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# The Impact of Intellectual Capital on Service Firm Financial Performance in Emerging Countries: The Case of Vietnam

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**Abstract:** This paper evaluates the effect of intellectual capital (IC) on firm financial performance in the service sector in an emerging country, Vietnam. This research is dissimilar from earlier ones for the following reasons: (i) this is the first study of IC's impact on service firms at different knowledge intensity levels, sizes, and ownerships in an emerging country, Vietnam; (ii) it expresses empirical evidence in details of service activities, particularly the research and development, financial, and technology services that play significant roles for the development of emerging countries; (iii) it examines the effects of the gender issue, firms' responsiveness to the government and employees, and market concentration. Applying the two-step system GMM model for the period 2005–2014, the results express that IC components generally had significant impacts on firm performance. Human capital efficiency had the strongest positive impact while capital employed efficiency had the second strongest impact. The impact of structural capital efficiency was inconsistent, depending on the knowledge intensity levels and the types of service activities. IC is more efficient for knowledge-intensive sub-sectors than the less knowledge-intensive ones. IC efficiencies differ among knowledge intensity levels, sizes, and ownerships, suggesting that policy makers and firm leaders should implement corresponding solutions.

**Keywords:** knowledge; intellectual; VAIC; firm performance; GMM; emerging countries

**JEL Classification:** D83; M29; L25

## 1. Introduction

One of the most important determinants of firm performance is knowledge, of which intellectual capital (IC) is a key component [1]. IC will multiply and accelerate the efficiency of inputs because typical knowledge characteristics create new technology, innovation, and reform [2,3].

The service sector plays an increasingly important role in the world economy, particularly in emerging countries [4]. Historically, the service sector is the ultimate target of economic restructuring, due to its high value-added services, thus encouraging continuous innovation and creativity. Therefore, investments in intellectual capital are crucial to the sound growth of the service sector [5,6]. In almost all countries of the world, especially in developed countries, the service sector is considered a key sector for economic development, accounting for about 70–80% of GDP. China, the second largest economy in the world, has worked to develop high value-added services, among which financial services, health care, education, entertainment, culture, science, and research contributed over 50% of China's GDP in 2015 [7].

In emerging markets, like Vietnam, IC is an important tool to significantly increase per capita income [8]. Since the Reform in 1986, Vietnam has experienced tremendous economic improvement, particularly in the service sector. Vietnam joined the ASEAN Free Trade Area (AFTA) in 1995, signed the Bilateral Trade Agreement (BTA) with the USA in 2000, became the largest rice exporter of the world in 2004, and joined WTO in 2007. In

2022, the service sector grew strongly with its growth rate reaching 9.99%, the highest in the period of 2011–2022, accounting for 41.33% of the GDP [9]. Some specific service sub-sectors contribute much to the growth rate of the total added value of the whole economy as follows: the wholesale and retail sub-sectors increased by 10.15% over the previous year, contributing 0.97 percentage points; the transportation and warehousing sub-sector increased by 11.93%, contributing 0.69 percentage points; the accommodation and food services sub-sector increased the most in the service sector with an increase of 40.61%, contributing 0.79 percentage points; financial, banking and insurance activities increased by 9.03%, contributing 0.53 percentage points; the information and communication sector increased by 7.80%, contributing 0.5 percentage points [9].

Finance, media, tourism, and information technology are the main contributors to the GDP in the service. Vietnam has achieved the top position among 34 lower middle-income economies in 2021 [10], strived to overcome the low-middle-income trap by working towards high-medium-income with speed, and has a sustainable development model for the new period of reforming and planning for economic and social development for the period of 2021–2030, with a vision up to 2050, based on the service sector.

In Vietnam, although the number of enterprises in the service industry is increasing rapidly, these firms are mostly small and micro-sized, and their average added values are decreasing. The service knowledge-intensive sectors (finance—credit, science and technology, education and training, health care) develop slowly, accounting for a tiny proportion of the GDP compared with many countries in the region. Service quality and human capacity in Vietnam are still low.

Recently, there are inconsistent findings about the effects of IC components on a firm's financial performance in emerging countries. Capital employed, an IC component, revealed its positive impacts on firm performance in some emerging countries, including China and India [11], but not in Bangladesh [12] or Turkey [13]. Particularly, there is no research about IC impact on service firms among different knowledge intensity levels, sizes, and ownerships for an emerging country like Vietnam. This research fills this gap, focusing on investigating how IC components affect service firms' financial performance in Vietnam for 2005–2014, which was a period of significant institutional reform for business, knowledge, science, and technology development while still experiencing a serious firm failure rate [14]. This research is dissimilar from the earlier ones due to the following reasons: (i) it is the first study about service firms at different level of knowledge intensity; (ii) this research offers a comparison among different cohorts of ownerships and firm size, particularly among those with different knowledge intensity levels; (iii) this research examines the effects of internal and external factors by controlling the gender issue, firms' responsiveness to the government and employees, and market concentration; (iv) this research expresses empirical evidence about Vietnamese service firms, specifically in the detail provided about service activities, particularly the research and development, financial, and technology services that sub-sectors have extremely high value-added potential and play significant roles in the economic development of emerging countries.

After the introduction, the paper reviews the literature about IC efficiency and its components. The next section describes the employed methodology, including variables, the empirical model, the econometric methodology, and data. Section 4 analyzes the empirical results. The final section expresses conclusion and policy implications.

## 2. Literature Review

### 2.1. Intellectual Capital

The concept of "Intellectual capital" was first proposed in 1969 by John Kenneth Galbraith [15] and includes both intangible and ideological processes. Some researchers have used this definition, including Edvinsson and Sullivan [16]; Bontis [17]; and Huang and Wu [18]. Rastogi [19] defines intellectual capital as the all-encompassing or outstanding capability of a company to combine and deploy its knowledge resources to create value to achieve future goals. The definition of IC has varied in the past and nowadays, there

is no universal definition of "intellectual capital" [20]. However, many scholars agree that intellectual capital is composed of three elements: human, structural, and social capital [17,21–23].

To measure IC efficiencies, various studied have applied the most popular method, the value-added intellectual coefficient, or VAIC, which was introduced by Pulic [24] and continuously developed by other researchers, including Bayraktaroglu et al. [13], Soewarno and Tjahjadi [25], and Muhammad [26]. The VAIC is estimated based on three elements, including CEE—capital employed efficiency, SCE—structural capital efficiency, and HCE—human capital efficiency.

