

Analyzing the Return on Investment of Higher Education: A Data-Driven Cost-Benefit Analysis

Luk Yiu

3035949229

Contents



Data science question



Data available for
answering the question &
data analysis



Why the questions are
important



Answers to the question



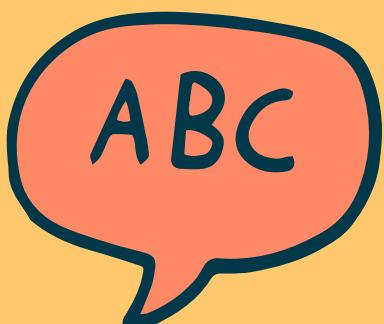
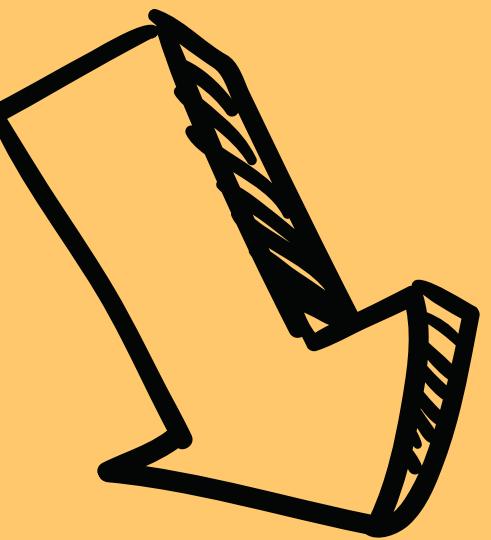
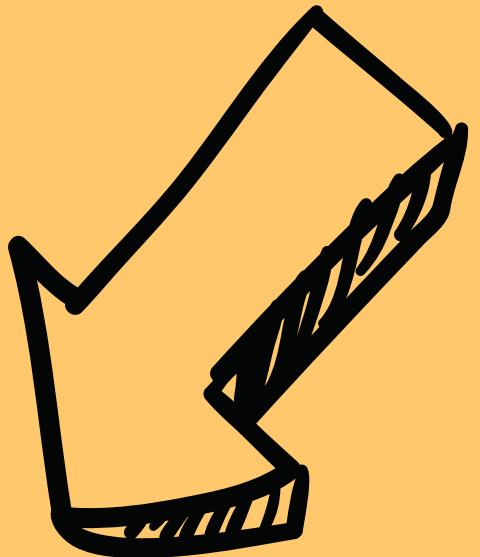
Difficulties in answering
the question



Possible future works and
direction

What data-driven techniques and methodologies can be employed to analyze the relationship between student academic performance with the goal of optimizing financial decision-making for individuals considering higher education investments?

Year 4



Post-graduate

Job

Policymakers



Difficulties in Answering the Question

- Limited Data:
Hard to find enough data
- Normalization:
Adjusting salaries for inflation and currency fluctuations to ensure fair cross-year comparisons.
- Causal Inference:
Isolating the impact of education from confounding factors

Location: Hong Kong

Cost vs Salary

Employment Rate

Return On Investment:

$$ROI = \frac{\text{Net Return}}{\text{Education Cost}} \times 100\%$$



Tuition Fees

HKD44,500

Annual Tuition Fees for Local
Hong Kong Students

(2025-26 cohort)

HKD198,000

Annual Tuition Fees for Non-
local Students Enrolling in Non-
STEM Faculties[#]

(2025-26 cohort)

[#] Faculties of Architecture, Arts, Business
and Economics, Education, Law, and Social
Sciences

HKD218,000

Annual Tuition Fees
(inclusive of HKD20,000 STEM
Fee) for Non-local Students
Enrolling in STEM Faculties and
Schools[^]

(2025-26 cohort)

[^] Faculties of Dentistry, Engineering,
Medicine, and Science; School of
Computing and Data Science, and School
of Innovation



STUDY HK

Hong Kong Education

Introduction	Education System
Tuition Fee and Living Expenses	Scholarships
Internship and Part-time Work	Universities and Higher Education
Programme List	Vocational and Professional Education and Training
Qualifications Framework	The Policy of "Developing Hong Kong's status as an International Education Hub"

