

Educational Investment and Labor Market Outcomes: A Microeconomic Perspective on Skill Transformation

ABSTRACT

This study examines how investment in education and skills development affects labor market outcomes, including employment status, income, job type, and job satisfaction, by looking at age and domicile among educated individuals in Central Java. Previous studies have focused on national employment shocks without looking at the interaction of skills education at the individual level, as well as limited scope analysis and not integrating demographic moderators. Therefore, this study examines how demographic factors such as gender, age, and place of residence moderate these relationships. This is a quantitative study using a descriptive-inferential approach. This study adopts a microeconomic perspective to understand individual-level variations in the education-to-employment pathway. This research was conducted in Central Java Province, Indonesia, from July to October 2025. This region was chosen because of its diverse socioeconomic conditions and high rate of educated unemployment. Using random sampling, data were collected from 400 respondents aged 18-45 years who had completed upper secondary education, resided in Central Java, and had work experience. Data collection tools included structured questionnaires and semi-structured interviews. This study applied multiple linear regression analysis using SmartPLS to test the direct and moderating effects between variables.

The results showed that educational investment had a significant impact on monthly income, formal job placement, and job suitability, although it did not significantly affect job satisfaction. Conversely, skill transformation, particularly in digital and soft skills, showed a more substantial and consistent influence across labor market outcomes. Demographic factors, particularly gender and urban-rural location, significantly moderated these relationships, indicating structural inequalities in access and impact.

Keywords: Educational Investment, Skill Transformation, Labor Market Outcomes, Job Relevance, Demographic Factors

1. INTRODUCTION

Human capital development is a key pillar for sustainable economic growth, particularly in developing regions. Among its critical components, educational investment plays a transformative role in shaping workforce quality and productivity. Grounded in human capital theory, education is framed not just as a

social good but as a long-term economic investment. (Baswedan et al., 2025) emphasized that returns to education, both social and private, remain significant across global economies, particularly in labor-driven markets. More recently, (Pritadrajati, 2022) reaffirm that well-targeted educational investments

33 contribute significantly to individual
34 income growth and national productivity,
35 primarily when supported by equitable
36 access.

37 Several studies show that each additional
38 year of education is associated with
39 income growth. For instance, (Forum,
40 2020) highlights that in lower-middle-
41 income countries, an extra year of
42 schooling may increase individual
43 earnings by approximately 10% on
44 average. (Ariansyah et al., 2024)
45 confirmed that the rate of return on
46 tertiary education continues to grow
47 globally, despite rising levels of degree
48 saturation. However, these returns are not
49 uniform across regions, as local
50 educational quality, labor market
51 structures, and economic sectors
52 influence the conversion of education into
53 income. The heterogeneity of these
54 effects has not been adequately captured
55 in Indonesia's subnational labor data.

56 In Central Java Province (Jawa Tengah),
57 one of the most populous regions in
58 Indonesia, with over 36 million
59 residents (Putranto et al., 2024), education
60 and employment outcomes display a
61 complex relationship. Although the gross
62 enrollment ratio in secondary and tertiary
63 education has increased, the open
64 unemployment rate among educated
65 youth remains relatively high, at 5.55% in
66 2023. Interestingly, BPS also reports that
67 graduates of vocational high schools
68 (SMK) face higher unemployment rates
69 (8.18%) than general high school
70 graduates, indicating a mismatch between
71 educational output and market needs.
72 This issue mirrors similar trends found in
73 Vietnam and the Philippines, where
74 technical and vocational education fails to
75 align with labor demands (Mustajab,
76 2023).

77 These statistics illustrate a critical
78 problem in the region: skill mismatch.
79 (Findeisen, 2024) define this as the
80 growing gap between the skills offered by
81 educational institutions and those
82 demanded by employers. In Central Java,
83 the persistence of educated
84 unemployment suggests that formal
85 qualifications alone are insufficient to

86 secure employment, particularly in a labor
87 market being restructured by technology,
88 automation, and platform-based work.
89 (Roson, 2022) Highlight that the mismatch
90 is highest in lower-income regions, where
91 labor markets lack mechanisms for
92 validating skills beyond formal degrees.

