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Returns to Work Experience in Formal and Informal Sector: Learning from Indonesian Labor Market
Nirbita Olga Ramadhanti, Gumilang Aryo Sahadewo, S.E., M.A., Ph.D.
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RETURNS TO WORK EXPERIENCE IN FORMAL AND INFORMAL SECTOR: LEARNING FROM INDONESIAN LABOR MARKET

Undergraduate Thesis

In Fulfilling Partial Requirement for the Completion of a Bachelor's Degree in Economics

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FACULTY OF ECONOMICS AND BUSINESS

UNIVERSITAS GADJAH MADA

2026

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RETURNS TO WORK EXPERIENCE IN FORMAL AND INFORMAL SECTOR:

LEARNING FROM INDONESIAN LABOR MARKET

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ABSTRACT

Work experience is one of the main sources of wage growth. Although, how much it pays is not the same everywhere. General experience carries across jobs, while specific experience tied to an employer, occupation, industry, or sector. In developing economies, like Indonesia, a formal–informal sector divide defines the labor market. This study estimates returns to work experience separately for the two sectors, and tests whether those returns vary by education level. Using two waves of the Indonesia Family Life Survey (IFLS 4 and 5), it estimates an augmented Mincerian wage equation with five experience measures (potential experience, along with tenure on employer, occupation, industry, and sector) using both pooled OLS and individual fixed effects. In OLS, returns differ sharply by sector, where the formal premium concentrates in sector tenure and industry tenure, while informal returns are insignificant. Once individual fixed effects remove time-invariant ability, the sector gap becomes borderline significant, so most of the formal premium reflects selection into the sector rather than a real sector effect. Only formal sector tenure survives within person, at about 14.7 percent over seven years, and mostly among men. Education steepens the experience profile in the formal sector, and it holds up under fixed effects, with the tertiary-primary gap of +34.3 percentage points on sector tenure over seven years. The formal–informal difference in returns to experience looks real on the surface, but mostly about who works in each sector rather than where they work.

Keywords: *returns to work experience; informal sector; human capital; Mincer wage equation; individual fixed effects; labor market segmentation; Indonesia; IFLS*

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IMBAL HASIL PENGALAMAN KERJA DI SEKTOR FORMAL DAN INFORMAL: PEMBELAJARAN DARI PASAR TENAGA KERJA INDONESIA

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INTISARI

Pengalaman kerja merupakan salah satu sumber utama pertumbuhan upah. Meski begitu, besaran imbalnya tidak sama di setiap tempat. Pengalaman kerja umum dapat dibawa antarpekerjaan, sementara pengalaman spesifik melekat pada pemberi kerja, jenis pekerjaan, industri, atau sektor pekerjaan tertentu. Di negara berkembang seperti Indonesia, pasar tenaga kerja dibentuk oleh dikotomi sektor formal–informal. Penelitian ini mengestimasi imbal hasil pengalaman kerja secara terpisah untuk kedua sektor, sekaligus menguji apakah imbal hasil tersebut berbeda menurut tingkat pendidikan. Dengan menggunakan dua gelombang Indonesia Family Life Survey (IFLS 4 dan 5), penelitian ini mengestimasi persamaan upah Mincer yang diperluas dengan lima pengukuran pengalaman kerja (pengalaman potensial, beserta masa kerja pada pemberi kerja, jenis pekerjaan, industri, dan sektor) menggunakan pooled OLS dan fixed effects individu. Pada OLS, imbal hasil berbeda jauh antarsektor, di mana premi sektor formal terkonsentrasi pada masa kerja sektor dan masa kerja industri, sementara imbal hasil di sektor informal tidak signifikan. Setelah mengaplikasikan fixed effects individu, selisih antarsektor menjadi signifikan secara marginal, sehingga sebagian besar premi sektor formal sebenarnya mencerminkan seleksi ke dalam sektor, bukan efek sektor yang sesungguhnya. Hanya masa kerja sektor formal yang bertahan dalam individu yang sama, yaitu sekitar 14.7 persen selama tujuh tahun, dan sebagian besar berasal dari pekerja laki-laki. Pendidikan membuat profil pengalaman kerja di sektor formal semakin curam, dan hal ini tetap bertahan di bawah fixed effects, dengan selisih sebesar +34.3 poin persentase antara pekerja berpendidikan tinggi dan berpendidikan dasar selama tujuh tahun. Perbedaan imbal hasil pengalaman antara sektor formal dan informal terlihat nyata, tetapi sebenarnya lebih ditentukan oleh siapa yang bekerja di tiap sektor daripada di mana mereka bekerja.