There are mixed findings about the effect of IC elements on firm financial performance in emerging countries. Therefore, this research tests the following hypotheses for the case of Vietnam:

**H1.** *Knowledge in terms of IC efficiency has a significant and positive impact on firm performance.*

### 2.2. Human Capital

One of the most important intangible resources is human capital—HC [27,28], which is the combination of credentials, skills, attitude, expertise, education, and professional history of the employees [29–31]. Human capital combines the material resources of the company with the capacity and the enthusiasm of employees, which enable them to creatively solve problems, increase their knowledge, and develop new business opportunities [29,30]. Human capital is represented by the company employee's knowledge, certification, and expertise, and is usually estimated by salaries and wages [32]. Some emerging countries witnessed the positive effects of HCE on firms' performance, including India [33–35]) and Tanzania [36]. Therefore, this research tests the following hypothesis for an emerging country, Vietnam:

**H2.** *Human capital efficiency (HCE) has a positive effect on the firm's performance.*

### 2.3. Structural Capital

Structural capital (SC) consists of the implementation of the internal controls and policies, such as firm strategies, organizational networks, patents, and brand names [24]. SC helps firms to achieve a productive working environment which usually goes along with the research and development activities of firms [24,37]. Serbia witnessed the positive impact of structural capital efficiency (SCE) [38], while Tanzania and Romania experienced the negative impact of structural capital efficiency on firm performance [39,40]. From the preceding evidence, the following hypothesis is set up:

**H3.** *Structural capital efficiency (SCE) has a negative effect on the firm's performance.*

### 2.4. Capital Employed

IC could not create value on its own, so it is required to combine it with capital employed (CE), which includes both physical and financial capital [41]. CE is the third component of IC, helping firms to develop good internal and external relationships with employees and consumers, suppliers, creditors, and government, thus improving firm performance [12]. CE is measured as total net tangible assets [24]. There are mixed findings related to the effects of CE on firm performance. Many researchers found the positive effects of CE [35,42,43], particularly for some emerging countries like China and India [11], while others did not [12,13]. Compared with other IC components, effects of CEE are strong, but not as strong as those of HCE [44]. Therefore, this research examines following hypotheses:

**H4.** *Capital employed efficiency (CEE) has a positive effect on the firm's performance.*

**H5.** *Human capital efficiency (HCE) is more important than CEE for the firm's performance.*

*2.5. Firm Performance*

There are various indicators expressing a firm's financial performance, including return on equity (ROE), return on asset (ROA), asset turnover (ATO), and sale growth (SG) [25] etc. Based on the resource-based theory, proposed by Wernerfelt [45], return on equity (ROE) represents a firm's financial performance because it can be transformed into "value" in the market [46]. Using this common indicator facilitates comparisons among other research [12,47–49]. Therefore, this study uses ROE for representing a firm's financial performance.

Firm attributes, including firm sizes, ownerships, and knowledge intensity levels, can affect firm performance through the way it operates and manages firm activities. Ownership influences intellectual capital [50], as well as firm financial performance [51]. Particularly, there is no research focusing on the service sector at different levels of knowledge intensity and different sizes and ownerships in an emerging country. Hence, following hypotheses are set up:

**H6.** *The impacts of IC efficiencies on a firm's performance differ among different levels of knowledge intensity.*

**H7.** *The impacts of IC efficiencies on a firm's performance differ among different cohorts of firm size.*

**H8.** *The impacts of IC efficiencies on firm performance differ among different cohorts of firm ownership.*

## 3. Methodology

*3.1. Variables*

All variables investigated in this research are theoretically driven (Table 1). Firm financial performance is represented by ROE in this study, which expresses whether or not the firm management effectively uses shareholders' capital. It is often an important criterion for considering investment opportunities in an emerging country that desires capital, like Vietnam.

In terms of internal and external factors, firm financial performance depends on asset management [52,53], thus the capital intensity average asset per employee is considered to be one determinant of a firm's performance. A firm's contribution is represented by social insurance paid in lieu of salary per employee, and by a firm's submission of social security insurance, helping to upgrade human resource allocation efficiency [54]. Exports are an extremely important issue for the service sector, thus the reform in export tax, which are instruments of export restrictions, could represent institutional reform for this sector, therefore, export tax per employee should be investigated [24]. Leverage plays an important role in solvency [55] and is measured by total liabilities divided by total assets [56,57]. In addition, gender issues affect a firm's performance [8,58]. Market competitiveness, represented by Herfindahl–Hirschman Index (HHI), expresses the industrial environment which will drive firms to a different type of performance [56,59].

Based on Vietnam's regulations on firm ownerships, this study divides firms into four types, including private, FDI, state-owned firms, and cooperatives. The firm size is defined by the number of employees according to Vietnam's regulations, including large-sized firms (>200 employees), medium-sized firms ($\leq$200 and >50 employees), small-sized firms ($\leq$50 and >10 employees), and micro-sized firms ($\leq$10 employees). Furthermore, measuring firm size by the number of employees has the advantage of avoiding being affected by flexible inflations, like financial measures, and it facilitates the comparison with other studies.

The time/year dummy variables are controlled for different changes in general institutional firm development. To compare among years, all financial variables are deflated with the Vietnam annual consumer price index. Other numeric variables are used in logarithmic form, including IC efficiencies, capital deepening, insurance and trade union contributions, and social insurance.

**Table 1.** Variables.

| Variables | Measurement |
|---|---|
| **Dependent variable** | Return on equity (ROE), representing firm financial performance |
| **Independent variables** | |
| ***Internal factors*** | |
| *Knowledge efficiency*<br>HCE<br>SCE<br>CEE | <br>Value added divided by total employees' earning<br>(Value added—total employees' earning)/value added<br>Value added divided by total tangible assets |
| *Internal factors*<br>Capital deepening<br>Leverage<br>Gender issue<br>Firm age<br>Export tax<br>Insurance and trade union contribution<br>Social Insurance | <br>Fixed asset per employee<br>Total liabilities divided by total assets (the book value)<br>Ratio of female employees<br>Years since the founding year<br>Export tax per employee<br>Firms' contributions to social insurance, health insurance, union funding per employee<br>Ratio of social insurance paid in lieu of salary per employee |
| *External factors—Industrial factors* | |
| Market concentration | Herfindahl–Hirschman Index (HHI): measured by squaring the market share of each firm in the market, and then summing those numbers |

Source: Own analysis.