Monthly Budget Plan

Living Expenses

Accommodation
- Hostel
- Rental for flat (with one bedroom)

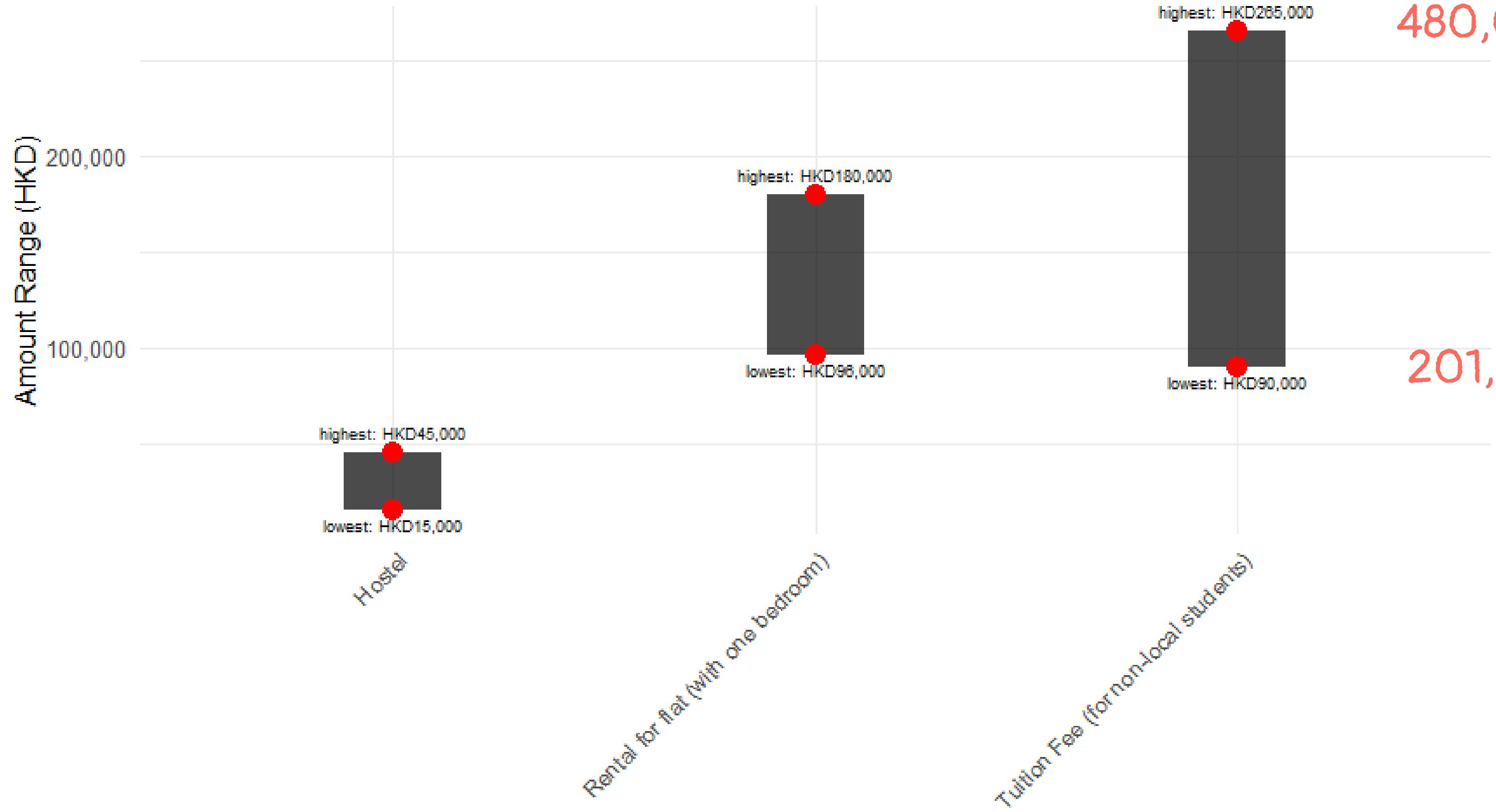
Living expenses

Miscellaneous

Item	Amount (HK\$/US\$) (per year)	
Tuition Fee (for non-local students)	HK\$90,000 - HK\$265,000	US\$11,500 – US\$34,000
Accommodation - Hostel - Rental for flat (with one bedroom)	HK\$15,000 – HK\$45,000 HK\$96,000 – HK\$180,000	US\$1,900 – US\$5,800 US\$12,600 – US\$23,000
Living expenses	Approx. HK\$50,000	Approx. US\$6,400
Miscellaneous	Approx. HK\$15,000	Approx. US\$1,900

```
ggplot(main_costs, aes(x = Item, fill = Item)) +
  geom_segment(aes(x = Item, xend = Item, y = HKD_min, yend = HKD_max),
               linewidth = 20, color = "black", alpha = 0.7) +
  geom_point(aes(y = HKD_min), size = 4, color = "red") +
  geom_point(aes(y = HKD_max), size = 4, color = "red") +
  geom_text(aes(y = HKD_max, label = paste0("highest: HKD", comma(HKD_max))),
            vjust = -1, size = 2.5, color = "black") +
  geom_text(aes(y = HKD_min, label = paste0("lowest: HKD", comma(HKD_min))),
            vjust = 1.5, size = 2.5, color = "black") +
  scale_y_continuous(labels = comma) +
  labs(
    title = "Main fee range for non-local students in Hong Kong (HKD)",
    x = "",
    y = "Amount Range (HKD)",
    caption = "Data source: Study in Hong Kong official documents"
  ) +
  theme_minimal(base_size = 12) +
  theme(
    axis.text.x = element_text(angle = 45, hjust = 1),
    legend.position = "none"
  )
```

Main fee range for non-local students in Hong Kong (HKD)