93 (Karantali & Panagiotidis, 2025) This
94 brings attention to the concept of skill
95 transformation, the process through which
96 individuals acquire adaptive, soft, and
97 digital competencies to remain
98 competitive. (Ugobueze, 2025) argue that
99 academic-to-vocational transitions are
100 increasingly crucial in digital economies.
101 Similarly, a report by the World Economic
102 Forum (2023) ranked problem-solving,
103 digital literacy, and teamwork as essential
104 competencies in the post-pandemic labor
105 market. Yet, in Central Java, adult
106 participation in non-formal skill training
107 remains limited, and the infrastructure for
108 lifelong learning, such as community-
109 based technical education or micro-
110 credentialing systems, is underdeveloped
111 (Paramole, 2024).

112 The gap between formal education and
113 actual employability underscores the
114 importance of integrating skill
115 transformation into the broader framework
116 of educational investment (Fajri et al.,
117 2022). (Deming & Silliman, 2024)
118 Advocate for responsive education
119 systems that adapt to rapid industrial and
120 technological shifts. In Central Java,
121 where a significant portion of the labor
122 force is absorbed in agriculture and
123 informal sectors, upskilling for digital
124 readiness remains an uphill challenge.
125 (Elert et al., 2015) point out that despite
126 national policies promoting Industry 4.0
127 readiness, regional disparities in digital
128 training access persist across Indonesia.
129 Prior research in Indonesia has
130 predominantly focused on national-level
131 statistics or urban labor centers, often
132 neglecting microeconomic variation at the
133 provincial level (Systems & Zurich, n.d.).
134 For instance, (No et al., 2025) examine
135 national employment shocks but do not
136 address how education and skills interact
137 at the household or individual level.
138 Studies in Java that adopt a micro-

139 lens(Ode et al., 2025), such as (Liliam et
140 al., n.d.), remain limited in scope and fail
141 to incorporate demographic moderators,
142 such as gender, age, and urban-rural
143 disparities. This study, therefore,
144 addresses a significant empirical gap in
145 Indonesian labor economics.

146 Hence, this research aims to explore how
147 educational investment and skill
148 transformation affect labor-market
149 outcomes, including employment status,
150 income, and job relevance, among
151 educated individuals in Central Java. It
152 also examines how demographic
153 variables such as gender, age, and place
154 of residence moderate these
155 relationships. The study applies a
156 microeconomic perspective to understand
157 how individual decision-making on
158 education and skills translates into
159 economic returns within a region-specific
160 context.

161 The findings are expected to provide
162 contextualized, evidence-based
163 recommendations for policymakers,
164 educational institutions, and local
165 governments by elucidating how
166 educational pathways and skill acquisition
167 shape labor market entry and
168 progression, especially in an increasingly
169 digitized economy like Central Java. This
170 study contributes to the development of
171 adaptive, inclusive, and regionally
172 responsive education-to-employment
173 strategies.

174 **Education and Income**

175 A study by the World Economic Forum
176 (2020) states that each additional year of
177 education can increase income by up to
178 10%. Ariansyah et al. (2024) also
179 emphasize that the rate of return on
180 investment in higher education remains
181 high globally, despite degree saturation.
182 However, the magnitude of the return on
183 education depends heavily on local
184 quality and labor market needs.

230 **2.1 Research Location and Time**

231 This study was conducted in Central Java
232 Province, Indonesia, a region
233 characterized by diverse socio-economic
234 conditions and varying educational and
235 employment profiles. The research period
236 spanned from July to October 2025.

185 **Skill Mismatch**

186 In Central Java Province, there is a
187 phenomenon of educated unemployment,
188 which indicates a mismatch between
189 educational output and labor market
190 needs (Putranto et al., 2024; Mustajab,
191 2023). The concept of skill mismatch is
192 described by Findeisen (2024) as the gap
193 between graduate skills and actual job
194 demand, especially in low-income and
195 highly informal regions.

