

Singapore IP and Firms' Performance Study





Foreword

The views expressed in this paper are solely those of the authors and do not necessarily reflect those of the Intellectual Property Office of Singapore (IPOS), or the Government of Singapore.

We would like to express our thanks to the NERVE Sectoral Data Hub team from the Ministry of Trade and Industry (MTI) for working with us from the start of this project, providing us with the necessary firms' financial data, useful inputs and suggestions on the data, and the Ministry of Manpower (MOM) for the support rendered during the implementation of this project.

Key Takeaways

- This study examines the impact of Intellectual Property Rights (IPRs) on firms' revenue and profitability. Findings show that, for local firms making positive revenues and profits, the ownership of IPRs leads to higher revenues and profits.
- On average, IPR ownership contributed to (1) 5.9% increase in revenue per invested capital per annum; (2) 4.9% increase in revenue per employee per annum; (3) 20.8% increase in profit per invested capital per annum; and (4) 21.7% increase in profit per employee per annum.
- The study's findings suggest that ownership of IPRs supports firm performance. Therefore, to grow innovative enterprises, it might be beneficial to support enterprises in the creation, management and commercialisation of their intellectual property and intangible assets.

Introduction

Intellectual Property (IP) refers to creations of the mind, such as inventions, works of art, designs, computer programmes and logos. These can be protected by law through IP rights (IPRs) such as patents, registered designs, and trademarks.

Singapore recognises the growing importance of IP and other intangible assets, e.g., data, brands and know-how in driving enterprise and economic growth. One focus area of the Singapore IP Strategy 2030 (SIPS 2030), released on April 2021 is to grow innovative enterprises using IP and intangible assets.

In support of SIPS 2030, IPOS looks to provide evidence-based research on the impact of IP and the role that IP plays relating to enterprise and economic growth. This study seeks to understand the impact of IPRs on firms' performance in Singapore, in particular the impact of IPRs on revenue and profit. The study of the Singapore market adds to existing international studies¹ contributed by key global markets such as Europe and Australia.

Using firm-level financial and manpower administrative data made available via various Singapore governmental databases, this study examines the impact of IPRs on firms' revenue and profitability.

Findings

This study found that, for local firms² generating positive revenues and profits, ownership of different portfolios of IPRs, specifically patents, trademarks, and registered designs, led to higher revenues and profits for firms.

Based on the study, between 2010 and 2022, IPR ownership (on average) contributed to:

- (i) 5.9% increase in revenue per invested capital per annum;
- (ii) 4.9% increase in revenue per employee per annum;
- (iii) 20.8% increase in profit per invested capital per annum; and

¹ The two international studies are "Intellectual Property Rights, Business Profitability and Competition in the Australian Economy" and "Intellectual Property Right and Firm Performance in the European Union", published in 2020 and 2021 respectively.

² Local firms refer to companies that have incorporated themselves in Singapore as a 'local company' (LC) and are recognised by a Unique Entity Number (UEN) Issuance Agency.

- (iv) 21.7% increase in profit per employee per annum.

Detailed findings are presented in the following paper.

This study provides a baseline understanding of the impact of IPRs on Singapore local firms' performance.

Similar to the findings of studies done by the European Patent Office (EPO) and the Australia IP Office (IP Australia), this study found that IPRs generally led to higher revenues and profits for firms in Singapore. We note that on average, for the Australian firms, the profit for IPR owners is about 2.5 times higher than non-owners of IPRs; for firms in the European Union (EU) Member States, the revenue for IPR owners is about 55% higher than non-owners of IPRs.³

Overall, the study findings suggest that ownership of IPRs supports firm performance. As such, to grow innovative enterprises, it can be beneficial to help enterprises in the creation, management and commercialisation of their IP and intangible assets.

³ These are based on the coefficient estimates of the variable 'IPR owner', i.e., owner of at least one of any type of IP – patent, trademark, or design, for dependent variables 'profit per *invested capital*' and 'profit per *employee*' (Zhang, H., 2020, Table 3.1, pp. 14), and coefficient estimate of the variable 'Any IPRs' for dependent variable 'revenue per employee' (EPO, EUIPO, 2021, Table 11, pp. 48).

