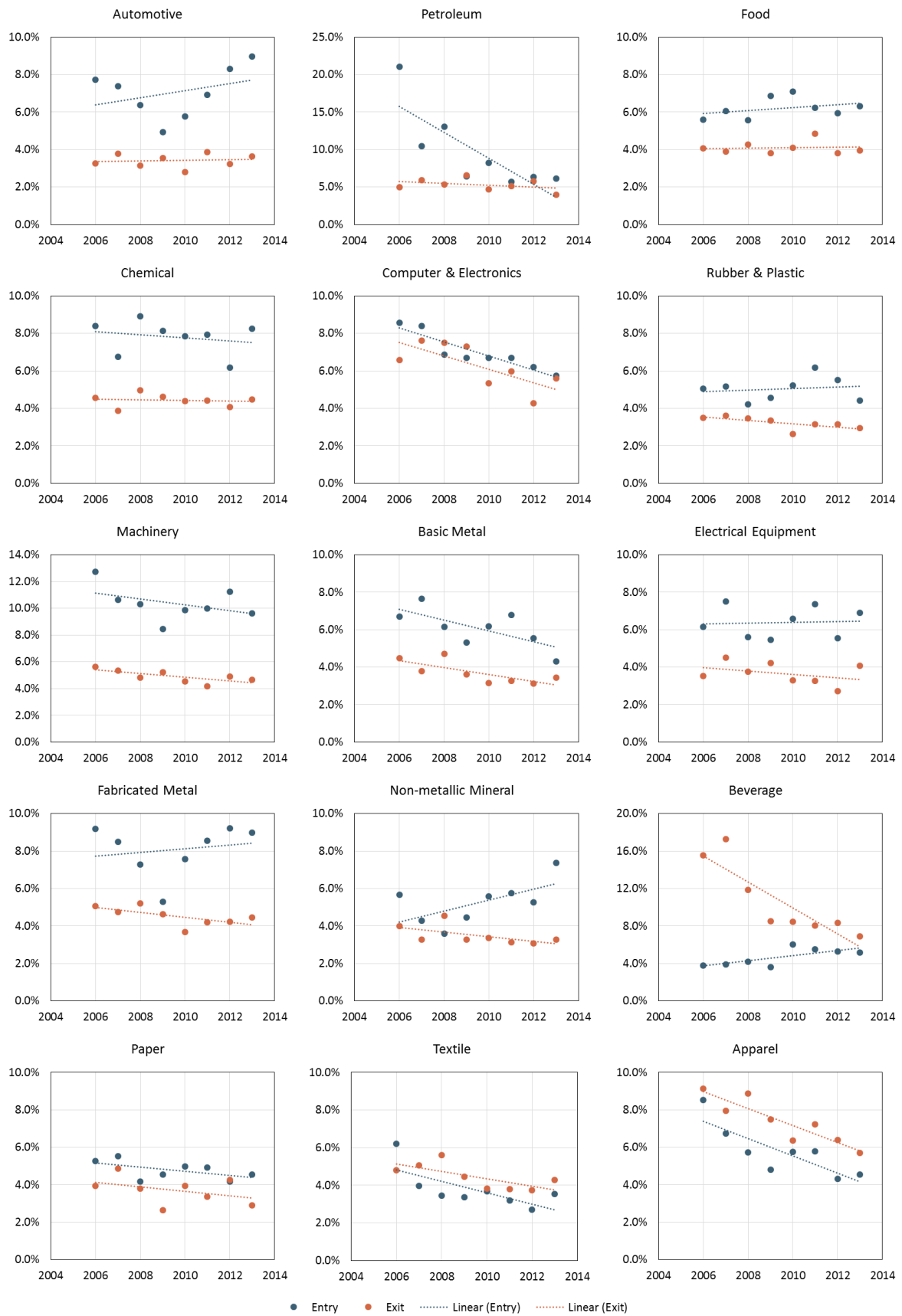
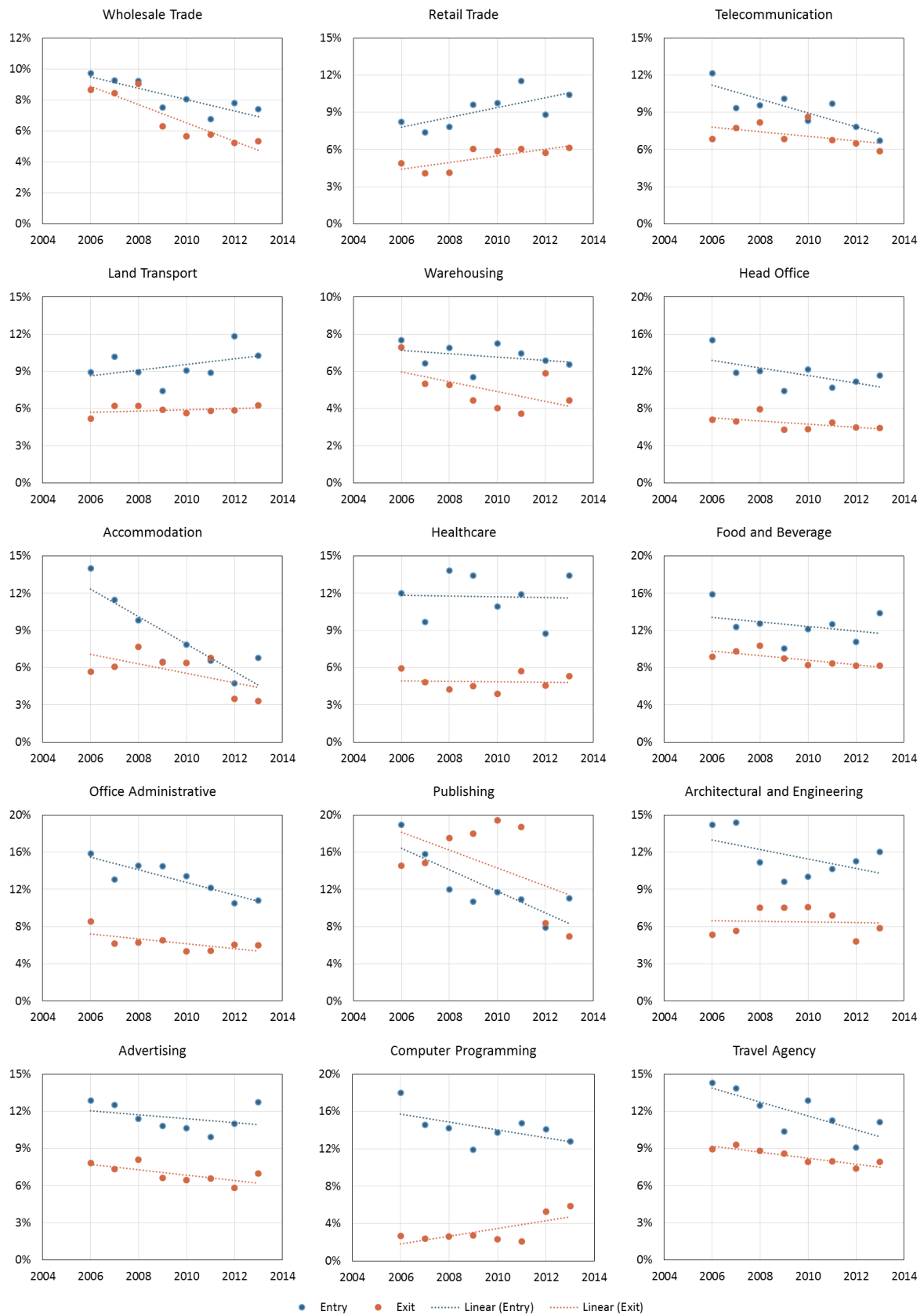Figure A.3: Entry and exit rates of firms in trade and service sectors