### *3.2. Empirical Model*

To measure the interested explanatory variables—IC efficiencies, the research applies the most popular method to measure IC efficiencies.

$$VAIC = HCE + SCE + CEE;\ HCE = VA/HC;\ SCE = SC/VA;\ CEE = VA/CE$$

$$VA = NI + T + DP + I + W;\ SC = VA - HC.$$

In which VA represents value added; NI is net income after tax; T means taxes; DP denotes depreciation; I denotes interest expense; and W includes employee wages and salaries; $X_{it}$ expresses internal and external variables.

To evaluate the effect of IC on firm financial performance—ROE, the research follows Chowdhury et al. [12] and Muhammad [26] as follows:

$$ROE_{it} = a_0 + \alpha_v - \ln(VAIC_{it}) + \alpha_x X_{it} + e_{it} \tag{1}$$

$$ROE_{it} = a_0 + \alpha_h \ln(HCE_{it}) + \alpha_s \ln(SCE_{it}) + \alpha_c \ln(CEE_{it}) + \alpha_x X_{it} + e_{it} \tag{2}$$

Model (1), (2) is run for all samples to evaluate the general impact of whole IC efficiency. Afterward, model (2) runs for various cohorts based on firm sizes, ownerships, and knowledge intensity levels to investigate the effect of each IC component.

### *3.3. Econometric Methodology*

This study applies a two-step system GMM, a generalized method of moments model, which were first introduced by Arellanor and Bond [60], then mainly developed by Arellano and Bover [61], and Blundell and Bond [62], because of its comparative advantage of producing better estimations than other models [63].

This method is most suitable for this research because it is designed for dynamic analysis, particularly for the case T (period, 10 years in this research) <<N (observations, 217.978 observations in this research) [63]. The advantages of the two-step GMM system is in its ability to solve some problems, including endogeneity, serial correlation, and heteroskedasticity. Applying the robust option of the two-step system GMM provides the best estimations because the unobservable firm-specific effects are removed by employing first-difference equations.

*3.4. Data*

This paper employed data from Vietnam's annual national enterprise census for the whole economy, which provides the most comprehensive firm information compared to other available data for the case of Vietnam. This census is implemented by Vietnam General Statistics Organization (GSO), with the support from World Bank. The survey's purpose is in serving the management, governance, assessment, and forecast of the socio-economic situation, policy making, and development plans of the whole economy and each province. These data are unique in satisfying the requirement of measuring VAIC with sufficient information of VA (value added), human capital, structural capital, and capital employed for continuous years at the firm level.

Driven from the theory that the characteristics of firms and the environment will affect the transformation of IC into firm performance, this research evaluates the impact of IC on firm performance with a comparison among different levels of knowledge intensity, firm size, and ownership. Similar to Long [64], the knowledge intensity level depends on the knowledge application level, complexity of business, and the production of sectors.

For the issues of null data, I drop missing observations, and an unbalanced panel of data were obtained with 217,978 firm-year observations (Table 2). In terms of ownership, observations include 196,885 private firms, 2822 FDI ones, 5992 state-owned ones and 12,279 cooperatives. Regarding firm size, 3205 large-sized firms, 15,919 medium-sized firms, 65,842 small-sized firms, and 133,012 micro-sized firms were included. In this research, all of the empirical results were obtained by employing STATA 16.0. software (StataCorp LLC, Texas, USA).

**Table 2.** Descriptive statistics of private firms.

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| ROE | 0.054 | 0.135 | −0.500 | 0.965 |
| VAIC | 3.374 | 2.054 | 1.003 | 17.862 |
| HCE | 2.639 | 1.827 | 1.000 | 16.822 |
| SCE | 0.494 | 0.225 | 0.000 | 0.941 |
| CEE | 0.241 | 0.255 | 0.000 | 2.250 |
| Capital deepening | 142.903 | 390.149 | 0.000 | 3641.749 |
| Leverage | 0.426 | 0.307 | 0.000 | 1.054 |
| Gender issue | 0.445 | 0.201 | 0.000 | 1.000 |
| Firm age | 9.269 | 5.765 | 1.000 | 67.000 |
| Export tax | 0.000 | 0.004 | 0.000 | 0.050 |
| Firm's insurance and trade union contribution | 1.340 | 1.898 | 0.000 | 12.667 |
| Social insurance | 0.305 | 0.347 | 0.000 | 1.375 |
| Market concentration | 0.014 | 0.032 | 0.001 | 0.995 |

Note: Author's calculation. The number of observations: 217,978.

## 4. Results

This part investigates impacts of IC on a firm's financial performance for the whole sample and then for different cohorts of firm size, firm ownership, and, particularly, different levels of knowledge intensity application for the comparison purpose. The findings will be useful inputs for making decisions to improve knowledge efficiency in

developing firm performance, contributing to a higher national income per capita for a lower-medium income country like Vietnam.

I first start with an OLS analysis and identify endogeneity issues by utilizing Durbin–Wu–Hausman test. Then, the GMM model incorporates lagged values of the endogenous variable with equation sub-options. Based on the results of the Arellano–Bond tests, which do not reject the null hypothesis of no autocorrelation, and the results of Hansen tests, which do not reject the null hypothesis of no over-identifying restriction problem, the instruments are chosen. Thereby, the endogeneity problems are addressed and the valid estimates are provided by using a rigorous GMM process [62].

### 4.1. General Effects of Intellectual Capital

This section gives the general description of the effects of knowledge represented by IC on whole sample of services firms in Vietnam, comparing the case without (model 1) and with (model 2) control variables (Table 3). Its main findings accept the hypotheses 1, 2, and 4 that IC, HCE, and CEE have positive effects on a firm's performance. However, the results reject hypothesis 3, because SCE is insignificant to a firm's ROE. Positive coefficients of HCE are higher than those of CEE, therefore the outcomes confirm hypothesis 5, which states that "HCE is more important than CEE for firm performance".

The empirical results for total IC efficiency in model (3) generally confirm the significant and positive impact of IC on firm performance, as mentioned in hypothesis 1, and like other lower-medium-income countries, including Nigeria and Ghana [65], as well as the Czech Republic [26]. In the models (1), (2), it was shown that there are significant and positive impacts of human capital efficiency, HCE, and capital employed efficiency, CEE, on a firm's performance and the ROE of all service firms in Vietnam, which confirms hypotheses 2 and 4. Among which, the HCE is the most beneficial component of IC for firms, with the highest coefficient (0.0729). This demonstrates that the most important IC component is human capital in developing the service sector because the sector requires creative reform that comes mostly from human capacity. Additionally, the effect of CEE, represented for added value created by a unit of tangible assets, implies that this kind of assets is increasingly crucially important.