196 **Skill Transformation**

197 Skill transformation includes digital
198 mastery, soft skills, and adaptation to new
199 technologies (Karantali & Panagiotidis,
200 2025). Ugobueze (2025) and the World
201 Economic Forum (2023) report
202 emphasize that 21st-century skills such
203 as digital literacy, problem-solving, and
204 teamwork are key in the digital economy.
205 Unfortunately, access to non-formal
206 training is still limited in regions such as
207 Central Java (Paramole, 2024).

208 **Demographic Disparities**

209 UNESCO (2023) notes that the digital
210 learning ecosystem is more concentrated
211 in urban areas, leaving rural areas behind
212 in terms of access. This is reinforced by
213 data in this study, which shows that
214 gender and location of residence
215 moderate educational outcomes and skills
216 for employment.

217 **Research Gap**

218 Previous research has largely focused on
219 national statistics or large urban areas,
220 without examining microeconomic
221 variations at the provincial level and the
222 interactions between education, skills,
223 and demographic factors (No et al., 2025;
224 Ode et al., 2025). This study closes that
225 gap with a microeconomic approach and
226 demographic variable moderation
227 analysis.

229 **2. MATERIAL AND METHODS**

237

238 **2.2 Research Type and Approach**

239 This research adopted a quantitative
240 method with a descriptive-inferential
241 approach. The goal was to analyze the
242 statistical relationship between
243 educational investment, skill

244 transformation, and labor market
 245 outcomes, while also examining how
 246 socio-demographic factors may moderate
 247 these relationships.

248

249 **2.3 Population and Sample**

250 The population targeted in this study
 251 comprised working-age individuals (18-45
 252 years old) residing in Central Java who
 253 had completed at least secondary or
 254 tertiary education. The sampling
 255 technique used was stratified random
 256 sampling, ensuring representation across
 257 education levels and employment
 258 categories. A sample size of 400
 259 respondents was determined to ensure
 260 statistical validity and generalizability of
 261 the results.

262

263 **2.4 Research Variables and
 264 Operational Definitions**

265 The variables and their indicators are
 266 summarized in Table 1.

267

268 **2.5 Data Collection Techniques**

269 Data were gathered through two main
 270 instruments:

295

296

297

271 Structured questionnaires: Distributed
 272 through both online (Google Forms) and
 273 offline (paper-based) formats, covering all
 274 variable indicators. Semi-structured
 275 interviews: Conducted with a selected
 276 sub-sample to capture contextual factors
 277 affecting skill transformation and
 278 employment quality.

279 **2.6 Instrument Testing**

280 To ensure the reliability and validity of the
 281 research instruments:

282 Validity testing was conducted using
 283 Pearson's Product-Moment Correlation,
 284 where items with a correlation coefficient
 285 ($r > 0.30$) were considered valid.
 286 Reliability testing used Cronbach's Alpha,
 287 with $\alpha \geq 0.70$ indicating an acceptable
 288 level of internal consistency.

289 **2.7 Data Analysis**

290 Data were analyzed using multiple linear
 291 regression with the aid of Smart PLS
 292 software to test the partial and
 293 simultaneous effects of the independent
 294 variables on teacher performance.

Table 1. Research variables and indicators

Variable Type	Variable Name	Indicators	Scale
Independent Variable	Educational Investment (X_1)	- Years of formal education - Total education cost - Highest qualification	Ratio / Ordinal
Independent Variable	Skill Transformation (X_2)	- Number of training programs - Mastery of digital skills - Soft skills (communication, teamwork, adaptability) - Skill-job match	Ordinal
Dependent Variable	Labor Market Outcomes (Y)	- Employment status (formal/informal) - Monthly income - Job type (aligned with education) - Job satisfaction	Ratio / Ordinal / Nominal
Moderating Variable	Demographic Factors (Z)	- Gender - Age - Residential location (Urban/Rural)	Nominal / Ratio

298

299 **3. RESULTS AND DISCUSSION**

300 **3.1 Research Result**

301 **3.1.1 Respondent Overview**

302 This study used random sampling
 303 techniques, with data collected from 400
 304 respondents aged 18-45 years who had

305 completed high school education, resided
 306 in Central Java, and had work experience.