1. Purpose

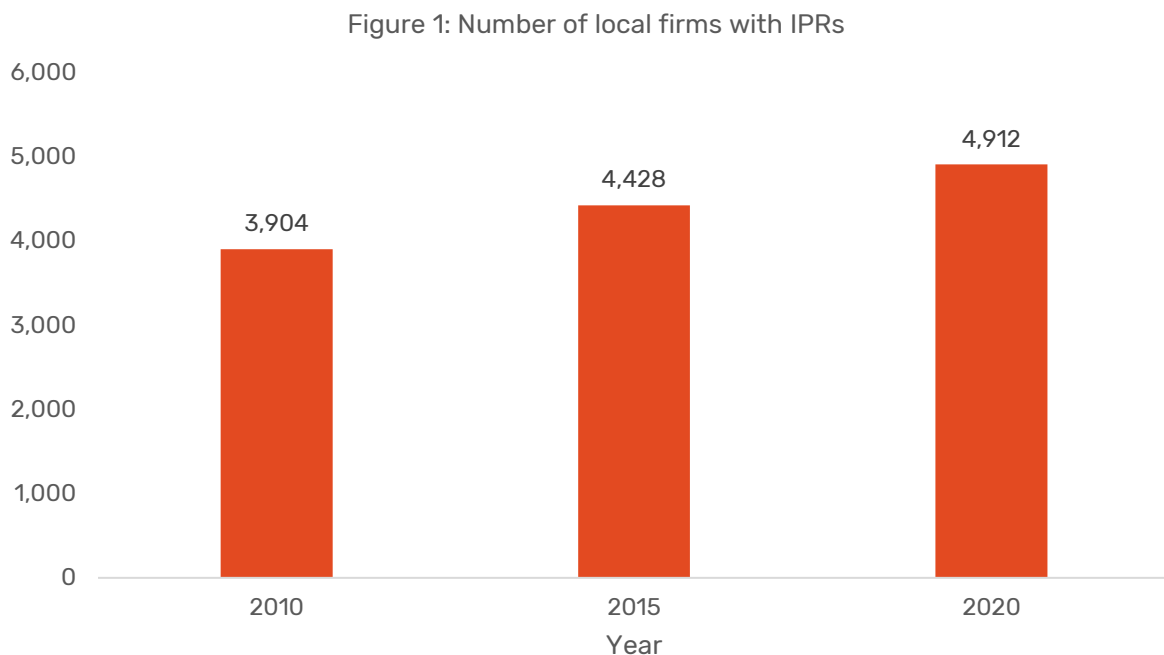
Several IP offices in the world have examined the impact of IPRs on firms' performance in their domestic markets. As economic conditions vary across jurisdictions, there is value in verifying whether the findings in other markets might also be found in Singapore. This study serves to provide a baseline understanding of the impact of IPRs on firms' performance in Singapore.

2. Data

This study uses administrative data – Accounting and Corporate Regulatory Authority (ACRA) firms' financial data between the period of 2010 to 2022 obtained from the NERVE Sectoral Data Hub in the Ministry of Trade and Industry (MTI) and firms' manpower data obtained from other governmental data source.

3. Summary Statistics

Between 2010 and 2020, the number of local firms with IPRs (IPR owners)⁴ grew at a Compound Annual Growth Rate (CAGR) of 2.3% from 3,904 to 4,912 (**Figure 1**). Within the same period, the proportion of firms with IPRs to those without IPRs remained fairly constant.



⁴ Firms with IPRs or 'IPR owners' refer to firms that own at least one type of IPR – patents, trademarks, or designs. The majority of them (about 90%) own only trademarks.

The percentages of firms owning different IPR portfolio types⁵ remained fairly constant. Between 2010 and 2022, the percentage of firms that own only trademarks is the highest at 89.1%, followed by firms that own only patents at 4.7% (**Figure 2**).

