Lezione 3.6
Impatto sul capitale umano

Per dettagli consultare il capitolo 4 di «Investing in Science»

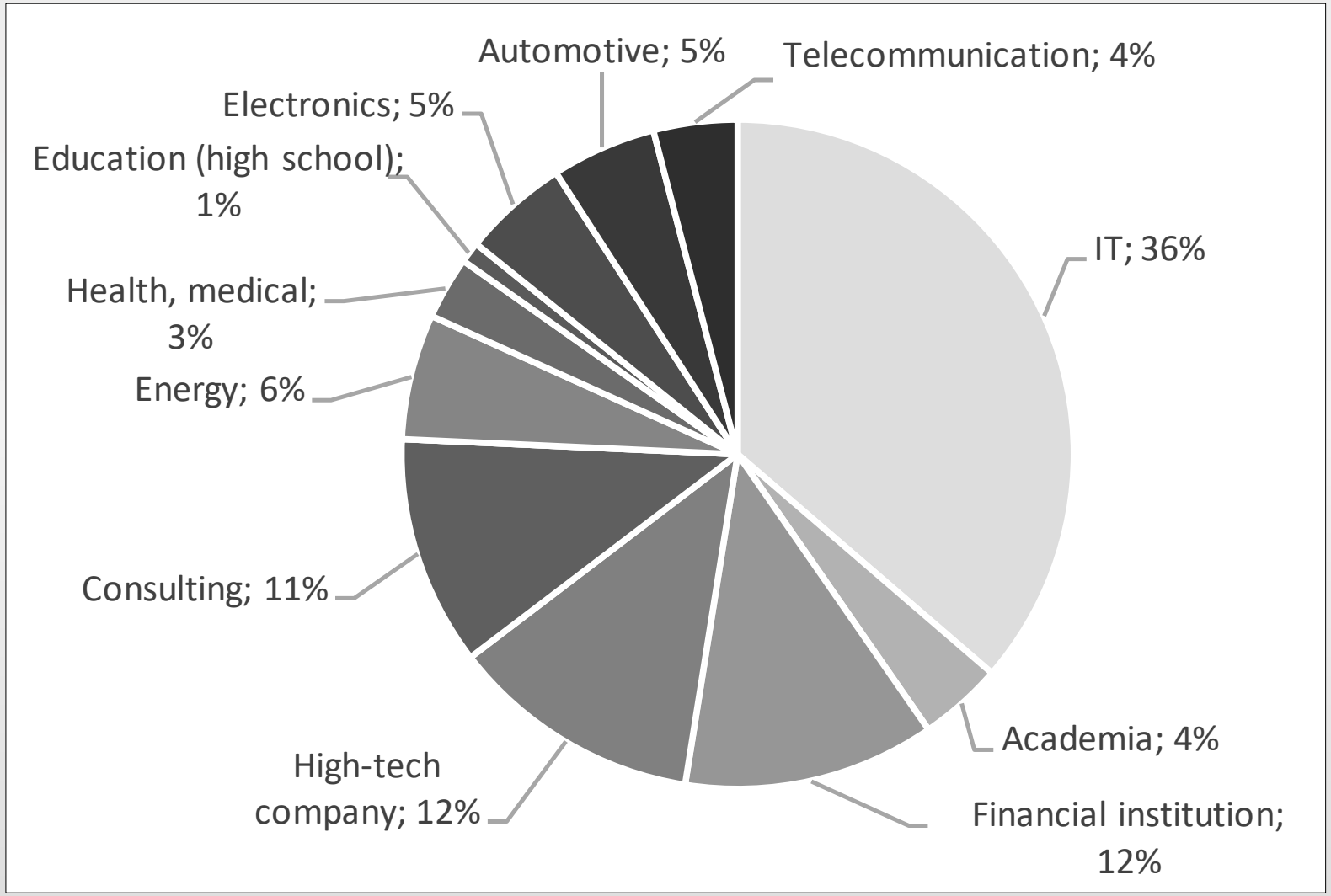
Benefits on employees: Human capital formation

Human capital formation benefits (H) are valued as **increased earnings (I)** gained by RI's students and **former employees (z)**, since the **moment (φ)** they leave the project, against **counterfactual scenario**.

$$H = \sum_{z=1}^{z} \sum_{t=\varphi}^{\mathcal{T}} s_t \cdot I_{zt}$$

APPROACH	DATA REQUIRED
Incremental lifelong salary	• Number of incoming young researchers by category (e.g. Master students, PhD students, fellows, postdoctoral researchers) • Probability distribution of different categories of students finding a job in identified possible sectors • Median gross annual salary for each of the identified professional sectors • Appropriate (e.g. logarithmic) function to estimate the continuous salary curve for each professional sector • 'Premium' salary