Figure A.4: Average age of firms in manufacturing sector

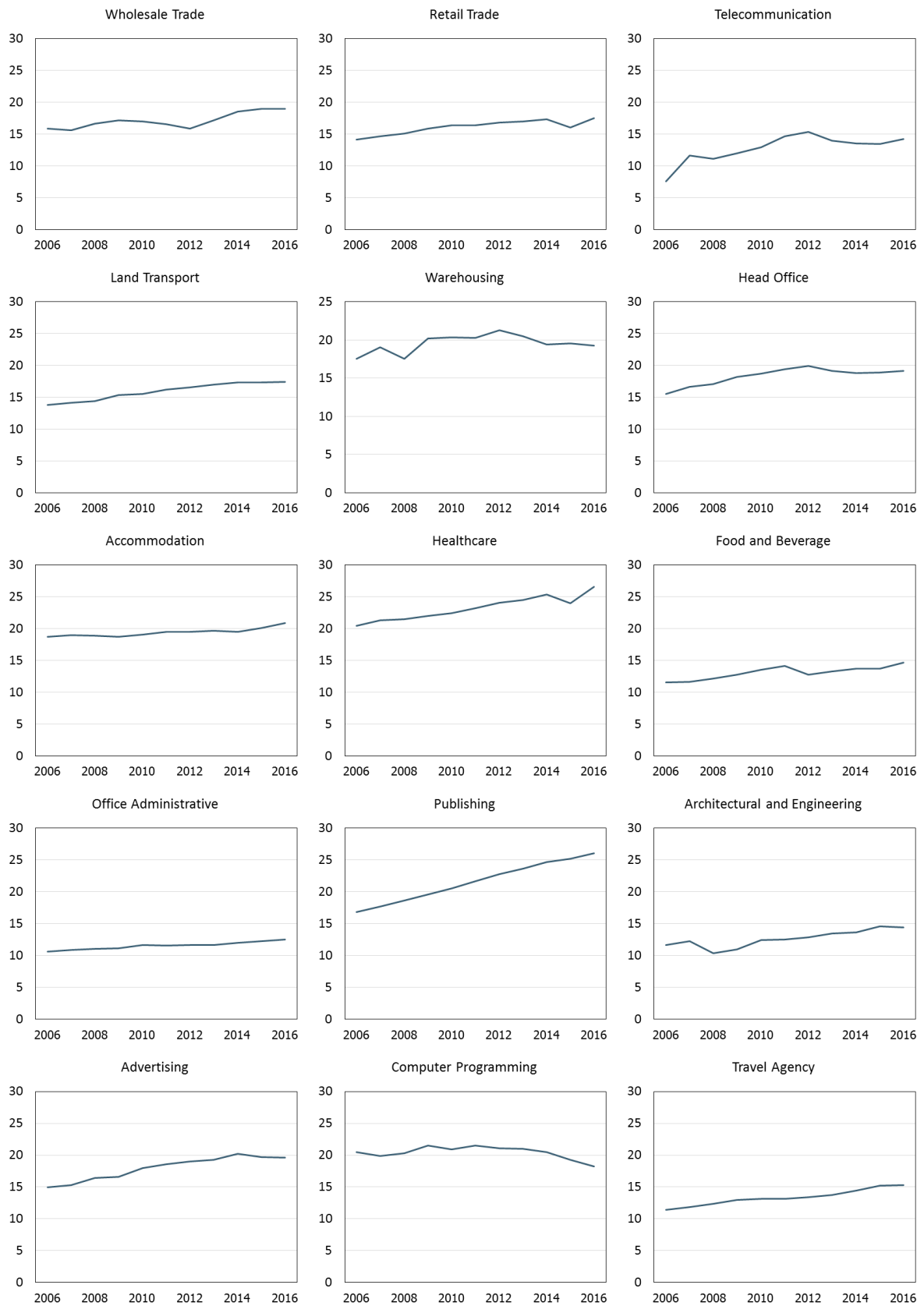