Figure 2: Breakdown of firms with IPRs by IP portfolio type (2010 - 2022)

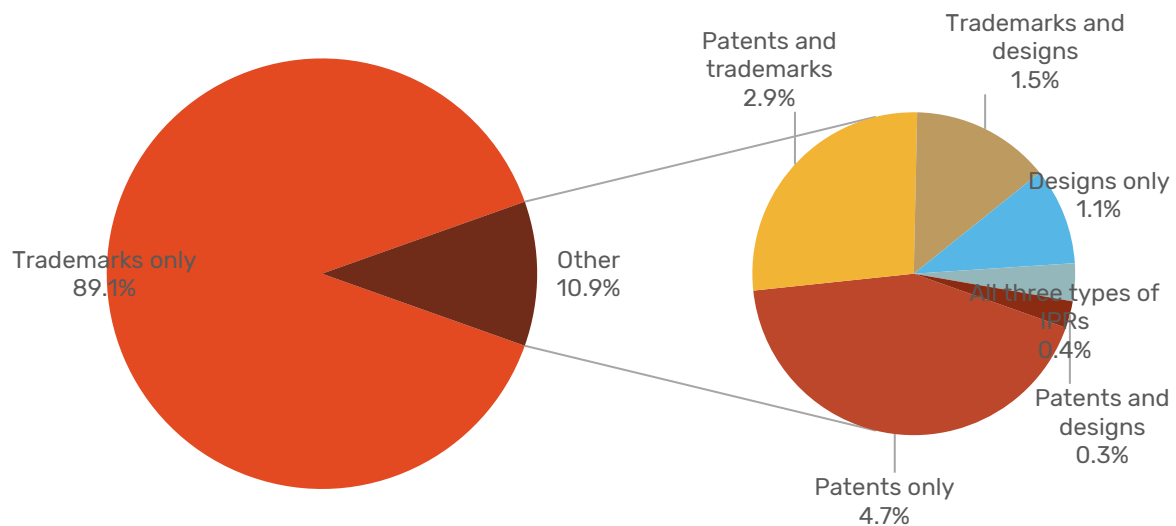


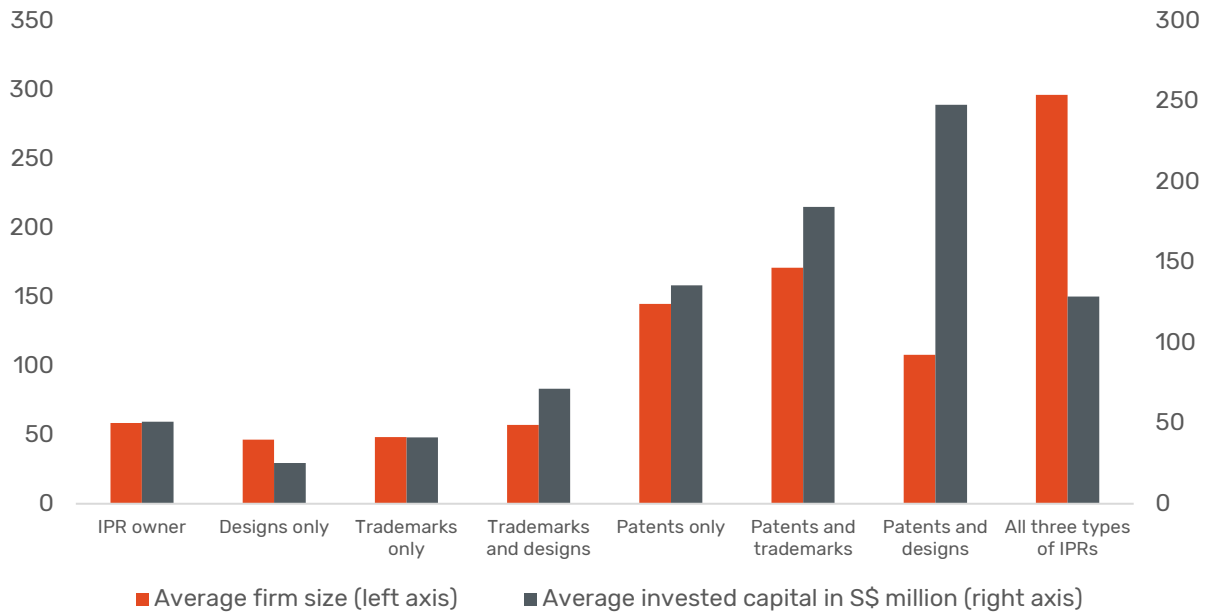
Figure 3 shows the average size⁶ and invested capital⁷ of firms with different IPR portfolios. Firms that own patents tend to have large number of employees and invested capital compared to firms that do not own patents. Firms with all three types of IPRs are largest in size, followed by firms that own patents and trademarks. Firms that own patents and designs have the largest invested capital, followed by firms that own patents and trademarks (**Figure 3**).