In addition, the impact of IC depends on the firm's features and context and the effect of HCE decreases, while the effect of CEE increases from model 1 to model 2. In addition, the insignificant coefficient of SCE rejects hypothesis 3.

In terms of internal factors, capital deepening has a significant and negative effect on a firm's performance, implying that the decreasing return to capital appeared in firms with more capital with outdated technology and management, the lower return to capital, causing lower return to equity, ROE. Older firms with more experience will support firm development.

**Table 3.** Intellectual capital efficiency for service enterprises in Vietnam.

| | IC Components | IC Components and Other Factors | VAIC and Other Factors |
|---|---|---|---|
| | **(1)** | **(2)** | **(3)** |
| *IC efficiencies* | | | |
| VAIC | | | 0.0877 *** |
| | | | (0.023) |
| HCE | 0.1148 ** | 0.0729 *** | |
| | (0.053) | (0.025) | |
| SCE | −0.0002 | −0.0145 | |
| | (0.023) | (0.014) | |
| CEE | 0.0158 ** | 0.0260 *** | |
| | (0.007) | (0.009) | |

**Table 3.** *Cont.*

| | IC Components | IC Components and Other Factors | VAIC and Other Factors |
|---|---|---|---|
| | **(1)** | **(2)** | **(3)** |
| *Internal factors* | | | |
| Capital deepening | | −0.0044 ** | −0.0069 *** |
| | | (0.002) | (0.002) |
| Leverage | | −0.0162 | 0.0335 * |
| | | (0.029) | (0.017) |
| Gender issue | | 0.0441 | −0.0590 |
| | | (0.059) | (0.069) |
| Experience/Firm age | | 0.0051 *** | 0.0100 *** |
| | | (0.002) | (0.003) |
| Export tax | | −0.0246 | 0.0084 |
| | | (0.016) | (0.017) |
| Firm's insurance and trade union contribution | | 0.0008 | 0.0047 *** |
| | | (0.001) | (0.002) |
| Social insurance | | 0.1200 ** | −0.1106 |
| | | (0.056) | (0.088) |
| *External factor* | | | |
| Market concentration—HHI | | −0.1097 | 0.1908 |
| | | (0.129) | (0.209) |
| Constant | 2.6269 | −0.8787 ** | 0.1602 |
| | (1.937) | (0.393) | (0.363) |
| chi2 Wald test | 0.00 | 0.00 | 0.00 |
| Hansen test | 0.13 | 0.10 | 0.23 |
| Arellano–Bond test AR(2) | 0.18 | 0.30 | 0.48 |
| No. of instruments | 30.00 | 55.00 | 35.00 |
| Observations | 217,978 | 217,978 | 217,978 |

Source: Own analysis. Note: Asterisks (*), (**), and (***) denote statistical significance levels at least at the 10%, 5%, and 1%, respectively. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported in parentheses. The Hansen test is a test of the validity of the overidentifying restrictions. The Arellano–Bond test AR (2) tests the null hypothesis so that there is no second-order serial correlation. Time dummy variables are included in all models, but their results are not reported here.

*4.2. Intellectual Capital Effects and Firm Size*

This section investigates how the effects of IC on service firm performance change among different cohorts of firm sizes (Table 4). There is a significant difference in IC effects based on firm size, affirming hypothesis 7 (there are differences in the impact of IC efficiencies among size-based cohorts). Generally, the main findings reject hypothesis 3, because SCE contributes positively to a firm's ROE.

Medium-sized firms benefit from all components of IC efficiency; large service firms receive help from SCE and CEE; small-sized firms profit from CEE, while micro-sized firms rely only on HCE to develop. Medium-sized firms benefit the most from CEE with the highest coefficient (0. 0602). HCE is the most useful for micro-sized firms, while SCE is most favorable for large-sized firms. The result of SCE is similar to the finding of Bontis et al. [38], rejecting hypothesis 3 that "SCE has a negative effect on the firm performance".

In terms of internal factors, similar to the case of the whole sample, capital deepening which is represented by total asset per employee, mostly has negative coefficients, thus implying diminished returns on capital. A similar explanation exists for the negative impact of capital deepening on the total factor of productivity, confirming that firm improvement relies on technology deepening rather than capital deepening [66].

Leverage is useful for firms at any size, expressing the importance of loans and credits for service firms in Vietnam. A higher female rate of labor is associated with better firm performance for large and medium-sized firms, but with the worst firm performance for micro-sized firms. It may imply that the firms hiring more female employees usually

operate in activities with lower skill, lower capacity, such as retail services, leading to lower ROE.

Firm age contributes to firm performance only for cases of small and micro-sized firms, indicating that large and medium-sized firms gain experience from some other means, including updated technology and professional and skilled employees, rather than from operating time.

The higher a firm's insurance and trade union contributions, the worse the firm's performance is for medium-sized, but there is better firm performance for small-sized firms. This suggests that when firm size increases up to a medium size, this contribution becomes a burden for firms. Meanwhile, social insurance paid in lieu of salary per employee becomes a burden for small-sized firms but becomes beneficial for medium-sized ones. It may imply that at a small size, higher social insurance seems lower than real working hours, which negatively affects the firm's performance. Regarding external factors, a higher market concentration seems encourage micro-sized firms, showing that firms in the market with higher intense competition usually have a higher ROE.