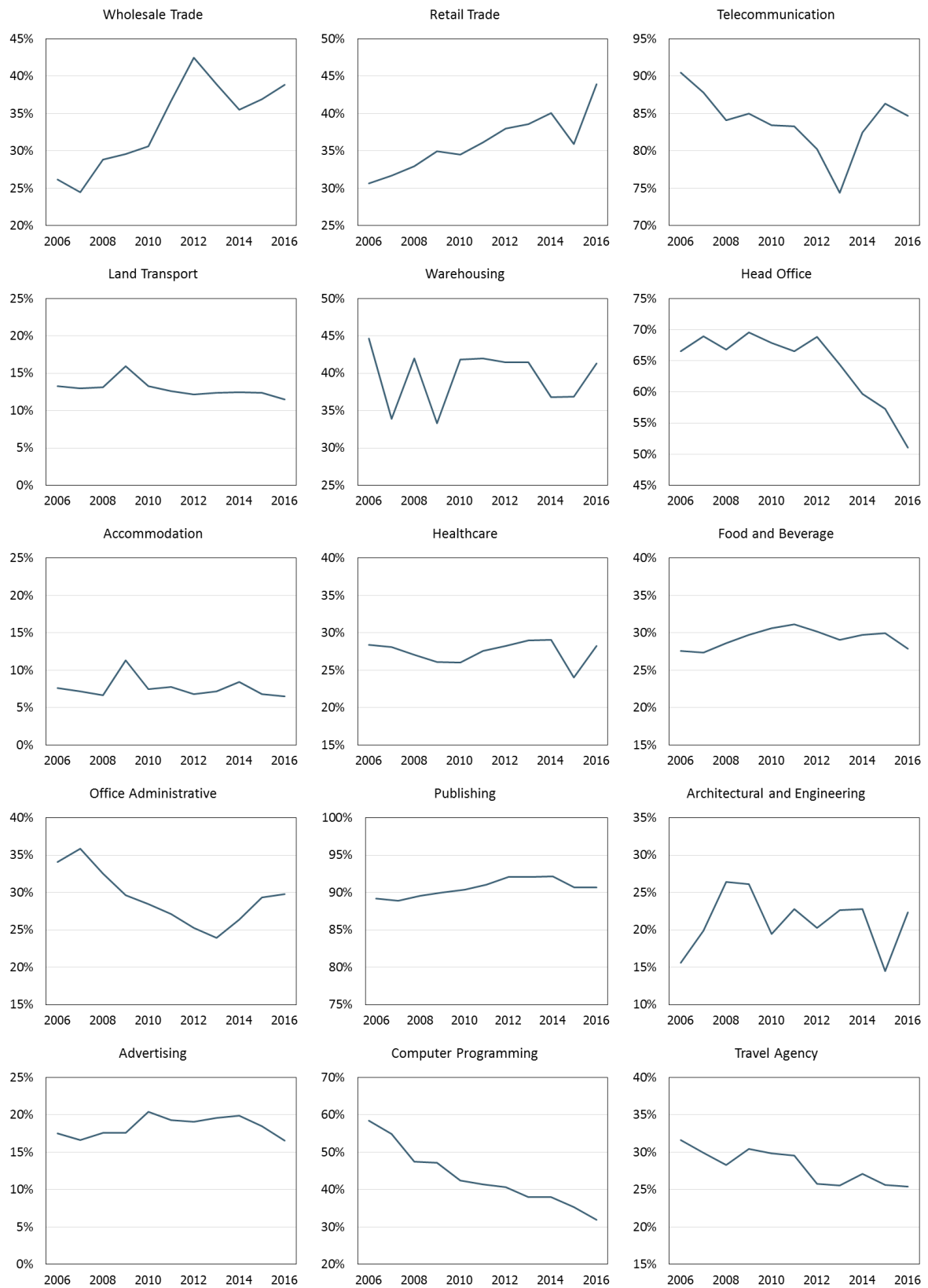Figure A.5: Average age of firms in trade and service sectors