⁵ Firms with the different IPR portfolio type are firms that own i) patents only, ii) designs only, iii) trademarks only, iv) patents and trademarks only, v) patents and designs only, vi) trademarks and designs only, and vii) all three types of IPRs – patents, designs, and trademarks.

⁶ The size of a firm is the total number of employees that a firm has.

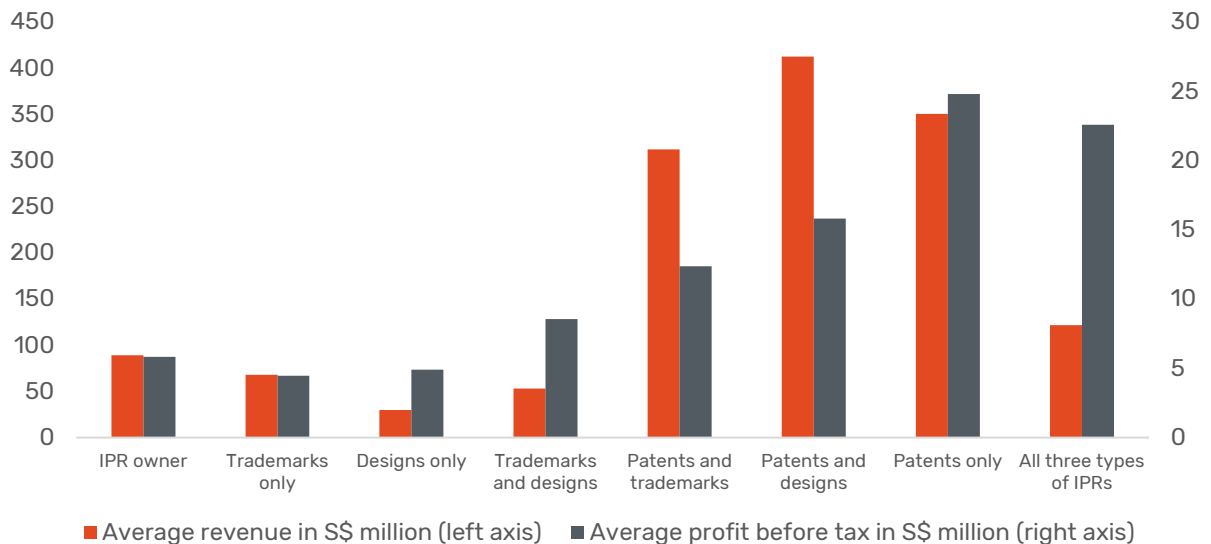
⁷ Invested capital is approximated by taking firm's total asset minus firm's total current liability amount. For details, see: Damodaran, A., 2007, "Return on Capital (ROC), Return on Invested Capital (ROIC), and Return on Equity (ROE): Measurement and Implications" (PDF). New York University Stern School of Business.

Figure 3: Average size and invested capital of firms by different IPR portfolio type



Likewise, firms with the largest revenues and profits⁸ are those that own patents. Firms that own patents and designs have the largest revenues, followed by firms that own only patents. For profits, firms that own only patents have the largest profits, followed by firms that own all three types of IPRs (**Figure 4**).

Figure 4: Average revenue and profit of firms by different IPR portfolio type



⁸ Profit refers to profit before tax.