Kata kunci: *imbal hasil pengalaman kerja; sektor informal; modal manusia; persamaan upah Mincer; fixed effects individu; segmentasi pasar tenaga kerja; Indonesia; IFLS*

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All the friends and mentors I have met throughout college. Thank you for your support and companion. Cheers to an even brighter and greater future ahead. Lastly, this thesis is not merely a completion requirement for an undergraduate degree. It was written at a time when the Indonesian labor market is being harsh to its workers, where stable jobs are hard to come by and years of work do not always pay. I hope this thesis can be a small contribution to understanding how experience is rewarded in Indonesia, and to whom, so that one day every worker's years of work truly count.

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CHAPTER 1: INTRODUCTION

1.1. Research Background

Work experience is one of the main sources of wage growth, but not for every worker, not in every job, not in every labor market setting. Human capital theory treats experience as an investment that workers keep building after school, so earnings rise with experience, but at a decreasing rate (Mincer, 1974; Becker, 1975). How much experience actually pays however, is not the same everywhere. Lagakos et al. (2018) compared eighteen countries and find that experience on wage profiles is about twice as steep in rich countries as in poor ones, and that more educated workers have steeper profiles. The returns also depend on the kind of experience and the kind of job. General experience is carried across jobs, while specific experience is tied to an employer, occupation, industry, or sector. A recurring finding shows that much of the cross-sectional tenure premium is selection, where abler and better-matched workers accumulate more tenure (Altonji & Shakotko, 1987; Altonji & Williams 1997; Kambourov & Manovskii, 2009; Dobbie et al., 2014). Segmented labor market theory goes further and argues that the same experience is rewarded in stable formal jobs but not in unstable informal ones (Doeringer & Piore, 1975; Piore, 2014).

Despite it being an important component in the determinant of wage profiles, work experience returns are less explored in the literature, especially in a developing economy setting, where the formal-informal sector divide defines the labor market.

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This research therefore takes up that question. Using the Indonesia Family Life Survey (IFLS), this study estimates the returns to work experience separately for the two sectors, involving individual fixed effects so that the return reflects wage growth within the same worker, rather than differences between workers.

This is especially relevant in Indonesia, where informal work is not a small margin but the larger part of the labor market. Roughly, Indonesia's total working population comprises 40% formal and 60% informal (Badan Pusat Statistik, 2026). Most Indonesian jobs are in low-productivity informal services, where productivity growth has come mostly from within sectors rather than from workers moving to better ones. The two sectors also pay differently. Santoso et al. (2022) find a formal–informal wage gap that is real but shrinking, still segmented for younger workers and more competitive for older ones. The closest study to this one, Marinescu & Triyana (2016), uses the Indonesia Family Life Survey (IFLS) and finds that formal-sector tenure is an important source of wage growth, with a ten-year return of about 35 percent, while informal-sector tenure pays nothing. On that note, Indonesia is exactly the kind of setting where a formal–informal difference in returns to experience should appear.

1.2. Research Objectives

This study pursues two objectives. First, it aims to estimate returns to work experience separately for formal and informal sectors in Indonesia. The estimation applies an augmented Mincerian wage equation with the IFLS panel data to measure how much wage rises with an additional year of experience, and whether that profile is

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concave. This study then sets two estimates side by side, comparing the return from differences between workers who happen to have more experience with that from variation within the same worker. Second, it tests whether the return to work experience varies by education level, within each sector. By interacting with experience in schooling, this study aims to see whether more educated workers gain more from each additional year of experience, and whether this pattern holds in both the informal sector and the formal one.

1.3. Research Questions

Specifically, this study aims to answer these questions:

1 Do returns to work experience vary between formal and informal labor markets?

2 For each sector, do workers with different educational levels receive different returns?

1.4 Scope and Limitations

Several limitations and issues will impact the quality of this study. First, the caveats of short panel data. Having only two waves (IFLS waves 4 and 5), the data follow workers over a single interval with only two wage observations, rather than a whole career. This structure also trims the sample on both ends, where the youngest respondents are dropped from IFLS4 because they have not started working yet, and the oldest are dropped from IFLS5 because they have already retired.

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Second, there are several selection bias arises from this study, and none can be removed completely. The first is selection into sector. Because the analysis separates workers to formal and informal subsamples, and workers are not randomly assigned to sectors, the split itself is built on a non random partrition, where abler workers may sort into formal jobs, so OLS estimates of sector returns mix workers' quality with sector effect. The second is selection into tenure. Good worker-employer matches will last longer, and tenure coefficients overstate the returns to staying with an employer (Altonji & Shakotko, 1987). The third is selection into the sample. Wages are observed only for those who work, with at least 500 annual work hours, and complete experience measures and controls; and for the fixed effects estimator, wage observation in both waves (no singletons). These requirements shape who qualifies. This is also not independent of the first, where the same unobserved traits that keep a worker in the estimation sample also influence which sector they sort into. The fourth is what remains after estimation (residuals). The fixed effects estimator only takes out fixed traits that are time invariant, but it cannot account for selection that does change over time.