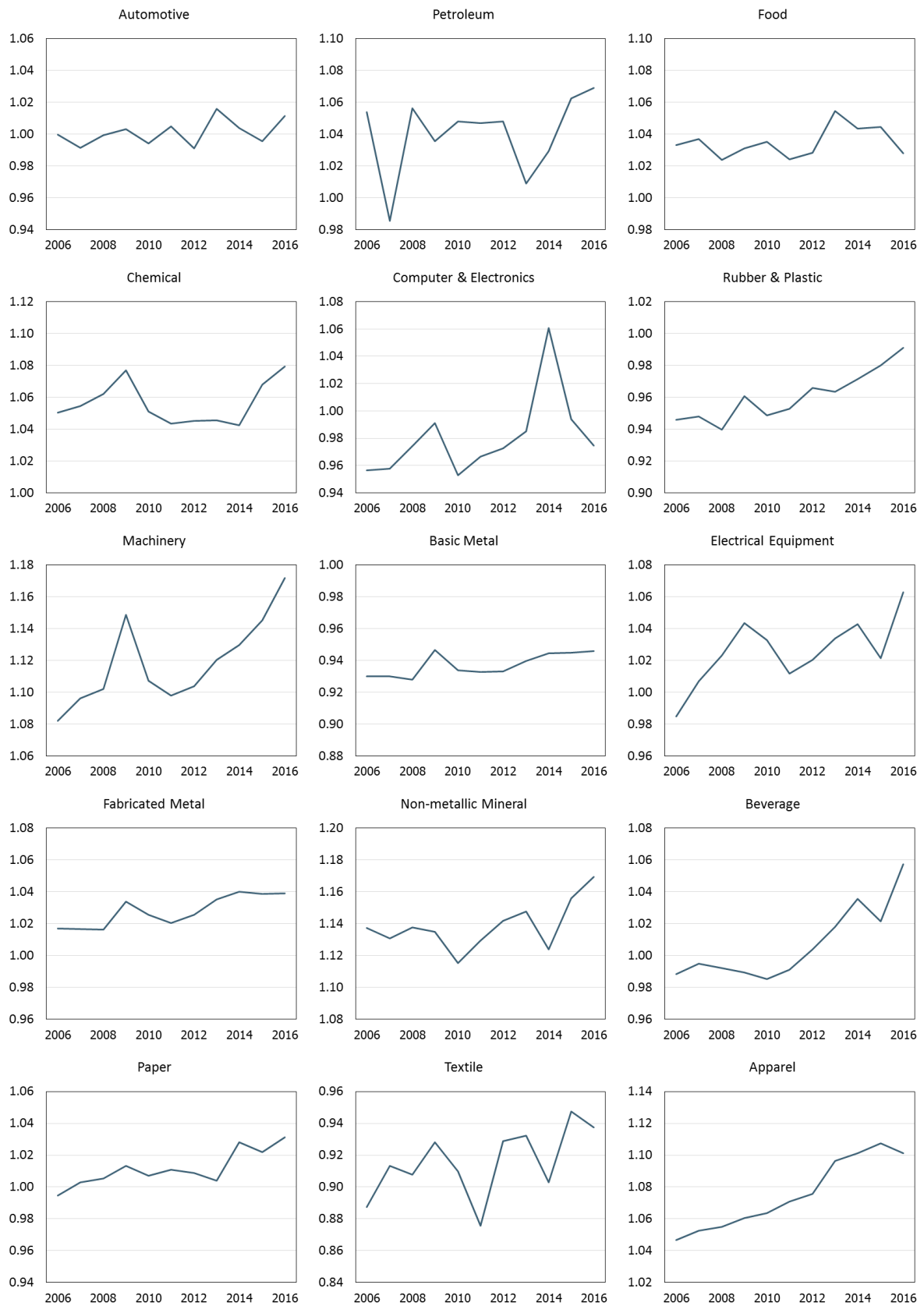## Figure A.6: CR4 of manufacturing industries