4. Empirical Methodology⁹

To study the causal impact of IP on firm-level performance, the econometric regression model¹⁰ used in this study is the linear dynamic panel model, given by:

$$\ln(y_{i,t}) = \alpha + \gamma \ln(y_{i,t-p}) + \beta X_{i,t} + \delta IP_{i,t} + u_i + v_{i,t}$$

where

- $X_{i,t}$ represents the set of control variables for firm i in year t : (i) the firm's industry or sectoral fixed effects, (ii) the age of firm, (iii) the year fixed effects;
- $IP_{i,t}$ represents the set of IPR variables for firm i in year t : (i) IPR owner (ii) patents only, (iii) trademarks only, (iv) designs only, (v) patents and trademarks, (vi) patents and designs, (vii) trademarks and designs, and (viii) patents, trademarks, and designs;
- $y_{i,t}$ represents the set of outcome or firm's performance variables: (i) revenue per invested capital, (ii) profit per invested capital, (iii) revenue per employee, and (iv) profit per employee;
- α is the constant term;
- u_i is the firm's fixed effect;
- $v_{i,t}$ is the random error term;
- p subscript denotes the choice of the number of lags of the dependent variable used;
- \ln refers to the logarithmic transformation of the outcome variables.

Since the logarithmic transformation is performed on the firm's performance variables, the analyses are restricted to firms with positive revenues, profits and invested capital. The coefficient of interest (δ) can be interpreted as the impact¹¹ of different IPR portfolio types on firms' performance in relation to similar firms that do not own IP. The estimator of the model is the system GMM estimator.

⁹ Empirical methodology is based on Zhang (2020).

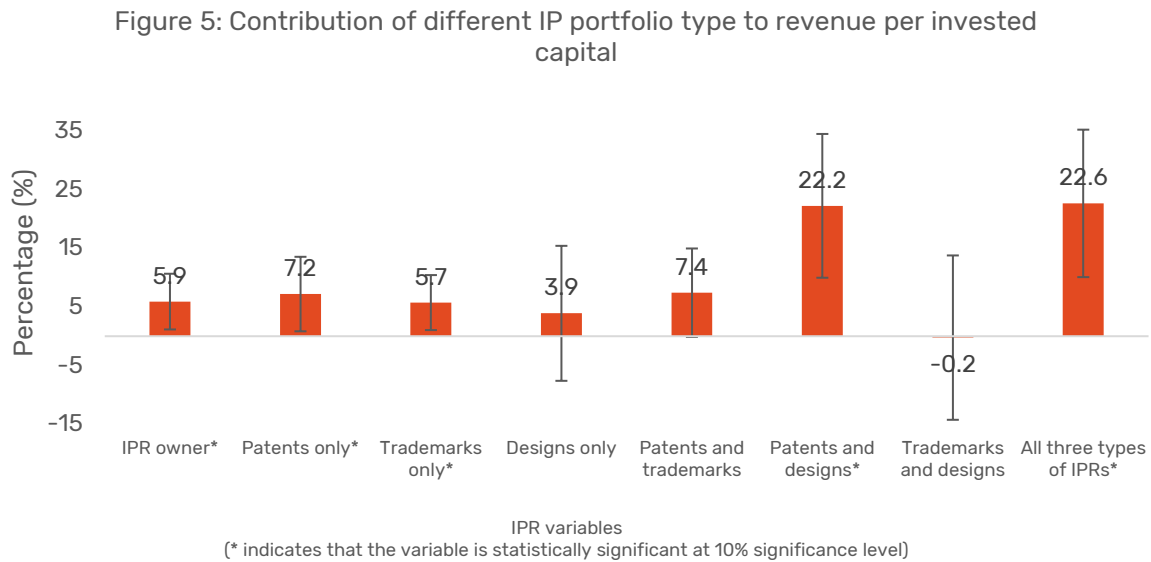
¹⁰ Model specification and estimator are same as Zhang (2020).

¹¹ As the model has a log-linear specification, additional calculation is needed to convert the coefficient estimates for the different variables obtained from the model to examine the impact of each variable in percentage terms.

5. Results^{12,13}

5.1. Revenue Per Invested Capital

For the variables that are statistically significant, the contribution of IPRs to firms' revenue per invested capital ranges from 5.7% to 22.6% depending on the different combinations of IP portfolio type (**Figure 5**).