307 **3.1.2 Descriptive Statistics of
 308 Research Variables**

309 This study uses four variables, namely
 310 educational investment (X_1), Skill
 311 Transformation (X_2), Demographic

312 Factors (Z), and Labor Market Outcomes 313 (Y).
 314

315 **Tabel 2. Outer Loading**

Konstruk	Indikator	Outer Loading	T-Statistics	P-Value
X1 Pendidikan)	(Investasi Tahun Pendidikan Formal	0.847	12.456	0.0
X1 Pendidikan)	(Investasi Tingkat Pendidikan Terakhir	0.756	9.834	0.0
X1 Pendidikan)	(Investasi Pengeluaran Pendidikan	0.728	8.923	0.0
X2 (Transformasi Skill)	Pelatihan Digital	0.882	14.237	0.0
X2 (Transformasi Skill)	Soft Skills	0.812	11.562	0.0
X2 (Transformasi Skill)	Relevansi Training	0.751	9.128	0.0
Z (Demografis)	Jenis Kelamin	0.795	10.892	0.0
Z (Demografis)	Lokasi Tempat Tinggal	0.681	7.346	0.0
Z (Demografis)	Usia Produktif	0.814	11.234	0.0
Y (Hasil Pasar Kerja)	Pendapatan Bulanan	0.876	15.123	0.0
Y (Hasil Pasar Kerja)	Penempatan Kerja Formal	0.827	12.876	0.0
Y (Hasil Pasar Kerja)	Kepuasan Kerja	0.789	10.456	0.0

316

317 **3.1.3 Hypothesis Test Result**

318 **Tabel 3. Bootstrap Path Coefficients**

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
Educational Investment (X1) → Labor Market Outcomes (Y)	0.32	0.325	0.066	4.875	0.0
Skill Transformation (X2) → Labor Market Outcomes (Y)	0.45	0.452	0.072	6.234	0.0
Demographic Factors (Z) → Educational Investment (X1) → Labor Market Outcomes (Y)	0.145	0.148	0.069	2.103	0.036
Demographic Factors (Z) → Skill Transformation (X2) → Labor Market Outcomes (Y)	0.287	0.289	0.063	4.562	0.0

319

320 **3.1.4 Interpretation of Hypothesis Test**
 321 **Result**

322 **Educational Investment (X₁) → Labor**
 323 **Market Outcomes (Y)**

324 Result: Significant ($p < 0.05$); $\beta = 0.32$

325 Interpretation: Educational investment
 326 exerts a positive and statistically
 327 significant influence on labor market
 328 outcomes. Each additional year of
 329 schooling or higher educational
 330 attainment is associated with improved
 331 monthly income, greater likelihood of

332 formal job placement, and better job–
333 education alignment.

334 **Skill Transformation (X_2) → Labor** 335 **Market Outcomes (Y)**

336 Result: Highly Significant ($p < 0.01$); $\beta =$
337 0.45

338 Interpretation: Skill transformation
339 demonstrates the strongest effect among
340 all predictors. Respondents who actively
341 engaged in non-formal training—
342 particularly in *digital literacy* and *soft*
343 *skills*—reported higher earnings,
344 improved job relevance, and greater job
345 satisfaction. This supports the (World
346 Economic Forum, 2023) report
347 emphasizing adaptive skills as key
348 determinants of employability in the digital
349 economy. The result suggests that in
350 dynamic labor markets, continuous skill
351 enhancement has become a more
352 immediate driver of employment success
353 than traditional educational credentials.

354 **Moderating Effect of Demographic** 355 **Factors (Z) on the Relationship** 356 **between Educational Investment (X_1)** 357 **and Labor Market Outcomes (Y)**

358 Result: Partially Significant ($p < 0.05$ for
359 gender and location)

360 Interpretation: Demographic variables
361 such as gender and residential location
362 partially moderate the relationship
363 between education and labor outcomes.
364 The positive impact of higher education is
365 more pronounced among males in urban
366 areas than among females in rural
367 regions. This disparity reflects structural
368 inequalities in access, quality, and labor
369 market valuation of education. It also
370 resonates with global findings on
371 gendered returns to education in
372 developing economies.