Thirdly, potential experience and tenure measures are measured with error. Potential experience is used (age-schooling-6), thus overestimating real experience for workers whose careers were interrupted, which matters most for women who leave and re-enter the labor force. It treats all years out of school as equally productive, and does not fully represent general human capital accumulation. Similarly, IFLS does not have questions that ask tenure measures directly, so the tenure measures have to be

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constructed from a combination of responses. Lastly, like most retrospective papers that use survey data, they are prone to recall bias.

1.4. Organization of Study

The remainder of this research is structured as follows. *Chapter 2* reviews the theoretical and empirical literature on human capital, returns to work experience, and labor market segmentation, and states the research hypotheses. *Chapter 3* explains the research design, estimation methodology, data, and variable constructions. This includes all model specifications and subsample heterogeneity analysis. *Chapter 4* presents and discusses the results. From the summary statistics, main findings, to the illustration of results, and discuss what they mean for the formal-informal comparison and education interactions. Finally, *Chapter 5* concludes the research, recommends policy implications, and directions for future research.

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CHAPTER 2: LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Human Capital Theory

Human capital theory starts from a simple idea, that workers earn more because they invest in themselves. Schultz (1972) treats schooling, training, health, and information as investments whose main cost is foregone earnings, and argues that returns to these investments explain much of the growth in earnings and national income. Becker (1975) then introduces the idea to a formal model, where education and on-the-job training are investments made up to the point where the present value of their returns equals the cost. A worker accepts lower earnings while investing, either through tuition or through lower pay during training, and then earns more afterwards. The gap between the two is the rate of return. Becker (1992, 1994) restates this and connects it to growth and the family, and Schultz (1992) later extends it to a setting of cross-country growth.

Mincer (1974) turned the theory into an equation that this research uses as a baseline. He shows that when the only cost of schooling is foregone earnings, the log of earnings becomes linear with years of schooling. He also adds that post-schooling investment, which decreases as workers get older, produces an experience-earnings profile that increases at a decreasing rate. The result is a human capital earnings function where the log of earnings depends on education and quadratically on experience. Here, experience matters because it reflects the workplace investment that

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workers continue to build after school, and not just the passage of time. Mincer (1975) then extended this concept to the distribution of employment and income. Eventually, this function became a standard tool in labor economics.

However, these coefficients are not automatically rates of return. Heckman et al. (2003) introduce conditions under which the coefficient on education equals actual returns and show that this does not hold in modern data, where returns are nonlinear, and that education and experience interact. They also warn that Mincerian potential experience (age – schooling – 6) is highly overestimating experience, knowing that workers are likely to have career interruptions.

2.1.2 General and specific human capital, and the measurement of experience

Becker (1975) distinguished types of human capital. General human capital raises productivity at many employers and can be transferred; meanwhile, firm-specific human capital only raises productivity at the respective employer. In a competitive market, workers pay for general training and keep their return, because if a firm paid for it, they cannot stop the worker from leaving. On the other hand, the cost and return of specific training are shared, since sharing gives both sides reasons to keep the match going. Specific human capital is thus the source of rising wage-tenure and lower turnover. Kessler & Lülfesmann (2006) then found how both investments correlate. When a firm can also invest in specific skills, a relationship-specific rent appears, and bargaining over that rent can eventually lead a firm to pay for general training as well. And this is why in practice, employers do pay for general skills.

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This logic is what justifies the splitting of work experience into five measures. General human capital is represented by potential experience, whereas specific human capital is captured by employer tenure, occupational tenure, industry tenure, and sector tenure. Kambourov & Manovskii (2009) find that the relevant specific capital is mostly occupational rather than firm-specific. Dobbie et al. (2014) also agree and add that general experience is the most important type of labor market experience.

On the other hand, tenure itself is not exogenous. Altonji & Shakotko (1987) and Belzil (2007) point out the issue of ability bias, where OLS overstates the true causal return. Altonji and Shakotko (1987) show that part of the wage and seniority relationship is really about selection, where good matches tend to last longer, and that more able workers are the ones who accumulate tenure in the first place. Once tenure is instrumented, estimated returns drop substantially. Similarly, Belzil (2007) finds that in schooling, structural estimates of 4-7% fall well short of the 10-15% that instrumental variable studies have found.

2.1.3 Dual Labor Market and Theories of Informality

Segmented labor market theory denies that a single competitive market sets every wage. Doeringer & Piore (1975) and Piore (2014) define a primary sector (formal sector) of stable and well-paid jobs run through internal labor markets, where tenure and skill pay off, and advancement is possible. On the other side, the secondary sector (informal sector) offers unstable, low-paid, dead-end jobs that neither provide education nor experience. Access to primary jobs is rationed, so two workers of similar

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skill can end up with very different earnings, depending only on the sector they are in. Accordingly, Taubman and Wachter (1986) highlight the literature, noting that segmentation that divides workers does not match the differences in their skills.