Source: Ministry of Commerce; Author's calculation.

Figure A.7: CR4 of trade and service industries
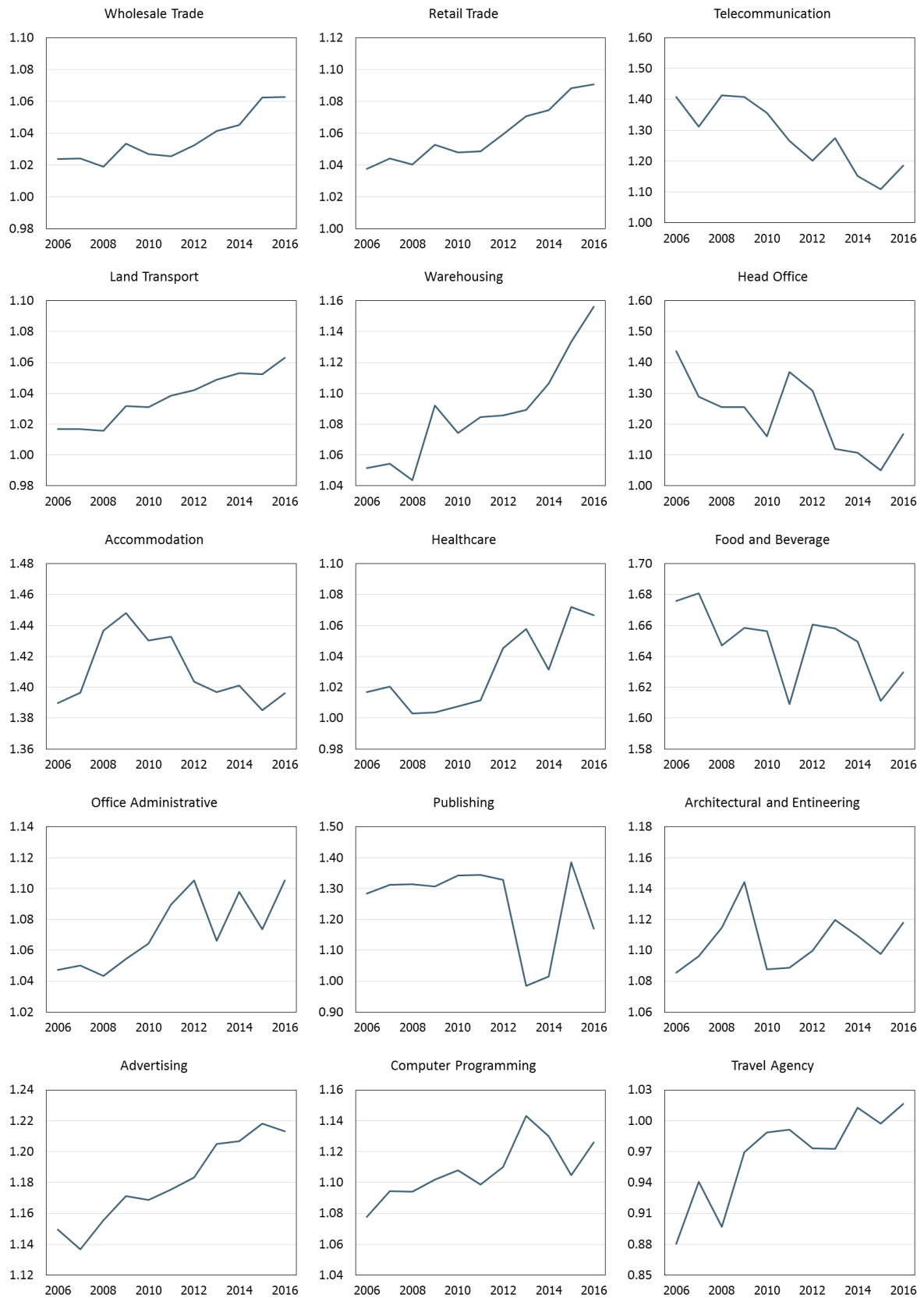

Source: Ministry of Commerce; Author's calculation.