373 **Moderating Effect of Demographic** 374 **Factors (Z) on the Relationship** 375 **between Skill Transformation (X_2) and** 376 **Labor Market Outcomes (Y)**

377 Result: Significant ($p < 0.01$ for all
378 moderators)

379 Interpretation: The moderating role of
380 demographics is more consistent in the

381 skill transformation model. The effects are
382 strongest among younger, productive-age
383 respondents (25–35 years) and those
384 living in urban areas. This indicates that
385 digital and soft-skill training programs
386 have not yet achieved equitable reach or
387 effectiveness across all demographic
388 segments. Rural participants and older
389 respondents report lower perceived
390 benefits, suggesting gaps in training
391 accessibility and adaptability.

392 **3.3 Discussion**

393 The results provide substantial empirical
394 support for the human capital framework.
395 Investment continues to yield measurable
396 labor market advantages, and the findings
397 reveal that skill transformation now serves
398 as a more dynamic and responsive
399 predictor of labor success in the digital
400 age. This shift indicates that static
401 academic credentials are increasingly
402 being supplanted by *transferable*
403 *competencies*, particularly digital
404 proficiency, communication, and problem-
405 solving skills, as core drivers of
406 employability.

407 Furthermore, the significant moderating
408 effects of demographic factors underscore
409 the persistence of inequality in
410 educational and skill-based opportunities.
411 The gender gap in returns to education
412 and the rural–urban divide in skill access
413 reflect both socio-economic and
414 infrastructural disparities. Digital learning
415 ecosystems remain concentrated in urban
416 centers, leaving peripheral regions
417 underserved. This imbalance may hinder
418 inclusive economic participation and
419 widen income inequality if not addressed
420 through policy reform.

421 The study’s evidence also suggests that
422 non-formal education and skill training
423 programs, when aligned with local labor
424 market demands, can bridge structural
425 gaps that formal education alone cannot.
426 Policymakers should thus prioritize
427 flexible, regionally adaptive education
428 frameworks integrating both formal and
429 informal learning pathways. Such
430 integration will enhance workforce agility,
431 reduce structural unemployment, and

432 promote inclusive labor participation,
433 particularly among marginalized groups.

434 In summary, while education remains
435 foundational, the synergy between
436 educational investment and continuous
437 skill transformation determines labor
438 market competitiveness in the digital era.
439 Equitable access to skill development
440 opportunities across gender, geography,
441 and socio-economic strata should
442 therefore become a central agenda in
443 Indonesia's human capital policy.

444 **4. CONCLUSION**

445
446 This study examined the influence of
447 educational investment and skill
448 transformation on labor market outcomes
449 in Central Java Province, Indonesia, while
450 considering demographic factors as
451 moderating variables. Based on data
452 analysis from 400 respondents of
453 productive age, several key conclusions
454 emerged:

455 Educational investment exerts a positive
456 and significant effect on labor market
457 outcomes, particularly in enhancing
458 monthly earnings, formal employment
459 status, and the alignment between
460 educational background and job type.
461 This finding reinforces the principles of
462 Human Capital Theory, confirming that
463 education remains an essential and
464 valuable economic asset.

465 Skill transformation demonstrates a
466 stronger impact than formal education
467 across all indicators of labor market
468 success. Mastery of digital competencies,
469 soft skills, and participation in non-formal
470 training programs substantially contribute
471 to higher productivity levels and greater
472 job satisfaction.

473 Demographic factors, including gender,
474 age, and residential location, significantly
475 moderate the relationships between
476 education, skills, and labor outcomes.
477 Disparities in training access and
478 educational quality in rural areas, as well
479 as gender gaps in employment results,
480 highlight the need for more inclusive and
481 equitable policy interventions.

482 The mismatch between educational
483 output and labor market demand remains
484 a major challenge. The relatively high
485 unemployment rate among vocational
486 school (SMK) graduates indicates a
487 persistent skills mismatch, underscoring
488 the importance of curriculum reform and
489 stronger industry–education partnerships
490 to align competencies with market needs.

491 **DISCLAIMER (ARTIFICIAL** 492 **INTELLIGENCE)**

493 Author(s) hereby declare that NO
494 generative AI technologies such as Large
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530
531 Authors have declared that no competing
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