This theory is therefore tested directly. Dickens and Lang (1985) modelled a switching regression estimation that lets their data assign workers to sectors (endogenous segmentation). They find two different wage regimes, and that earlier mixed results came from misclassifying workers by industry or occupation. On top of that, Sakamoto & Chen (1991) find that schooling is rewarded similarly in both sectors, but access to the primary sector is rationed through a queue. Meanwhile, Bentolila et al. (2019) argue that duality can be driven by regulation. Where the occurrence of strict protection for permanent contracts and cheap temporary contracts splits the labor market into protected and precarious jobs. So if Indonesia's labor market is segmented along formal and informal, returns to work experience should be concentrated in the formal sector and largely absent in the informal.

Nevertheless, whether the formal and informal gap is segmentation or sorting is itself debated. The dualistic theory views informality as exclusion where workers are kept out of good formal jobs. However, the same patterns can appear even without any barrier to entry. Amaral & Quintin (2006) build an estimation where labor markets are perfectly competitive, and yet formal workers are still more educated and better paid. The reason is that formal firms have better access to finance and operate with more

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capital, and since capital and skill are complementary, they demand more skilled labor. So in their account, formal premium is a composition and not a barrier.

Hence, Haanwinckel and Soares (2021) integrate these approaches, where informality is a margin chosen by different workers and firms. In their model, they weigh the costs of formality (payroll taxes and minimum wage) against benefits that workers partly value, and wage setting is imperfectly competitive. With Brazil as the country context, their models explain the large drop in informality from 2003 to 2012 as a joint result of rising minimum wages and rising education. Here, informality is neither pure exclusion nor pure choice, but an equilibrium outcome. This result matters as the differences in returns to experience across sectors are not always due to segmentation. It can be a selection of more able or better-matched workers into the formal sector.

2.2 Empirical Evidence

2.2.1 Returns to Experience over the life cycle and across education

How much experience pays and whether it pays more for educated workers varies across countries. Lagakos et al. (2018) compare eighteen countries with different development status, including Indonesia. They show that experience-wage profiles are roughly twice as steep in developed countries as in developing ones, and that more educated workers have steeper profiles, which accounts for about a third of the cross-country gap. This evidence sets the expectation of this research that returns to work

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experience in a developing country should be modest, and education should shape them.

Several studies have closely analyzed how education shapes this slope. Connolly & Gottschalk (2000) find that wage growth, within jobs and across job changes, increases with education, meaning that less educated workers gain less from each additional year of work. This essentially addresses a similar objective to this research. Brunello & Comi (2004) use cohort data from eleven European countries and find a steeper experience-earnings result for tertiary education workers, with the widest gap in countries where productivity grows fastest. Braga (2018) reaches a similar result using US panel data, showing that higher returns to experience are among more educated workers. Furthermore, Debowy et al. (2021) find returns to work experience differ across groups and peak after about three decades. Although they do note that those estimations are correlations rather than causal effects.

Once experience is split up, the question becomes which type of experience actually pays. Kambourov & Manovskii (2009) find that five years of occupational tenure raise wages by 12 to 20%, and that employer and industry tenure add little once occupational tenure is controlled. This is evidence that specific human capital is mainly occupational. Dobbie et al. (2014) estimate returns to general experience, employer tenure, and occupational tenure in Australian panel data. The result concludes that general experience and occupational tenure bring the returns, while employer tenure

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becomes small when unobserved heterogeneity is controlled for. In other words, much of the cross-sectional employer tenure premium is due to selection.

There are also findings for looking at this by sector. Rattso and Stokke (2020) use Norwegian register data and worker fixed effects, finding that experience accumulated in the private sector is worth more than in the public sector, and this gap widens over time. The implication for the formal-informal case is similar, where experience can be priced differently depending on where it is built up. Fixed effects are necessary so this difference is not simply picking up selection.

2.2.2 Formal-Informal Segmentation and Wage Differentials

Pratap and Quintin (2006) test for segmentation in Argentina with semiparametric matching, showing that formal premium disappears after matching similar workers and controlling for establishment size, which casts doubt on the dualistic view. On the contrary, Li and Gao (2023) find that returns to schooling are higher in formal employment and widen at the university (tertiary) level. Meanwhile, Cantillo et al. (2022) use a stated preference design in Colombia and find that informal workers do value formal job amenities, which is consistent with informality being partly a choice rather than purely exclusion.