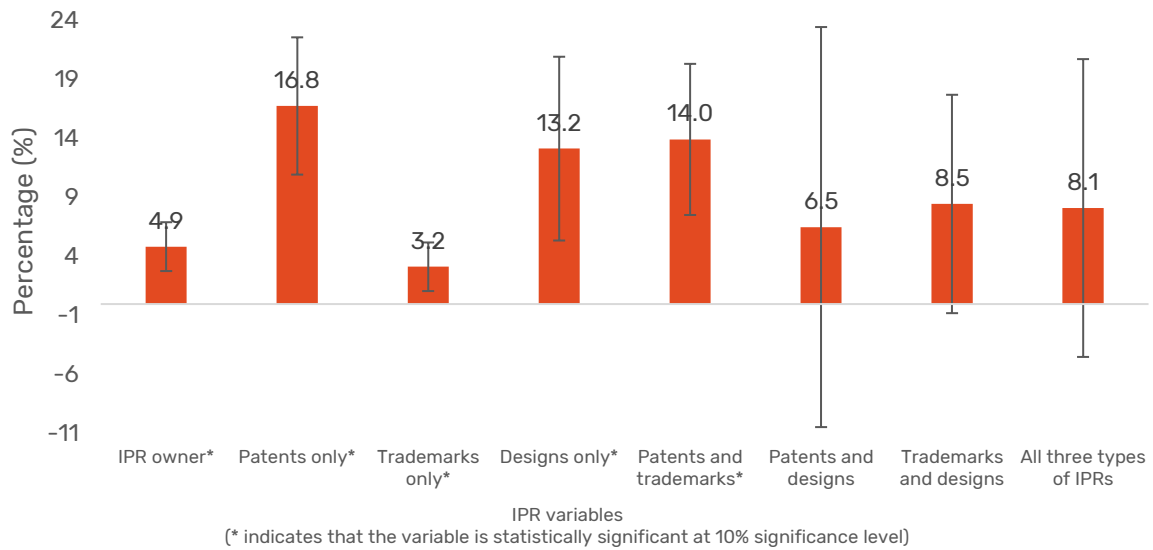
5.2. Revenue Per Employee

For the variables that are statistically significant, the contribution of IPRs to firms' revenue per employee ranges from 3.2% to 16.8% depending on the different combinations of IP portfolio type (**Figure 6**).

¹² The black vertical lines in figures in this section represent 90% confidence intervals, signifying the possible ranges of the effects of the different IPR variables when a new sample is drawn. Note that not all the effects of the different IP variables are always *statistically different from zero*, i.e., statistically significant at the 10% level of significance. For each figure, 5 out of 8 IPR variables are statistically significant.

¹³ The estimates of the effects of the IPR variables that are not statistically significant tend to be for variables with smaller data points, as indicated by Figure 2. These estimates tend to have wider confidence intervals.

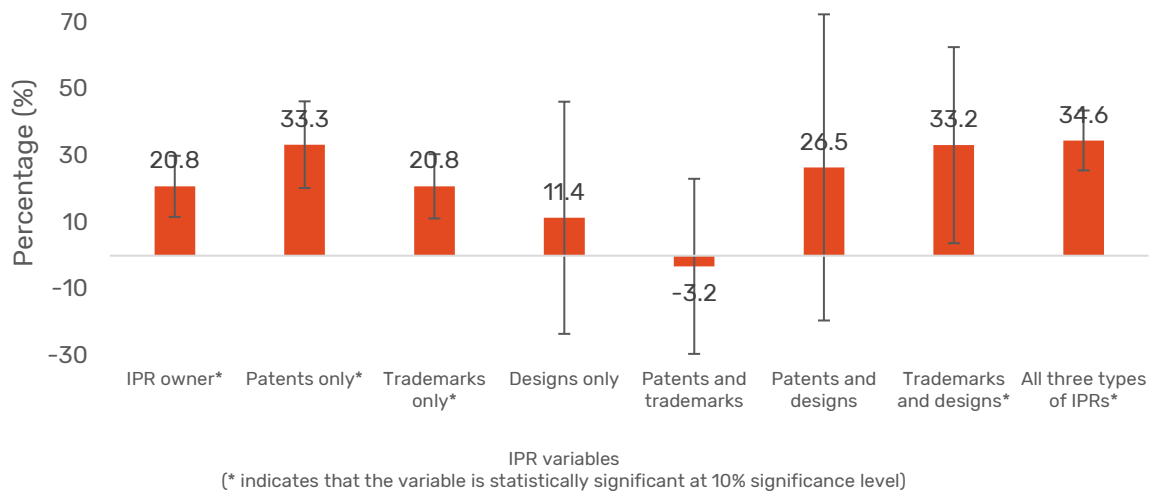
Figure 6: Contribution of different IP portfolio type to revenue per employee



5.3. Profit Per Invested Capital

For the variables that are statistically significant, the contribution of IPRs to firms' profit per invested capital ranges from 20.8% to 34.6% depending on the different combinations of IP portfolio type (**Figure 7**).