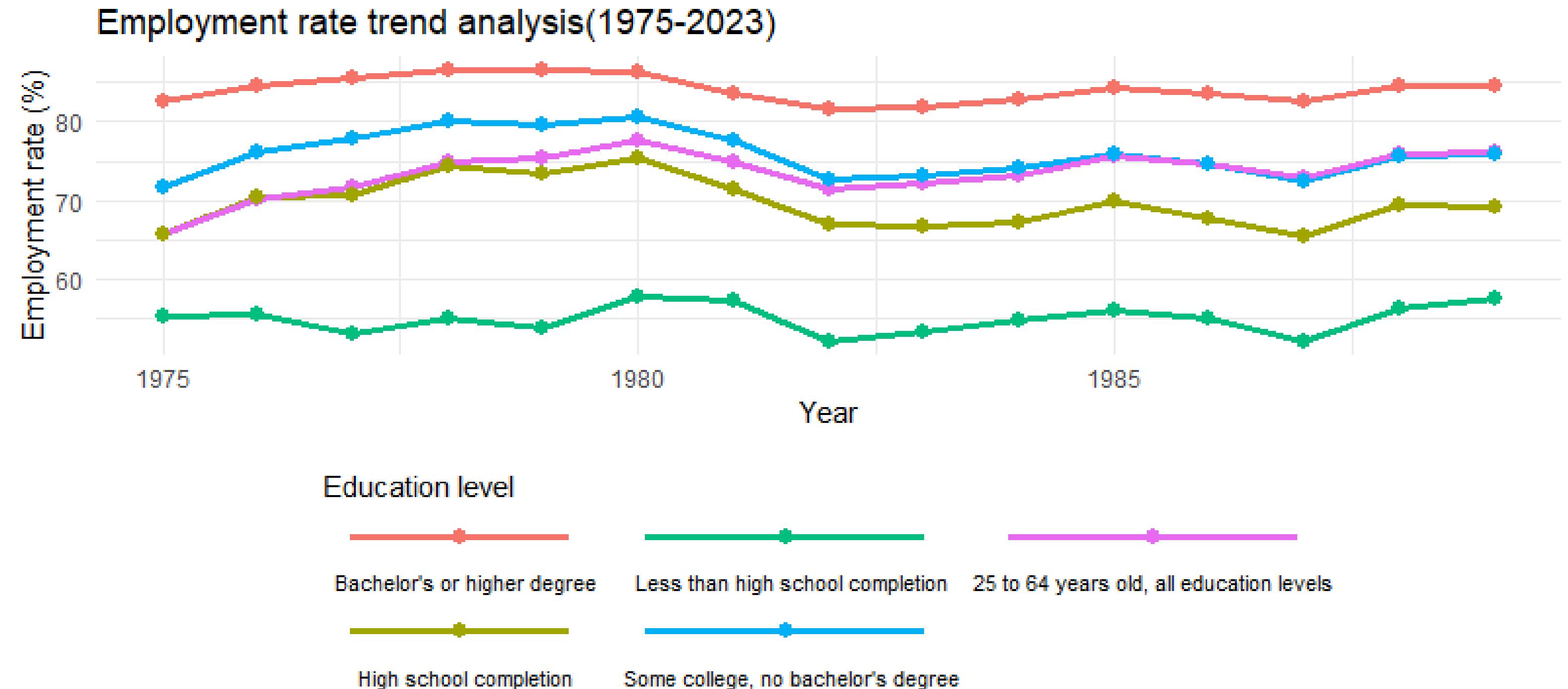


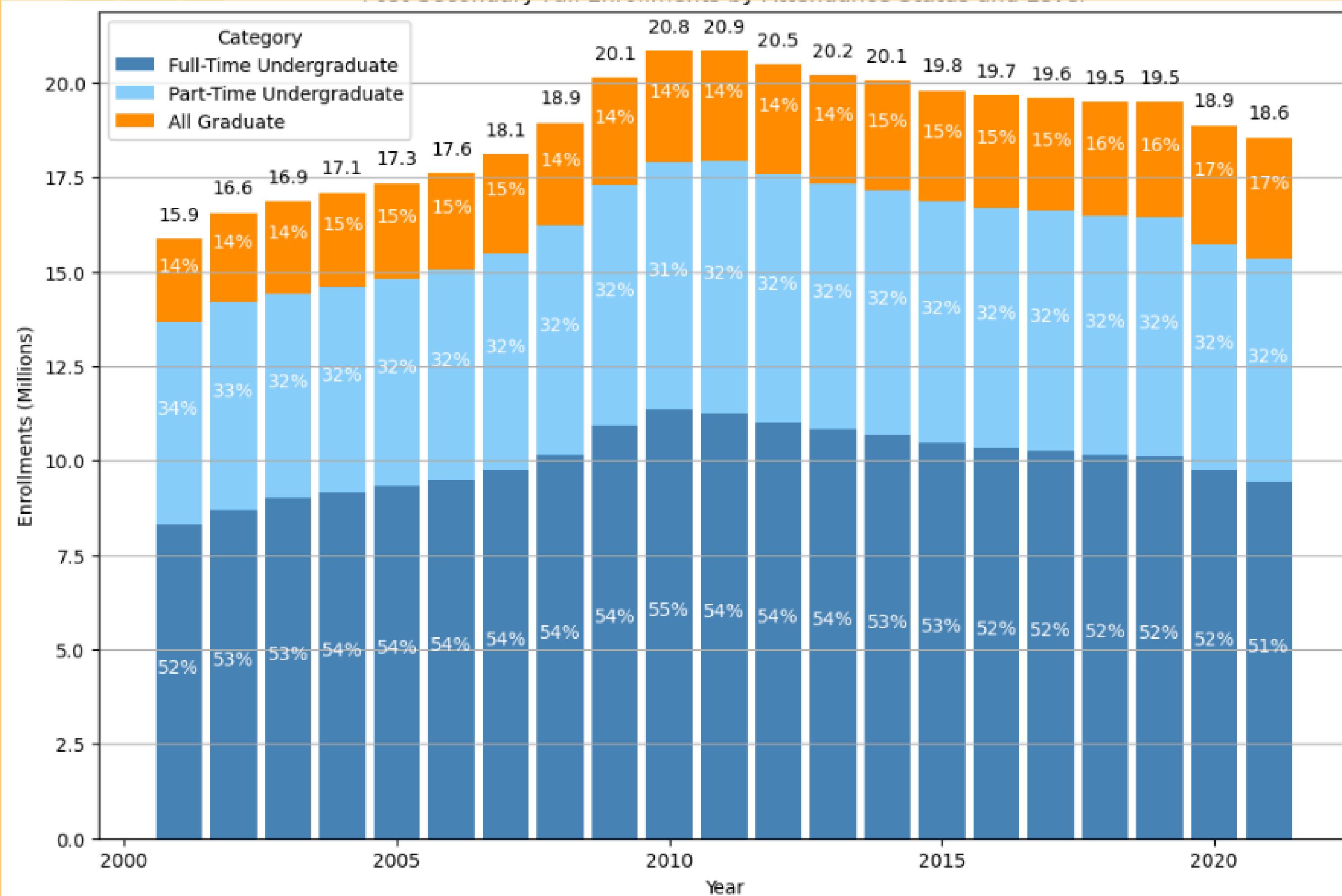
Data source: Study in Hong Kong official documents