Stratifying the estimation by sector rather than pooling is also done in previous studies. In Thailand, Wattanasaovaluk (2020) estimates returns to experience separately by occupation skill, and find them the largest in high-skilled work. On the

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other hand, Chacaltana & Moreno (2025) estimate returns to education separately by formal and informal status in Peru and report that higher education returns are mainly in formal employment. With segmentation in some settings and composition in others, the debate on this literature is still not completely resolved.

2.2.3 Evidence from Indonesia

The closest work to this research is by Marinescu & Triyana (2016), who use the Indonesia Family Life Survey (IFLS) in estimating sources of wage growth. Unlike in the United States, they find that returns to employer tenure exceed returns to general experience (substituted by potential experience), with a ten-year return to employer tenure about 24%. They also report that formal sector tenure roughly generates 35% over ten years, while informal sector tenure is insignificant. Their finding that returns to general experience are lower than in the United States also fits the cross-country pattern of Lagakos et al. (2018), where experience pays less in poorer economies. To situate the setting even more, Santoso et al. (2022) decompose the formal and informal wage gap using national labor force data (Sakernas), and find it segmented for younger cohorts and more competitive for older ones, with education as the driver. Mulyaningsih et al. (2021) using IFLS, estimate a return to a year of schooling of about eight percent and show that the relationship is nonlinear, meaning that the actual return changes depend on which year of schooling that is added. Moreover, Gil Sander & Yoong (2020) report that most Indonesian jobs are in low-productivity informal services. They argue that productivity growth come mostly from within sectors, rather

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than from workers moving to better ones, and that on-the-job training raises the return to experience. Lastly, Allen (2016) adds a descriptive account of informality, short-term contracting, and segmentation in the Indonesian labor market. She documents weak job growth and high labor underutilization, with worse outcomes for youth, women, and rural workers, which points to a segmented market.

2.3 Research Gap

Preceding literature on returns to work experience mainly comes from developed countries. Dobbie et al. (2014) use Australian panel data, and Kambourov & Manovskii (2009) use the United States, where in both settings almost all work is formal. Developing nations, on the other hand, are different. Their labor markets are divided, and the bigger share of workers is within the informal sector. Hence, the return to experience may not work the same way. But yet, returns to work experience in these settings are still understudied, which leaves the developing country case open to be explored.

On top of that, where the formal and informal sectors are compared, the focus has mostly been on the wage gap or on returns to schooling, rather than returns to work experience. Pratap and Quintin (2006), Li and Gao (2023), and Santoso et al. (2022) all study the formal-informal divide, but through wages or education, not experience profile. Moreover, returns to work experience are also rarely broken into general and specific components. Therefore this study does both, estimating the returns by disaggregating the measures to general experience and specific tenures (employer,

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occupational, industry, and sector), constructed from a combination of questionnaires in the panel survey.

Furthermore, whether the gap between the two sectors reflects segmentation—informal workers are kept out of formal returns—or selection, where more able and better-matched workers sort into the sectors, is still unresolved. Many of the existing findings are cross-sectional, so it cannot separate the two. Thus, this study's panel data with individual fixed effects can take out time-invariant ability, and attempt to reach a conclusion over this underlying debate.

The closest work to this research is the one by Marinescu & Triyana (2016), which also uses IFLS and finds that formal sector tenure is an important source of wage growth, while informal sector tenure is not. Even so, they do not test whether the returns to work experience in each sector vary by education levels. In addition, they rely on the earlier waves, IFLS waves 1 to 4. This study essentially extends Marinescu & Triyana's (2016) work by adding the education dimension, using the most recent waves (IFLS 4 and 5), and estimating within person.

2.4 Research Hypotheses

According to the research questions, hypotheses are constructed as the follows:

1. Hypothesis 1

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Null hypothesis: returns to work experience do not vary between formal and informal labor markets.

Alternative hypothesis: returns to work experience vary between formal and informal labor markets.

2. Hypothesis 2

   Null hypothesis: workers with different educational levels do not receive different returns in each segment.

   Alternative hypothesis: workers with different educational levels receive different returns in each segment.