**Table 4.** Intellectual capital efficiency for service enterprises by firm size in Vietnam.

| | Large | Medium | Small | Micro |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *IC efficiency* | | | | |
| Human capital efficiency | 0.0368 | 0.0366 * | 0.0192 | 0.0841 *** |
| | (0.030) | (0.021) | (0.070) | (0.012) |
| Structural capital efficiency | 0.0655 ** | 0.0489 ** | 0.0254 | −0.0153 |
| | (0.031) | (0.022) | (0.049) | (0.013) |
| Capital employed efficiency | 0.0568 *** | 0.0602 *** | 0.0525 ** | 0.0145 |
| | (0.011) | (0.003) | (0.020) | (0.010) |
| *Internal factors* | | | | |
| Capital deepening | −0.0253 * | −0.0049 ** | −0.0036 | −0.0043 *** |
| | (0.013) | (0.002) | (0.007) | (0.001) |
| Leverage | 0.1511 *** | 0.0623 *** | 0.0809 ** | 0.0539 * |
| | (0.044) | (0.023) | (0.034) | (0.031) |
| Gender issue | 0.0934 * | 0.0479 * | 0.1435 | −0.1476 *** |
| | (0.048) | (0.028) | (0.095) | (0.055) |
| Firm age | 0.0012 | 0.0003 | 0.0112 *** | 0.0074 *** |
| | (0.001) | (0.001) | (0.003) | (0.002) |
| Export tax | −0.0005 | 0.0000 | −0.0264 | −0.0023 |
| | (0.001) | (0.001) | (0.025) | (0.002) |
| Firm's insurance and trade union contribution | −0.0003 | −0.0011 * | 0.0044 *** | 0.0013 |
| | (0.001) | (0.001) | (0.002) | (0.001) |
| Social insurance | 0.0629 | 0.0777 *** | −0.0895 * | −0.0102 |
| | (0.042) | (0.030) | (0.052) | (0.032) |
| *External factor* | | | | |
| Market concentration—HHI | 0.2029 | −0.0930 | 0.2315 | 0.5060 ** |
| | (0.284) | (0.525) | (0.447) | (0.236) |
| Constant | 0.0876 | 0.0716 | −0.6565 | −0.0514 |
| | (0.068) | (0.055) | (1.771) | (0.055) |
| chi2 Wald test | 0.00 | 0.00 | 0.00 | 0.00 |
| Hansen test | 0.74 | 0.10 | 0.48 | 0.37 |
| Arellano–Bond test AR(2) | 0.46 | 0.45 | 0.54 | 0.47 |
| No. of instruments | 220.00 | 116.00 | 48.00 | 44.00 |
| Observations | 3205 | 15,919 | 65,842 | 133,012 |

Source: Own analysis. Note: Asterisks (*), (**), and (***) denote statistical significance levels at least at the 10%, 5%, and 1%, respectively. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported in parentheses. The Hansen test is a test of the validity of the overidentifying restrictions. The Arellano–Bond test AR (2) tests the null hypothesis that there is no second-order serial correlation. Time dummy variables are included in all models, but their results are not reported here.

### 4.3. Intellectual Capital Effects and Firm Ownership

The results generally express that the effects of IC are different corresponding to firm characteristics, such as ownership (Table 5). These results confirm hypothesis 8 (there are differences in the impact of intellectual capital efficiency among different cohorts of firm ownership). These outcomes are similar to the findings of Fauzi and Sami [67] and Vitolla et al. [68], implying that different ownership structures with different typical management methods result in different firm performances.

**Table 5.** The impact of intellectual capital efficiency on service enterprises by ownership in Vietnam.

| | Private | FDI | State | Cooperatives |
|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** |
| *IC efficiency* | | | | |
| Human capital efficiency (HCE) | 0.0998 *** | 0.0928 *** | 0.0149 | 0.0521 *** |
| | (0.028) | (0.029) | (0.012) | (0.010) |
| Structural capital efficiency (SCE) | −0.0414 | 0.0695 ** | 0.0493 *** | 0.0237 *** |
| | (0.028) | (0.031) | (0.015) | (0.007) |
| Capital employed efficiency (CEE) | 0.0378 *** | 0.1068 *** | 0.0777 * | 0.0754 *** |
| | (0.003) | (0.010) | (0.040) | (0.005) |
| *Internal factors* | | | | |
| Capital deepening | −0.0016 ** | −0.0070 *** | 0.0157 | −0.0012 * |
| | (0.001) | (0.003) | (0.025) | (0.001) |
| Leverage | 0.0120 | 0.0670 ** | 0.0820 *** | 0.3687 *** |
| | (0.009) | (0.031) | (0.022) | (0.022) |
| Firm age | −0.0020 | −0.0030 * | 0.0004 | −0.0005 |
| | (0.001) | (0.002) | (0.001) | (0.001) |
| Gender issue | −0.0588 ** | 0.0659 ** | 0.1662 | 0.0025 |
| | (0.028) | (0.033) | (0.273) | (0.015) |
| Export tax | 0.0032 | 0.0027 | −0.0013 | −0.0047 ** |
| | (0.002) | (0.002) | (0.004) | (0.002) |
| Firm's insurance and trade union contribution | −0.0036 *** | 0.0036 ** | 0.0027 | −0.0012 *** |
| | (0.001) | (0.002) | (0.002) | (0.000) |
| Social insurance | 0.1699 *** | 0.0353 | −0.0137 | 0.0219 *** |
| | (0.062) | (0.028) | (0.023) | (0.006) |
| *External factor* | | | | |
| Market concentration—HHI | 0.0795 ** | 0.2737 | −0.8509 | −0.0915 *** |
| | (0.035) | (0.277) | (0.735) | (0.026) |
| Constant | −0.2611 *** | 0.2076 *** | 0.2655 ** | −0.0545 |
| | (0.096) | (0.080) | (0.114) | (0.047) |
| chi2 Wald test | 0.00 | 0.00 | 0.00 | 0.00 |
| Hansen test | 0.15 | 0.14 | 0.38 | 0.11 |
| Arellano–Bond test AR(2) | 0.42 | 0.80 | 0.60 | 0.10 |
| No. of instruments | 24.00 | 29.00 | 23.00 | 27.00 |
| Observations | 196,885 | 2822 | 5992 | 12,279 |

Source: Own analysis. Note: Asterisks (*), (**), and (***) denote statistical significance levels at least at the 10%, 5%, and 1%, respectively. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported in parentheses. The Hansen test is a test of the validity of the overidentifying restrictions. The Arellano–Bond test AR (2) tests the null hypothesis that there is no second order serial correlation. Time dummy variables are included in all models, but their results are not reported here.

HCE increases ROE of private, FDI firms, and cooperatives, but not state-owned ones, while SCE contributes to all firms except for private ones. Remarkedly, HCE is insignificant for state-owned firms, and it is the smallest for cooperatives. These outcomes express the fact that, in Vietnam, the salary and income mechanism in state-owned firms and cooperatives is mainly based on positions and career seniority measured by working years and is not based on working efficiency. The labor force in these firms is usually large in quantity but low in quality.

Only CEE has significant and positive effects for all ownerships, but there are differences in terms of the strength level of effects. FDI firms, state-owned firms, and cooperatives benefit the most from CEE, compared with other IC components. Private firms have the highest positive effect from HCE, but the weakest effect from CEE, and an even insignificant effect from SCE, compared with other ownerships. These findings may indicate that most private firms are small or micro-sized, with mainly outdated machines, technology, and costly loans, thus CEE has a low effect on ROE. Additionally, at small and micro sizes, these private firms are mostly lacking or are weak in firm strategies, organizational networks or relationships, patents, and brand names, thus SCE is insignificant for these firms. With the significant and positive effects of all IC components, FDI firms receive stronger effects compared to cooperatives.