Figure A.8: Average markup of firms in manufacturing sector

Figure A.9: Average markup of firms in trade and service sectors

Source: Ministry of Commerce; Authors' calculation.

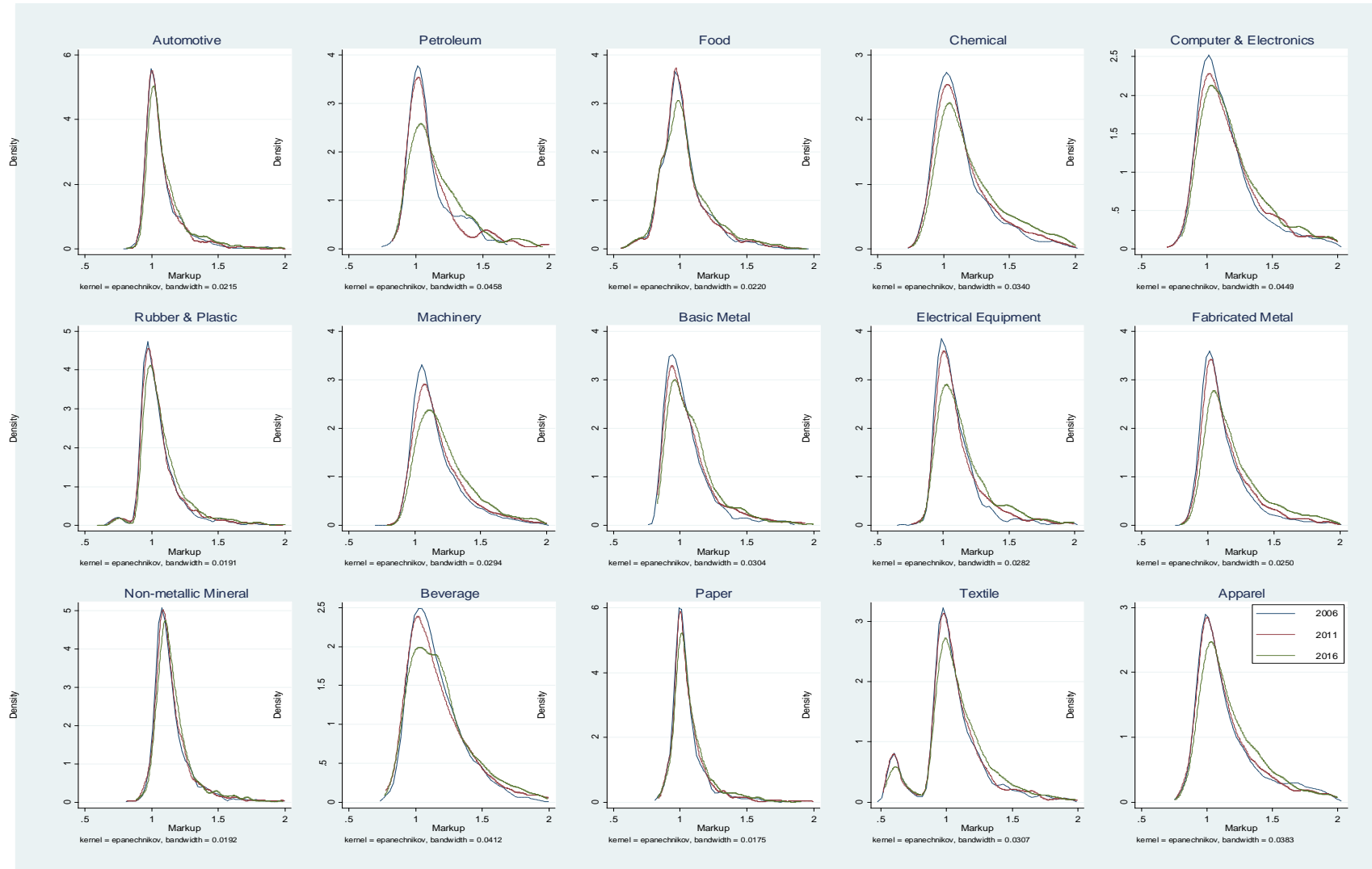Figure A.10: Markup distribution in manufacturing industries