Employment Rate

```
ggplot(employ_long, aes(x = Year, y = Employment_Rate,
                        color = Education_Level)) +
  geom_line(linewidth = 1.2) +
  geom_point(size = 2.5) +
  scale_x_continuous(breaks = seq(1975, 2023, 5)) +
  labs(
    title = "Employment rate trend analysis(1975-2023)",
    x = "Year",
    y = "Employment rate (%)",
    color = "Education Level"
  ) +
  theme_minimal() +
  theme(
    legend.position = "bottom",
    legend.direction = "horizontal",
    legend.box = "vertical",
    legend.text = element_text(size = 8),
    legend.spacing.x = unit(0.3, "cm"),
    plot.margin = margin(t=1, r=1, b=4, l=1, "cm"),
    legend.key.width = unit(1.2, "cm")
  ) +
  guides(color = guide_legend(
    nrow = 2,
    title.position = "top",
    label.position = "bottom"
  ))
}
```

Employment Rate

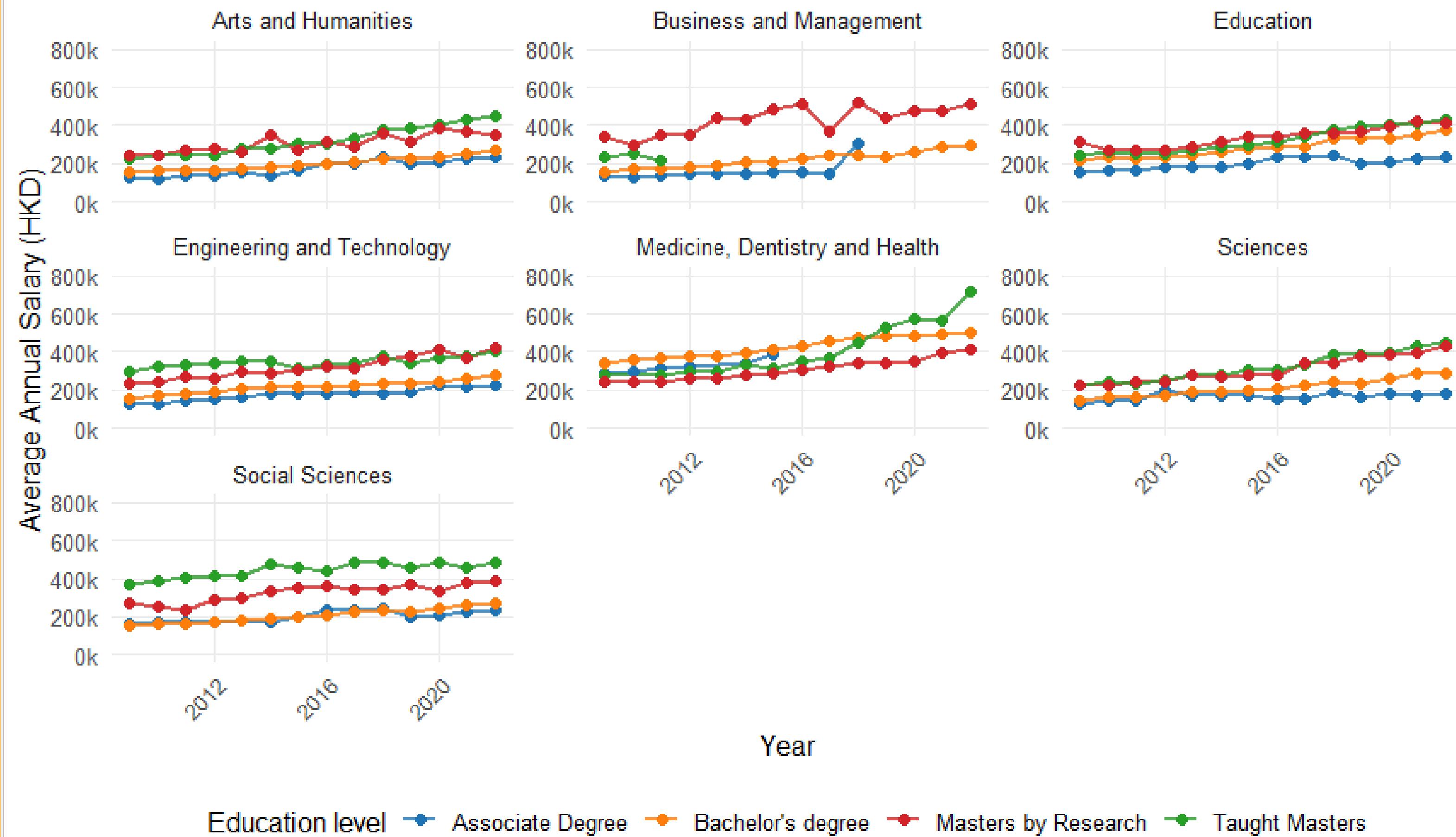




Salary trends of different educational backgrounds and professional levels in Hong Kong (2009-2023)

```
p <- ggplot(income_data, aes(x = Year, y = salary, color = Degree, group = Degree)) +  
  geom_line(linewidth = 1, alpha = 0.8) +  
  geom_point(size = 2) +  
  scale_color_manual(values = color_palette) +  
  scale_y_continuous(  
    labels = scales::comma_format(scale = 1e-3, suffix = "k"),  
    limits = c(0, 800000)  
) +  
  labs(  
    title = "Salary trends of different educational backgrounds and professional levels in Hong Kong (2009-2023)",  
    x = "Year",  
    y = "Average Annual salary (HKD)",  
    color = "Education Level",  
) +  
  theme_minimal(base_size = 12) +  
  theme(  
    legend.position = "bottom",  
    axis.text.x = element_text(angle = 45, hjust = 1),  
    panel.grid.minor = element_blank()  
) +  
  facet_wrap(~Field, ncol = 3, scales = "free_y")
```

Salary trends of different educational backgrounds and professional levels in Hong Kong (2009-)