Regarding internal factors, similar to the results of the previous section, capital deepening seems insignificant for service firms. Leverage activities contribute to almost all firms, except private ones, because the ability to access priority credit is mainly determined by the relationship rather than the efficiency of capital usage in Vietnam. Leveraging is more favorable for state-owned enterprises' performance than for FDI firms because state-owned firms have the easiest access to preferential loans. Similar to the results of the previous section, export tax, with negative effects, seems to burden and restrict the development of cooperatives. This result may imply the difficulties of exporting to the international market because of the unsuitable tax system, as well as the low quality of products from cooperatives in Vietnam. With the negative or insignificant coefficient of the firm's age, longer operation time does not bring more advantages for the case of service FDI firms because this ownership has enough capital capacity to possess modern knowledge and experience, even at the time of start-up. The younger that FDI firms are, the more updated technology and professional and skilled employees they can afford. The effect of the gender issue, or the ratio of female employees, is negative for private firms but positive for FDI firms, implying that there are less efficient working conditions for dealing with gender issues in private firms. Higher insurance and trade union contributions per employee usually results in better performance for FDI firms. Higher social insurance contributes to a better firm performance for private firms and cooperatives. Regarding external factors, a higher market concentration encourages private firms to have better firm performance but is more harmful for cooperatives.

### 4.4. Intellectual Capital Effects of Knowledge Intensity Levels

4.4.1. Knowledge Intensity Versus Lower Knowledge Intensity

This research evaluates and compares the impact of IC on a firm's performance among different levels of knowledge intensity, as well as different service activities. The results confirm hypothesis 6 (there are differences in the impact of intellectual capital efficiency among different levels of knowledge intensity).

Following Long [64], service firms are divided into two groups based on knowledge intensity level. The group that are assessed for knowledge intensity include research and development (R&D) and consultant services (consultants, technical analysis, accounting, auditing, research and development, market research, design services); high-tech services (technology, information and communication, programming, data analysis, satelliting, television and radio, science and technology services, publishing services); financial and insurance services (financial, banking, insurance services); and knowledge-intensive social services (education, training, healthcare, social assistance, arts, recreation, entertainment). The group of less knowledge-intensive services include wholesale, retail, repair services for motorized vehicles; transport, warehouse services; accommodation, food and beverage services; real estate services (real estate business; real estate consulting, brokerage, auction); as well as administration and supporting services (services of leasing, labor resources, tourism, personal protection, ensuring safety, cleaning, administrative operations and office support, trade promotion). This section conducts nine models corresponding to the mentioned services sub-sectors (Table 6).

**Table 6.** Intellectual capital efficiency for service enterprises by knowledge intensity level in Vietnam.

| Dependent var.: ROE | Knowledge-Intensive Services | | | | | Less Knowledge-Intensive Services | | | |
|---|---|---|---|---|---|---|---|---|---|
| Independent Vars. | R&D and Consultant Ser. | High-Tech Ser. | Financial and Insurance Ser. | Social Ser. | Wholesale, Retail, Repair Services for Motorized Vehicles | Transport, Warehouse Ser. | Accommodation, Food, Beverage Ser. | Real Estate Ser. | Administration, Supporting Ser. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *IC efficiency* | | | | | | | | | |
| Human cap. eff. (HCE) | 0.1446 *** | 0.2035 *** | 0.0764 ** | 0.0873 *** | 0.0600 *** | 0.0669 * | 0.0620 *** | 0.0366 *** | 0.1732 *** |
| | (0.032) | (0.025) | (0.035) | (0.010) | (0.019) | (0.040) | (0.007) | (0.011) | (0.032) |
| Structural cap. eff. (SCE) | −0.0178 | 0.0014 | 0.0174 | 0.0006 | −0.0028 | 0.0344 | −0.0004 | −0.0067 | −0.0398 ** |
| | (0.015) | (0.012) | (0.043) | (0.002) | (0.022) | (0.030) | (0.005) | (0.009) | (0.020) |
| Capital emp. eff. (CEE) | 0.0185 *** | 0.0692 *** | 0.0760 *** | 0.0451 *** | 0.0445 *** | 0.0391 *** | 0.0376 *** | 0.0166 *** | 0.0359 *** |
| | (0.007) | (0.007) | (0.004) | (0.005) | (0.016) | (0.009) | (0.002) | (0.003) | (0.003) |
| *Internal factors* | | | | | | | | | |
| Capital deepening | −0.0043 ** | −0.0046 ** | 0.0010 | −0.0005 | -0.0070 ** | −0.0006 | −0.0022 ** | −0.0017 | −0.0013 |
| | (0.002) | (0.002) | (0.001) | (0.001) | (0.003) | (0.002) | (0.001) | (0.002) | (0.001) |
| Leverage | 0.0982 *** | 0.0845 * | 0.2162 *** | 0.0184 | 0.0150 | −0.0316 * | 0.0187 | 0.0130 | 0.0362 |
| | (0.019) | (0.049) | (0.016) | (0.018) | (0.030) | (0.018) | (0.016) | (0.023) | (0.028) |
| Firm age | 0.0009 | −0.0010 | 0.0013 | −0.0019 ** | −0.0009 | −0.0001 | −0.0002 | 0.0014 | 0.0067 ** |
| | (0.001) | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) | (0.001) | (0.003) |
| Gender issue | −0.0449 | −0.0100 | −0.0311 | 0.0328 * | 0.0464 | 0.0533 | −0.0389 | 0.0787 ** | 0.0503 |
| | (0.042) | (0.085) | (0.038) | (0.018) | (0.060) | (0.048) | (0.034) | (0.036) | (0.038) |
| Export tax | 0.0229 | −0.0024 | −0.0026 | −0.0007 | −0.0019 | −0.0002 | 0.0020 * | −0.0009 | -0.0011 |
| | (0.015) | (0.003) | (0.003) | (0.003) | (0.001) | (0.016) | (0.001) | (0.002) | (0.001) |
| Insurance and trade union | 0.0003 | −0.0026 ** | −0.0006 * | −0.0004 | 0.0011 | 0.0016 | −0.0008 | −0.0004 | −0.0008 |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Social insurance | 0.1414 *** | 0.1256 *** | −0.0023 | 0.0272 * | 0.0459 | 0.0154 | 0.0248 | 0.0561 ** | 0.0400 |
| | (0.021) | (0.038) | (0.005) | (0.015) | (0.045) | (0.022) | (0.025) | (0.028) | (0.035) |
| *External factor* | | | | | | | | | |
| Market concentration | 0.3149 | 0.1130 | 0.0977 *** | −0.1393 * | −0.0708 ** | 0.3840 | 0.0086 | −0.1029 | −0.0033 |
| | (0.253) | (0.128) | (0.028) | (0.071) | (0.032) | (0.257) | (0.394) | (0.276) | (0.165) |
| Constant | −1.0903 | −0.1566 ** | 0.0519 | −0.0082 | −0.0097 | 0.1691 | 0.0829 ** | −0.0873 | −0.2025 *** |
| | (0.776) | (0.079) | (0.082) | (0.061) | (0.073) | (0.734) | (0.040) | (0.066) | (0.068) |
| chi2 Wald test | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hansen test | 0.10 | 0.51 | 0.23 | 0.98 | 0.42 | 0.17 | 0.37 | 0.20 | 0.40 |
| Are.–Bond test AR(2) | 0.12 | 0.82 | 0.10 | 0.44 | 0.20 | 0.84 | 0.84 | 0.25 | 0.80 |
| No. of instruments | 241.00 | 220.00 | 86.00 | 74.00 | 44.00 | 105.00 | 220.00 | 220.00 | 220.00 |
| Observations | 15,960 | 2259 | 8086 | 2506 | 146,243 | 18,509 | 14,488 | 4424 | 5503 |