2.5 Conceptual Framework

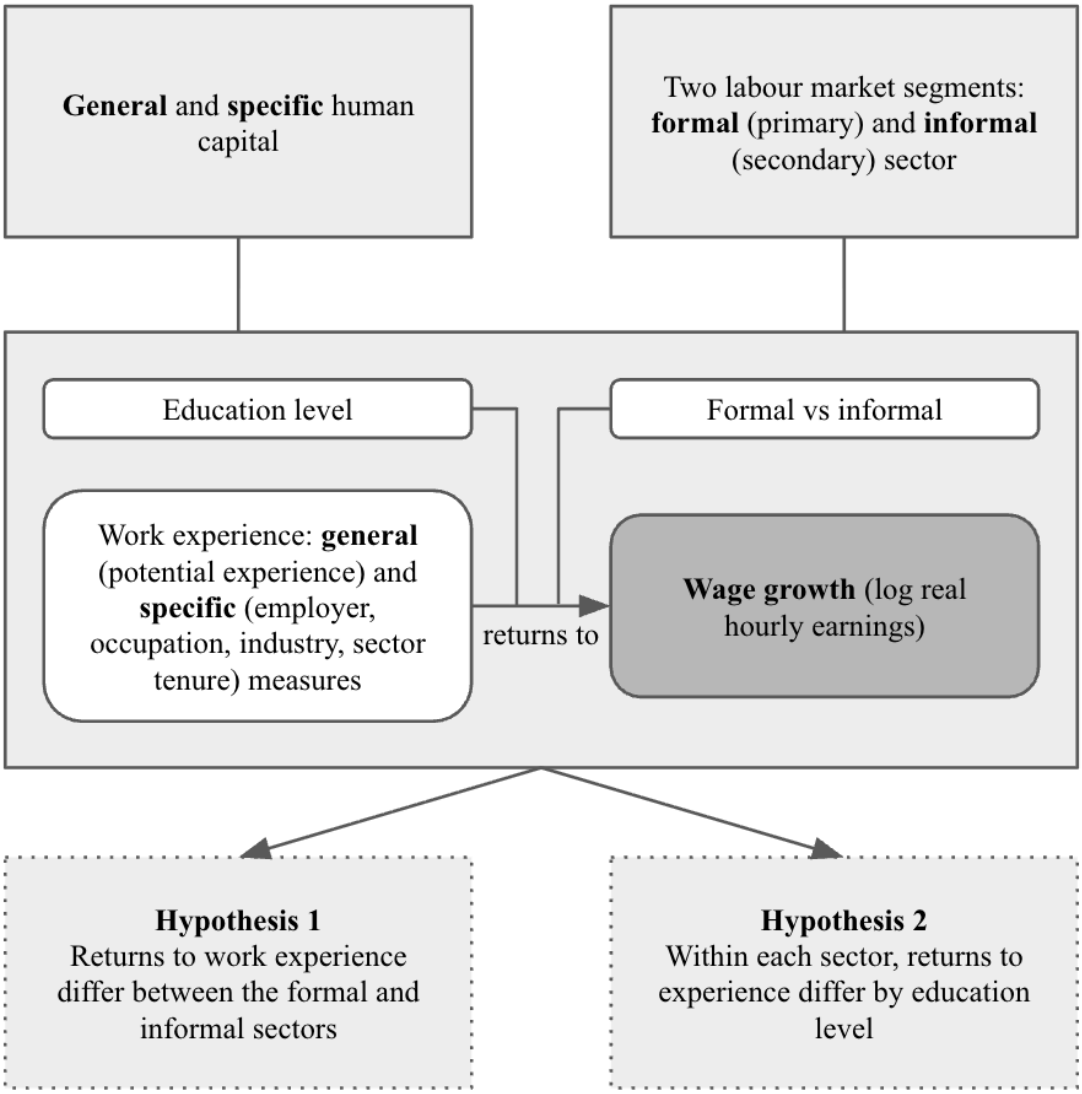
Figure 2.1 connects the theories to the research hypotheses. The human capital theory explains why work experience raises wages, while the segmented labor market theory explains why the same experience may not pay the same across jobs. In the model, work experience drives wage growth. Experience is then split into five measures: potential experience for general human capital, and employer, occupational, industry, and sector tenure for the specific kind, where each has its own return. However, two things can change the size of that return. The first is sector. Hypothesis 1 asks whether returns to experience differ between the formal and informal sectors. Segmentation theory predicts they do vary, the formal sector rewarding experience through internal labor markets while the informal sector does not. The second is

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education. Hypothesis 2 asks whether returns to experience differ by education level within each sector.

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Figure 2.1: Conceptual Framework



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CHAPTER 3: METHODOLOGY AND DATA

3.1 Research Design

This study's main purpose is to estimate returns to work experience in Indonesia's formal and informal labor markets and test whether these returns vary systematically across education levels. The benchmark estimation is derived from the Mincer earnings framework (Mincer, 1974), followed by specific experience extensions used by Dobbie et al. (2014) and Marinescu & Triyana (2016). In this study, work experience is then disaggregated into five measures: potential experience, employer tenure, occupation tenure, industry tenure, and sector tenure. Potential experience, however, will highly overestimate the results, so these extensions of work experience are used to address the measurement error resulting from it (Heckman et al., 2003).