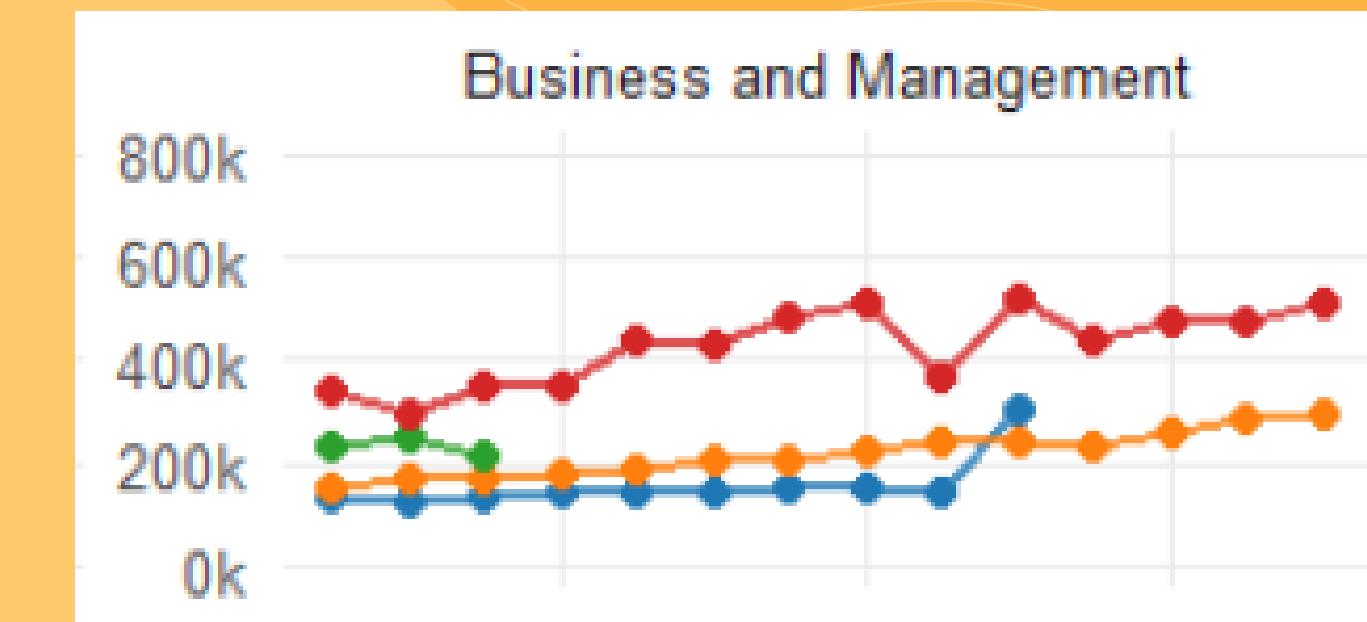


ROI

Cost: 480,000/year

Salary: Undergraduate: 300,000/year

Master: 500,000/year



Metric	Undergraduate	Postgraduate
Total Education Cost	HKD 1,920,000	HKD 2,400,000
Career Earnings	HKD 9,000,000	HKD 12,500,000
Net Earnings	HKD 7,080,000	HKD 10,100,000
ROI	369%	421%

Degree Duration: 4 years

Annual Cost: HKD 480,000

Total Education Cost:

$$4 \times \text{HKD } 480,000 = \text{HKD } 1,920,000$$

Annual Postgraduate Salary: HKD 300,000

Career Earnings (30 years):

$$30 \times \text{HKD } 300,000 = \text{HKD } 9,000,000$$

Net Earnings:

$$\text{HKD } 9,000,000 - \text{HKD } 1,920,000 = \text{HKD } 7,080,000$$

ROI:

$$\text{ROI}_{\text{Undergrad}} = \frac{7,080,000}{1,920,000} \times 100\% \approx 369\%$$

Undergraduate + Postgraduate Duration: $4 + 1 = 5$ years

Total Education Cost:

$$\text{Undergrad Cost} + \text{Postgrad Cost} = \text{HKD } 1,920,000 + \text{HKD } 480,000 = \text{HKD } 2,400,000$$

Annual Postgraduate Salary: HKD 500,000

Career Earnings (25 years):

$$(30 - 5) \times \text{HKD } 500,000 = \text{HKD } 12,500,000$$

Net Earnings:

$$\text{HKD } 12,500,000 - \text{HKD } 2,400,000 = \text{HKD } 10,100,000$$

ROI:

$$\text{ROI}_{\text{Postgrad}} = \frac{10,100,000}{2,400,000} \times 100\% \approx 421\%$$

Undergraduate

Master

Find a Job

Job Title

Possible future works and direction

- 1 Time value of money (e.g., interest rates)
- 2 Unemployment risks or industry volatility
- 3 Scholarships or part-time work

Thank you!