The Effects of Research Infrastructures on Human Capital



- Students and Postdoctoral Researchers
- Respondents of the CERN Alumni survey (2018), by current employment in private sector

- Out of the 2,859 respondents, many currently work in the private sector, specifically in engineering, consulting, information technology (IT), and other domains
- The respondents declared that they had acquired a variety of skills at CERN that they consider to be important in their current jobs (programming, working in international groups, data analysis, logical thinking, and communication)
- The more time they spent at CERN, the higher their satisfaction was with their current position and the larger and more diverse skills they acquired

Signaling and Human Capital Effects

$$\log w = \log w_0 + \gamma_1 NH + \gamma_2 EXP + \gamma_3 EXP^2 + e$$

γ_1, γ_2, γ_3: return parameters to be estimated

e: an error term

w: earnings

w_0: level of earnings of an individual with no education or experience (the intercept of the function)

NH: Number of years of schooling

EXP: Number of years of potential labor market experience

Average return on tertiary education (%)

Country	Harmon, Oosterbeek, and Walker (2003), 1995	Blöndal, Field, and Girouard (2002), 1999–2000	Boarini and Strauss (2007), 2001
Austria	6.8	–	6.4
Denmark	5.6	11.3	9.1
Finland	8.7	–	7.8
France	7.8	14.8	9.0
Germany	8.8	8.7	6.3
Ireland	11.3	–	13.1
Italy	6.9	6.5	5.1
Netherlands	5.7	12.3	6.2
Portugal	9.7	–	12.2
Spain	7.8	–	5.7
United Kingdom	10.4	16.1	12.0

Expected present value of human capital

- The expected present value of human capital accumulation benefits, $\mathbb{E}(HC)$, can be defined as the sum of the expected increasing earnings, $\mathbb{E}(Dw_{zt})$, gained by the RI students and young scientists and commonly indexed by z, from the moment (at time φ) they leave the RI
- s_t is the discount factor at year t

$$\mathbb{E}(HC) = \sum_{z=1}^{Z} \sum_{t=\varphi}^{T} s_t \cdot \mathbb{E}(Dw_{zt})$$

Experiential Learning in High-Energy Physics (1)

- *expwz*: dependent variable, measuring the range of salary expectations and taking integer values from 1 to F

exact but unobserved dependent variable

$$expw_z^* = X_z\delta + \varepsilon_z$$

- X_z is a vector of independent variables, aimed at explaining the range of salary expectations
- δ is the vector of regression coefficients we wish to estimate
- ε_z is the random disturbance term that follows a logistic distribution

Experiential Learning in High-Energy Physics (2)

- *expw*$_z$ rules:

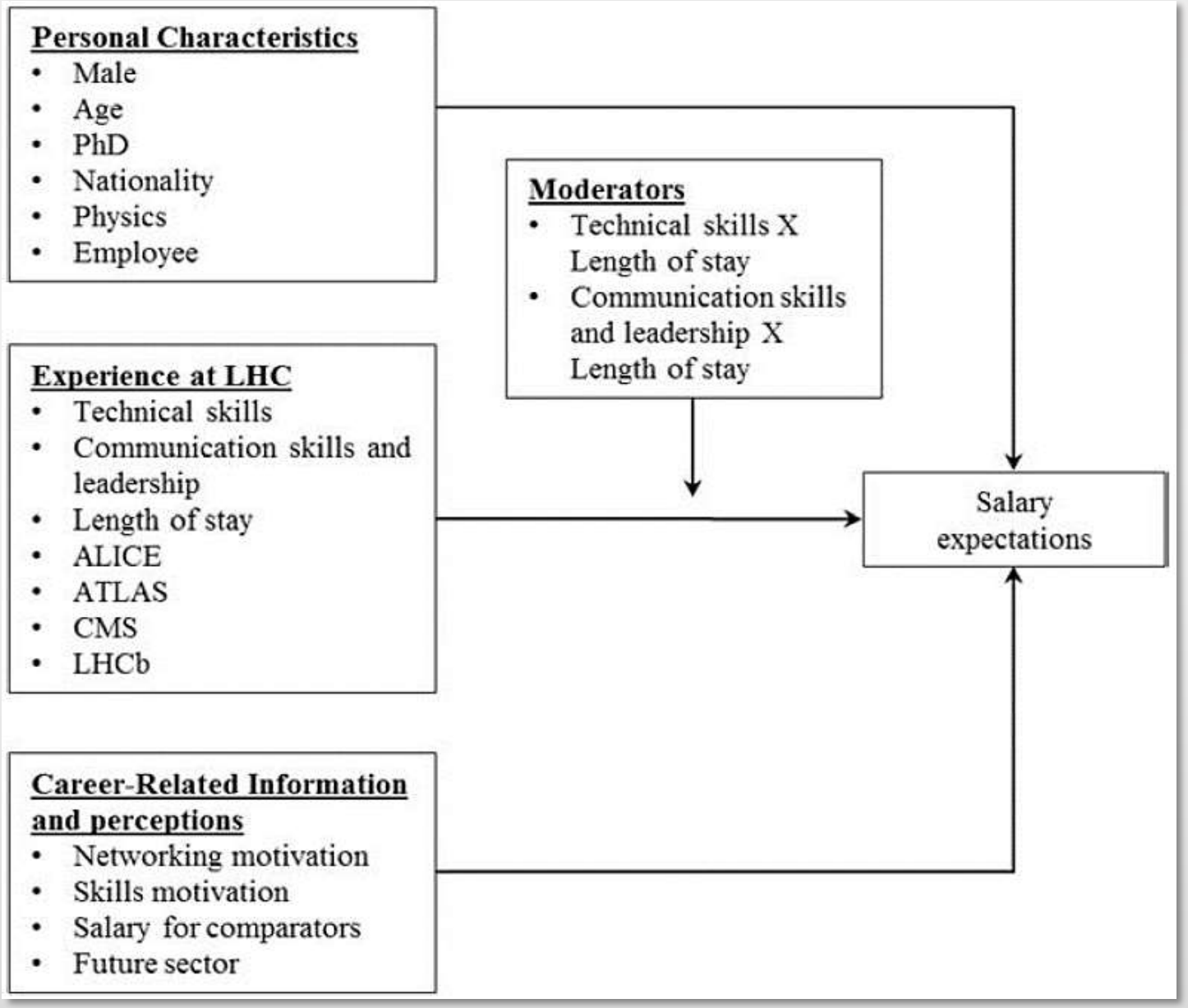
$$
\begin{aligned}
expw_z &= 1 \ if \ \ expw_z^* \le \tau_1 \\
expw_z &= f \ \ if \ \ \tau_{j-1} < expw_z^* \le \tau_j \ f = 2,\ldots, F-1, \\
expw_z &= F \ \ if \ \ \tau_{J-1} < expw_z^* < \infty
\end{aligned}
$$

- where $\tau_1 \le \tau_2 \le \ldots \le \tau_{f-1}$ are unknown thresholds (cut points) to be estimated.
- The conditional distribution of expw$_z$, given X$_z$, is expressed by:

$$
\Pr(expw_z = f \,|X_z) = \Lambda(\tau_f - X_z\beta) - \Lambda(\tau_{f-1} - X_z\delta)
$$

- where Λ (.) denotes the logistic cumulative distribution function

Conceptual model of salary expectations



Ordered logistic estimates of end-career salary expectation

	(1)		(2)		(3)		(4)		(5)	
Variables	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**
Experience at LHC										
Technical skills	0.103*	(0.062)			0.110*	(0.061)	0.004	(0.145)	0.135	(0.134)
Length of stay			0.009*	(0.005)	0.009*	(0.005)	0.011**	(0.005)	0.017**	(0.007)
Technical skills X Length of stay							0.004**	(0.002)	0.004**	(0.002)
Personal Characteristics										
Employee	0.814***	(0.282)	0.455	(0.346)	0.493	(0.352)	0.500	(0.354)	0.444	(0.409)
Male									0.946***	(0.349)
Age									-0.035	(0.043)
PhD									2.653***	(0.924)
Physics									-0.294	(0.449)
Career-related information										
Networking motivation									-0.098	(0.157)
Skill motivation									0.272	(0.239)
Salary for comparators									0.342***	(0.130)
Future sector									0.495***	(0.155)
Nationality-specific effects	Yes		Yes		Yes		Yes		Yes	
Experiments-specific effects	Yes		Yes		Yes		Yes		Yes	
Interview-specific effects	Yes		Yes		Yes		Yes		Yes	
Observations	318		318		318		318		318	
McFadden's R2	0.036		0.035		0.043		0.050		0.159	
Log Likelihood	-254.3		-240.8		-237.4		-235.9		-172.8	
Likelihood ratio test	16.87		17.99		19.17		22.75		52.20	
Proportional odds hp test (p-value)	0.291		0.276		0.227		0.205		0.182	