Source: Own analysis. Note: Asterisks (*), (**), and (***) denote statistical significance levels at least at the 10%, 5%, and 1%, respectively. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported in parentheses. The Hansen test is a test of the validity of the overidentifying restrictions. The Arellano–Bond test AR (2) tests the null hypothesis that there is no second-order serial correlation. Time dummy variables are included in all models, but their results are not reported here.

The effects of HCE and CEE are all significant and positive for firms at all levels of knowledge intensity, but different in the strength of the effects. The effect of SCE is only significant and negative for the case of firms operating in the administration and supporting services sub-sector, suggesting that these firms have inefficient management, strategies, and a stagnant administration system.

Remarkably, HCE is more important than CEE in supporting a service firm's performance for all sub-sectors, particularly for R&D, consultant services (coefficients of HCE and CEE are 0.1446 and 0.0185, respectively), high-tech services (coefficients of HCE and CEE are 0.2035 and 0.0692, respectively) and administration and supporting services (coefficients of HCE and CEE are 0.1732 and 0.0359, respectively).

The high-technology services receive the highest effects of HCE, with the highest coefficients at 0.2035. These results are suitable because these services require high-quality human capital with professional specialists and high knowledge labor to satisfy the typical sector requirements.

With generally higher coefficients, IC is more efficient for knowledge-intensive sub-sectors than for the less knowledge-intensive sub-sectors. Only in the case of administration and supporting services, which are less knowledge-intensive, does the HCE have a high effect (0.1732), which is even stronger than in some sub-sectors in the knowledge-intensive group, such as financial and insurance and social services. This finding is suitable because these sub-sector activities, particularly tourism, personal protection, ensuring safety, investigation, and cleaning, depend highly on a highly skilled labor force. CEE is the most important IC component for financial and insurance services (with the highest coefficient at 0.0760 in model 3) because financing, banking, and insurance sub-sectors require and depend seriously on high capital volume and usage efficiency.

In terms of internal factors, the results imply a decreasing return to capital that appeared for firms focusing on R&D and consultants, high-tech, wholesale, retail, repair of motorized vehicles, as well as accommodations, food and beverage services, implying that the higher inefficient capital, the worse the firm's performance. Leveraging contributes to most of knowledge-intensive sub-sectors, except social services (education, training, healthcare, social assistance, arts, recreation, entertainment). This factor is even harmful for transport and warehouse services, perhaps because of the problem of bad debt, delayed disbursement of transport, and construction services in Vietnam. Along with the effects of firm age, customers seem to prefer older firms in terms of administration and supporting services but prefer younger firms in terms of social services. This is likely because younger firms are more creative and updated in arts, recreation, entertainment services. Higher export taxes go along with better performance of firms that focus on accommodation and food and beverage services because the added value of firms operating in food processing and beverage services is accelerated quickly when firms can enter international markets.

A firm's insurance and trade union contributions seem burden to firms in high-tech and financial and insurance services. Social insurance is mostly important for groups of knowledge-intensive services, while it is only significant for one sub-sector of lower knowledge intensity, which is real estate services. The female employment rate, which is proxy for the gender issue, supports firm performance in social services and real estate services, particularly in education, training, healthcare, and social assistance services. In addition, a higher market concentration encourages financial and insurance services but threatens firms in social services, and wholesale, retail, and repair for motorized vehicle services.

### 4.4.2. Lower Knowledge Intensity

With the effort to improve less knowledge-intensive services and to have an empirical bases for making policy reform, this section evaluates IC's impact on ROE for the less knowledge-intensive sub-sectors with the largest number of observations, namely wholesale, retail, and repair services for motorized vehicles. This sub-sector includes three main groups, including: (i) sales and repairs; (ii) wholesalers and resellers; (iii) and retailers

(Table 7). For the wholesale, retail, and repair services for motorized vehicles, the outcomes accept hypotheses 2 and 4 (HCE and CEE have positive impacts on firm performance), while they reject hypothesis 3 (SCE has a negative impact on firm performance).

**Table 7.** Knowledge—intellectual capital efficiency for Vietnamese service enterprises at a lower knowledge level. Two-step GMM system.

| Variables | Wholesale, Retail, Repair Services for Motorized Vehicles | | |
| --- | --- | --- | --- |
| | *Sale and Repair* | *Wholesale and Reseller* | *Retail* |
| | **(1)** | **(2)** | **(3)** |
| *IC efficiency* | | | |
| Human capital efficiency | 0.0324 *** | 0.0233 | 0.0919 *** |
| | (0.009) | (0.030) | (0.018) |
| Structural capital efficiency | 0.0029 * | 0.0063 | -0.0276 |
| | (0.002) | (0.022) | (0.018) |
| Capital employed efficiency | 0.0346 ** | 0.0346 *** | 0.0179 * |
| | (0.018) | (0.010) | (0.010) |
| *Internal factors* | | | |
| Capital deepening | −0.0011 *** | −0.0050 *** | −0.0014 *** |
| | (0.000) | (0.001) | (0.000) |
| Leverage | 0.0173 | 0.0894 ** | −0.0346 *** |
| | (0.013) | (0.044) | (0.013) |
| Firm age | 0.0008 | 0.0023 * | 0.0010 *** |
| | (0.001) | (0.001) | (0.000) |
| Gender issue | −0.0009 | −0.0259 * | 0.0631 *** |
| | (0.017) | (0.014) | (0.020) |
| Export tax | 0.0015 | 0.0010 | 0.0250 |
| | (0.002) | (0.007) | (0.022) |
| Firm's insurance and trade union contribution | −0.0017 *** | −0.0069 *** | −0.0009 * |
| | (0.000) | (0.001) | (0.001) |
| Social insurance | 0.0616 *** | 0.3745 *** | 0.0279 |
| | (0.018) | (0.065) | (0.051) |
| *External factor* | | | |
| Market concentration—HHI | −0.0077 | 0.5756 | −0.1953 *** |
| | (0.082) | (0.403) | (0.031) |
| Constant | 0.0101 | −0.3875 *** | 0.2775 |
| | (0.057) | (0.087) | (0.412) |
| chi2 Wald test | 0.00 | 0.00 | 0.00 |
| Hansen test | 0.18 | 0.15 | 0.14 |
| Arellano–Bond test AR(2) | 0.45 | 0.13 | 0.96 |
| No. of instruments | 48.00 | 78.00 | 86.00 |
| Observations | 9258 | 77,872 | 59,113 |