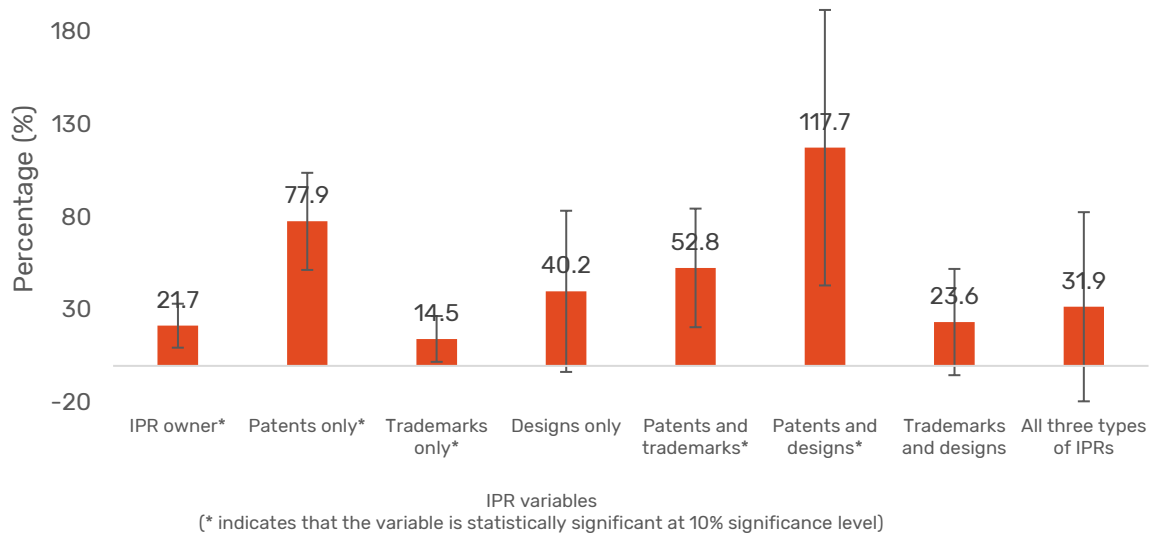
Figure 7: Contribution of different IP portfolio type to profit per invested capital



5.4. Profit Per Employee

For the variables that are statistically significant, the contribution of IPRs to firms' profit per employee ranges from 14.5% to 117.7% depending on the different combinations of IP portfolio type (**Figure 8**).

Figure 8: Contribution of different IP portfolio type to profit per employee



Overall, after normalising firms’ revenues and profits by their invested capital and manpower sizes, different combinations of IPRs contributed differently to firms’ performance. The impact of IP on firms’ revenues ranges from 3.2% to 22.6%, and the impact of IP on firms’ profits ranges from 14.5% to 117.7%.¹⁴

6. Conclusion

Using firm-level financial and manpower administrative data, this study examines the impact of IPRs on local firms’ revenue and profitability.

Similar to results obtained in previous studies done by IP Australia and EPO, this study also finds that IPRs have a positive impact on local firms’ performance, in terms of both the revenues and profits generated. For this Singapore study, between 2010 and 2022, IPR ownership contributed to 5.9% increase in revenue per invested capital, 4.9% increase in revenue per employee, 20.8% increase in profit per invested capital, and 21.7% increase in profit per employee (on average per year).

To grow innovative enterprises using IP and intangible assets, the government should remain committed to supporting companies in their IP creation, management, and commercialisation journey.

¹⁴ Figures are based on the coefficient estimates of IPR variables that are statistically significant at 10% significance level. The three variables with the largest shares of firms, ‘IPR owner’, ‘Patents only’ and ‘Trademarks only’ are statistically significant for all regressions.

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