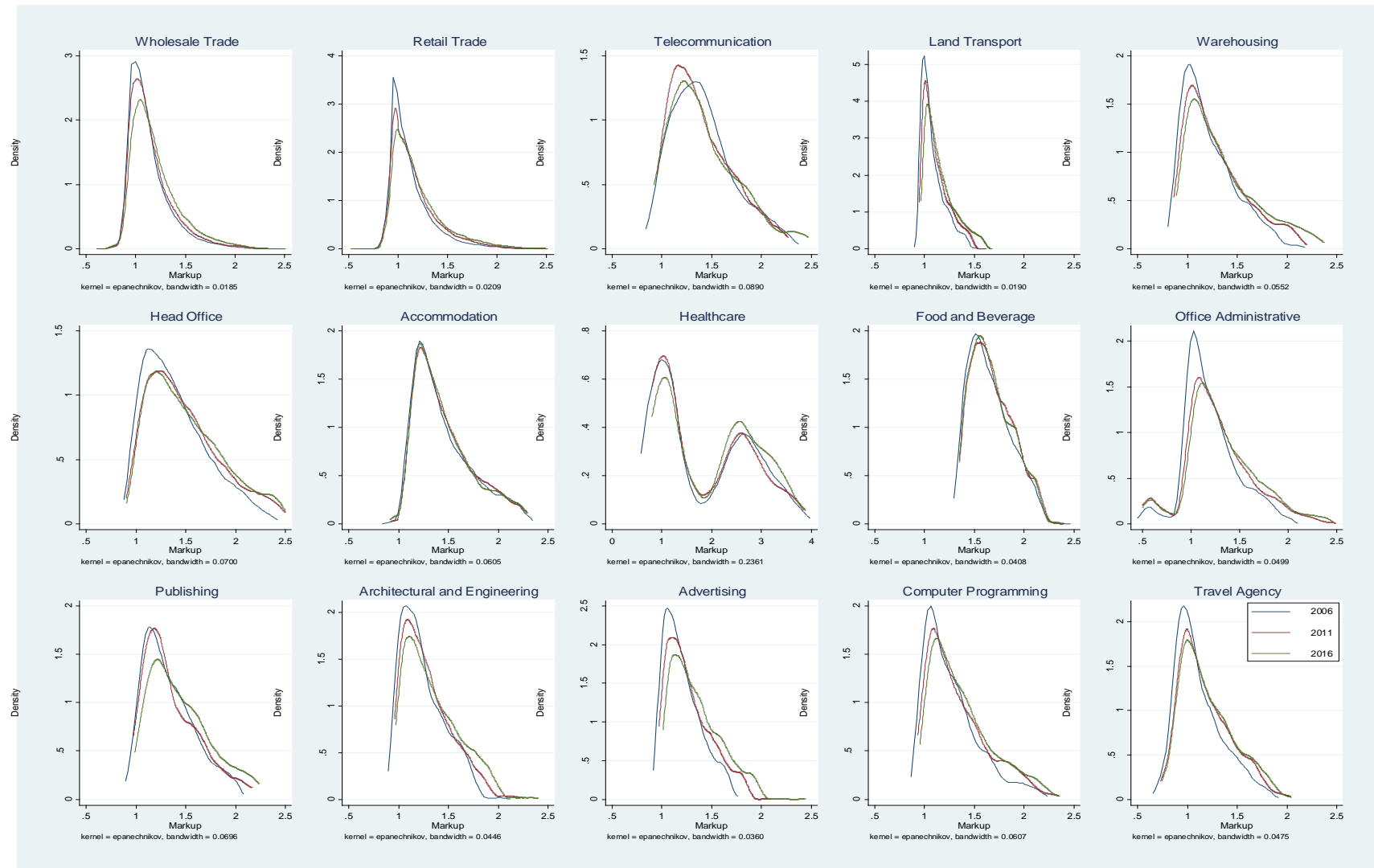Figure A.11: Markup distribution in trade and service industries

Wholesale Trade   Retail Trade   Telecommunication   Land Transport   Warehousing

kernel = epanechnikov, bandwidth = 0.0185
kernel = epanechnikov, bandwidth = 0.0209
kernel = epanechnikov, bandwidth = 0.0890
kernel = epanechnikov, bandwidth = 0.0190
kernel = epanechnikov, bandwidth = 0.0552

Head Office   Accommodation   Healthcare   Food and Beverage   Office Administrative

kernel = epanechnikov, bandwidth = 0.0700
kernel = epanechnikov, bandwidth = 0.0605
kernel = epanechnikov, bandwidth = 0.2361
kernel = epanechnikov, bandwidth = 0.0408
kernel = epanechnikov, bandwidth = 0.0499