Standard errors in parentheses. Source: Own analysis. Note: Asterisks (*), (**), and (***) denote statistical significance at least at the 10%, 5%, and 1% levels, respectively. Asymptotic standard errors robust to general cross-section and time-series heteroskedasticity are reported in parentheses. The Hansen test is a test of the validity of the overidentifying restrictions. The Arellano–Bond test AR (2) tests the null hypothesis that there is no second-order serial correlation. All models are regressed with time dummy variables which are not reported here.

In terms of IC efficiencies, CEE contributes to the performance of all firms, mostly to those operating in sales and repairs, and wholesaler and reseller services. The effect of HCE is highest for retail services, it is significant for retail services, but insignificant for wholesaler and reseller services. The firm performance of wholesaler and reseller services, only depends on CEE. These findings are suitable because the services for vehicle repair as well as retail, require highly skilled employees while wholesale services require capital, as well as usage efficiency.

Interestingly, all IC components are positive and significant for sale and repair services. It is the only sub-sector that benefited from SCE, suggesting that efficient management, strategies, and administration systems are significantly important to sales and repair services.

Regarding internal factors, there are signs of decreasing return to capital. Leveraging is useful for wholesale but harmful for retail services. Positive coefficients of firm age imply that customers seem to believe in older wholesalers and retail services. A higher female employment rate is useful for firms with retail services but harmful for wholesale services. A firm's insurance and trade union contributions appear to be a burden for all firms in this sub-sector. Social insurance is important for firms supplying motorized vehicle repair and wholesale services. Additionally, a higher market concentration threatens retail firms.

## 5. Conclusions

In the service sector in Vietnam, knowledge in terms of intellectual capital generally has a significant and positive impact on a firm's performance, therefore the government should concentrate on allocating investments to IC in this sector. This may help an emerging country like Vietnam achieve its new goal of raising income per capita and becoming a high-middle-income country over the next decade. Regarding IC components, in general, HCE has the strongest positive effect and CEE has the second strongest effect on the firm's performance, or ROE. This implies that firms should pay more attention to improving HCE and pay secondary attention to CEE. The effect of SCE depends on the characteristics of service firms. SCE contributes to the performance of firms of large or medium size, FDI, state-owned, or cooperatives, it also contributes to one less knowledge-intensive sub-sector (sale and repair services for vehicles). There are differences in the impact of intellectual capital efficiency among different levels of knowledge intensity, cohorts of firm size, and firm ownership, suggesting different policies and solutions.

Regarding different cohorts of firm size, the leaders of only medium-sized firms should invest in all IC components. Based on the strongest effects of each IT component, medium-sized, micro-sized, and large-sized firms should pay most attention to enhancing CEE, HCE, and SCE, respectively. In terms of ownership, all firm owners found CEE is beneficial for their firm performance. Additionally, private firm leaders should focus mainly on increasing HCE, while FDI firms should invest significantly in SCE and CEE. FDI leaders should pay more attention to increasing IC components, which all have significant and positive effects for their financial performance. For different knowledge intensity levels, knowledge-intensive sub-sectors should generally promote IC more than the less knowledge-intensive ones. High-technology services should mostly improve HCE while financial and insurance services should focus on CEE.

The results of this study suggest that policy makers focus on improving the quality and diversification of services associated with the development of the knowledge economy. The managers of service firms should make good use of advantages and restructure toward more knowledge-intensive fields. The Vietnamese government should pay attention to developing some potential service industries with high added-value, including R&D and consultancy, high-tech, and financial and insurance services. Among which, the financial and banking services, especially e-banking services, have great prospects for development, both diversifying types of services and better satisfying customer demands. The government should promote competition and encourage inventions and innovations in the service industry. The Vietnamese government should develop high-tech services and enhance digital technology application and digital platforms. R&D and consultancy and high-tech services are "intermediate" services, that create a foundation for promoting other service sub-sectors, such as information technology services, thereby helping Vietnam enter the service economy step-by-step, particularly the knowledge service economy which is becoming a common trend for development in the world.

Policy makers and firm leaders should spend major investment on human capital, because it has the most important role in firm performance compared with other IC com-

ponents. It is necessary to invest in training, attracting, and honoring talent and highly qualified human resources.

Regarding the less knowledge-intensive sub-sectors, service firm leaders in administration and supporting services should focus on increasing HCE because it has the highest contribution to a positive impact on a firm's financial performance. Firm leaders in the retail sector, which accounts for a large proportion, should pay more attention to improving human capability. Firm leaders in wholesale and reseller services should mainly increase CEE, rather than HCE, to improve firm performance. Additionally, it is necessary to synchronously develop the wholesale and retail distribution systems, including the application of modern e-commerce.

This research also found that capital-deepening is not useful in improving firm performance, thus implying diminishing returns on capital. This result suggests service firms in Vietnam should focus on upgrading production methods and business management to improve the efficiency of capital usage. Service firms should generally employ more leverage and contribute more to social insurance. The government should pay attention to reforming regulations on a firm's insurance and trade union contributions, as well as the export tax system. Firm leaders should have different solutions corresponding to the various effects of gender issues, firm age, and market concentrations.

There are some limitations in this research. It uses only one measurement for firm financial performance, ROE. Future studies could examine other financial performance measurements, including ROA and assets turnover (ATO). This study only looked at controlled external factors at the industrial level, not at a provincial one. Other research could examine the effects of provincial expenditure on science and technology, which affects IC efficiency at firm level.

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