The data used is a secondary panel data constructed from the Indonesia Family Life Survey (IFLS) waves 4 (2007/2008) and 5 (2014/2015). The estimation methodologies used in this study are Pooled Ordinary Least Squares and Fixed Effects Estimator.

In answering Hypothesis 1, the wage equation is estimated separately on the formal and informal subsamples using Pooled OLS (Wattanasaovaluk, 2020; Li & Gao, 2023; Chacaltana & Moreno, 2025), and a pooled specification with interaction terms of formal dummy and experience measures with FE model. Meanwhile Hypothesis 2 is answered by placing experience and education interactions inside each sector's equation (Connolly and Gottschalk, 2000), one experience measure at a time in both

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estimators. Eventually, the results for each measure are interpreted by constructing seven-year cumulative returns and additionally illustrated with *marginsplot*.

3.2 Estimation Methodology

This research utilizes two estimation methodologies, Pooled Ordinary Least Squares (OLS) and Fixed Effects Panel Model, and proceeds with four stages. First, preliminary regressions are conducted by analysing one measure at a time. Second, each work experience measures are builded up sequentially using both method. Third, to answer hypothesis 1, regressions are sector-stratified for OLS and pooled interaction specifications for fixed effects. Fourth, education interaction specifications are added for Hypothesis 2.

3.2.1 Functional Form

In principle, each experience measure can be entered linearly, quadratically, and cubically to capture the concave experience-earnings profile with acceleration and deceleration (Mincer, 1974; Chiswick, 2003). However, the working specification for every model in this study is linear plus quadratic for all five work experience measures (Dobbie et al., 2014).

Since the explanatory variables were entered as polynomials, the coefficients cannot be read on its on. Therefore, throughout the analysis, estimations are interpreted as a 7-year cumulative return, or in other words the predicted change in log earnings from 0 to 7 years of a measure (m):

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$$\Delta_7(m) = 7\beta_{m,1} + 49\beta_{m,2} \quad (3.1)$$

It is reported both in log points and as the exact percentage, with delta method standard errors. Alongside cumulative returns, the fitted model is also presented graphically with a 95% confidence interval, so the polynomial is interpreted as a whole profile rather than its individual coefficients.

3.2.2 Pooled Ordinary Least Squares (OLS) Mincerian

The full pooled OLS specification:

$$\ln(wage)_{it} = \beta_0 + \Sigma_m\left(\beta_{m,1}m_{it} + \beta_{m,2}m_{it}^2\right) + \eta educlevel_{it} + X_{it}\gamma + \delta_t + \theta_p + \varepsilon_{it} \quad (3.2)$$

Where m represents five work experience measures {exp, tenure, occ_ten, ind_ten, sec_ten}; $\ln(wage)_{it}$ is log real hourly earnings of individual *i* in wave *t*; $educlevel_{it}$ is education level categorical; X_{it} is the controls; δ_t is the wave dummy; θ_p is the province fixed effect; and ε_{it} is the error term. Standard errors are clustered at the individual level.

To begin with, preliminary regressions are done by entering one experience measure at a time (with a full control set) to show each measure's raw return and curvature before all measures are pooled. Secondly, the build-up model adds each measures sequentially (both their linear and squared terms), starting with potential experience, then employer tenure, occupation tenure, industry tenure, up until sector tenure, mirroring the logic of Dobbie et al. (2014) and Marinescu & Triyana (2016).

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Movements of the preceding experience coefficients once narrower tenure measures are added is itself a point of discussion.

In answering Hypothesis 1, equation (3.2) is estimated separately on formal and informal subsamples (sector-stratified), resulting in sector-specific cumulative returns. For each sector (s):

$$\ln(wage)_{it}^{s} = \beta_0 + \Sigma_m\left(\beta_{m,1} m_{it} + \beta_{m,2} m_{it}^2\right) + \eta educlevel_{it} + X_{it}\gamma + \delta_t + \theta_p + \varepsilon_{it} \quad (3.3)$$

The hypothesis test comes from a pooled specification that adds a full set of formal and experience interactions to equation (3.2):

$$\ln(wage)_{it} = \beta_0 + \Sigma_m\left(\beta_{m,1} m_{it} + \beta_{m,2} m_{it}^2\right) + \Sigma_m\left(\varphi_{m,1} formal_{it} \,.\, m_{it} + \varphi_{m,2} formal_{it} \,.\, m_{it}^2\right) + \lambda formal_{it} + \eta educlevel_{it} + X_{it}\gamma + \delta_t + \theta_p + \varepsilon_{it} \quad (3.4)$$

Where interaction terms φ show how formal and informal returns differ. So in response to hypothesis 1, *testparm* is used to test whether all ten interactions are jointly zero (whether returns differ by sector).