Publishing   Architectural and Engineering   Advertising   Computer Programming   Travel Agency

kernel = epanechnikov, bandwidth = 0.0696
kernel = epanechnikov, bandwidth = 0.0446
kernel = epanechnikov, bandwidth = 0.0360
kernel = epanechnikov, bandwidth = 0.0607
kernel = epanechnikov, bandwidth = 0.0475

2006
2011
2016

39

Figure A.12: Decomposition of markups change of firms in manufacturing sector
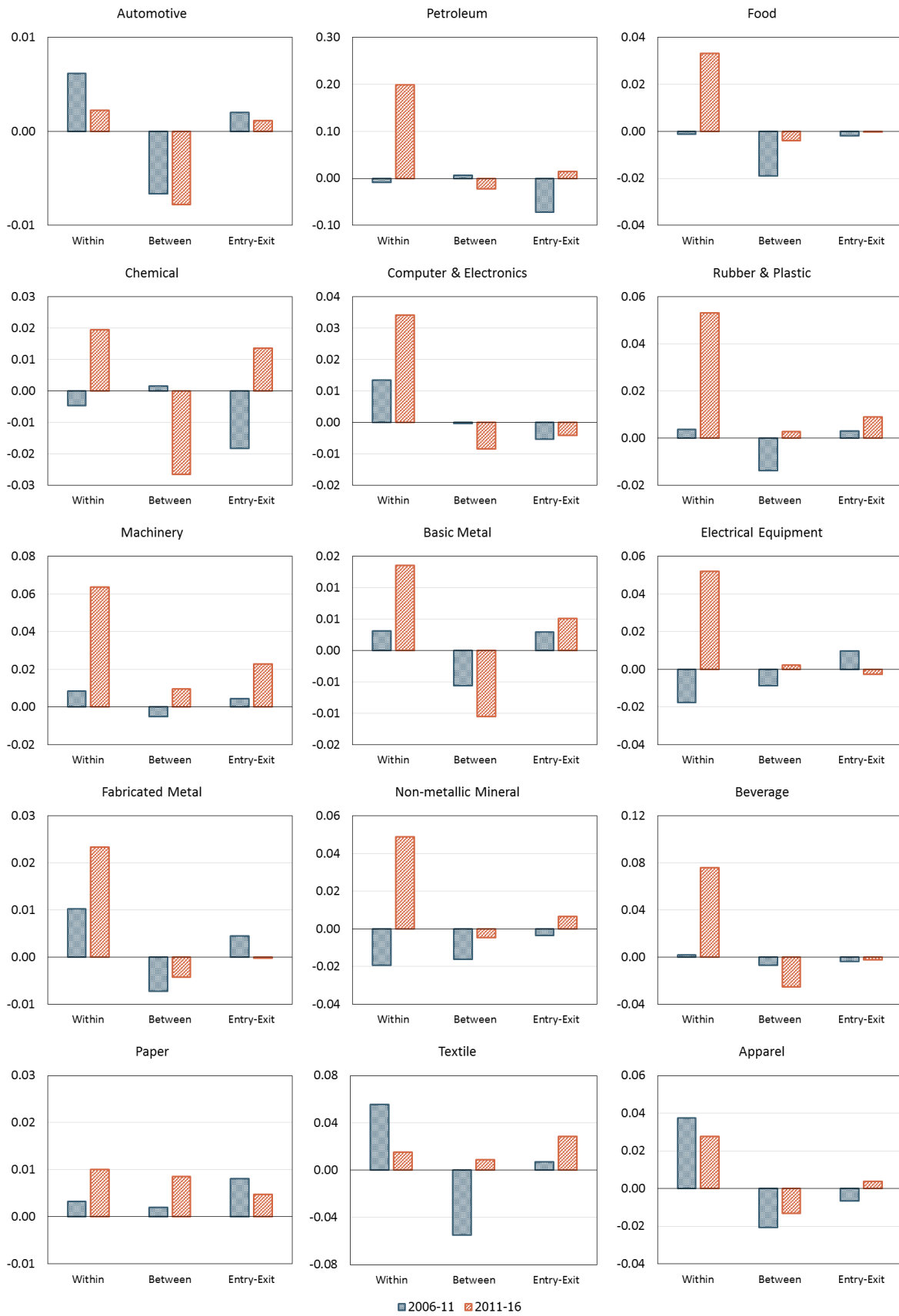

■ 2006-11 ■ 2011-16

Figure A.13: Decomposition of markups change of firms in trade and service sectors