Subsequently, to answer Hypothesis 2, the sector-stratified equation is augmented with interactions between one experience measure at a time and education level dummies. Therefore, for each sector (s) and measure (m):

$$\ln(wage)_{it} = \beta_0 + \beta_1 m_{it} + \beta_2 m_{it}^2 + \eta_s S_{it} + \eta_T T_{it} + \kappa_{s,1}(S_{it}.m_{it}) + \kappa_{t,1}(T_{it}.m_{it}) + \kappa_{s,2}\left(S_{it}.m_{it}^2\right) + \kappa_{t,2}\left(T_{it}.m_{it}^2\right) + X_{it}\gamma + \delta_t + \theta_p + \varepsilon_{it} \quad (3.5)$$

where S and T are dummies for secondary and tertiary education (primary or less is the reference). Hypothesis 2 is tested within the sector by the joint significance

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of those four interaction terms. Then, ten regressions are estimated (two sectors × five experience measures).

3.2.3 Fixed Effects Panel Model

Fixed effects model uses only within-individual variation across the time frame, and time-invariant unobserved characteristics are differenced out. Similar to OLS, the FE estimation starts with a build-up model where the five experience measures enter subsequently:

$$\ln(wage)_{it} = \Sigma_m\left(\beta_{m,1}m_{it} + \beta_{m,2}m_{it}^2\right) + X_{cit}\theta + \alpha_i + \delta_t + \varepsilon_{it} \qquad (3.6)$$

Where α_i is individual fixed effect and X_{cit} consists of time-variant controls. This build-up shows which returns survive once selection on time-invariant characteristics is removed, and how each measure's within-person payoff shifts as other tenure measures enter, before any sector distinction is accounted. For Hypothesis 1, one pooled FE model then interacts the formal dummy with every experience term:

$$\ln(wage)_{it} = \Sigma_m\left(\beta_{m,1}m_{it} + \beta_{m,2}m_{it}^2\right) + \Sigma_m\left(\varphi_{m,1}formal_{it}\,.\,m_{it} + \varphi_{m,2}formal_{it}\,.\,m_{it}^2\right) + \lambda formal_{it} + X_{cit}\theta + \alpha_i + \delta_t + \varepsilon_{it} \qquad (3.7)$$

Gender and education level (for non-switchers) are absorbed into α_i. Province is excluded from the specification since only about one percent change province between waves, so there is nothing to identify movers. This pooled interaction specification keeps sector switchers that stratified FE would not. The informal sector

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return is read off the base terms, while the formal sector return is read off base plus interaction. Additionally, joint *testparm* on ten interactions is conducted.

To answer Hypothesis 2, the experience and education interactions survive within transformation because the experience component is time variant, even though the education level is itself absorbed for non-switchers. Therefore, within each sector and for one measure at a time:

$$\ln(wage)_{it} = \beta_1 m_{it} + \beta_2 m_{it}^2 + \kappa_{s,1}(S_{it}.m_{it}) + \kappa_{t,1}(T_{it}.m_{it}) + \kappa_{s,2}(S_{it}.m_{it}^2) + \kappa_{t,2}(T_{it}.m_{it}^2) + X_{cit}\theta + \alpha_i + \delta_t + \varepsilon_{it} \quad (3.8)$$

3.3 Heterogeneity and Robustness Analysis

Heterogeneity analysis are conducted by re-estimating the fixed effects model's main specification on theoretically motivated subsamples:

First , informal sector workers are separated into self-employed and salaried informal employees. Self-employed earnings are net business profits rather than a wage, so the main specification which estimates general informal sector returns, mixes two conceptually different outcomes. Marinescu & Triyana (2016) avoids this by excluding currently self-employed observations. Therefore, separating these subsamples is useful to see whether each results supports or diverges from the main specification.

Second (R2), gender. Men and women are analyzed separately in each sector. This separation is motivated by gender differences in formal-informal sorting in Indonesia (Gallaway and Bernasek, 2002). Women are more likely to have interruptions

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throughout their careers (Bian & Wang, 2019). Marinescu & Triyana (2016) restrict their samples to urban males, considering that men and women face different labor market opportunities in developing nations. Additionally, Dobbie et al. (2014) also excluded female samples due to the high significance of missing observations. So it is interesting to see whether the main specification's results are driven by one group.

Meanwhile a robustness check that adds occupation and firm size controls is conducted. The Hypothesis 1 specifications (equations 3.3, 3.4, and 3.7) are re-estimated with a 1-digit occupation group and a firm-size band added to the control set, each with a *not reported* category so that no observation is dropped. The motivation is that the formal-informal gap in returns can partly reflect the kinds of jobs and firms that populate each sector rather than formality itself. Informal employment is concentrated in small firms and in a narrow set of occupations (Perry et al., 2007), and firm size even enters this study's formality classification, so a sector premium estimated without these controls can carry a firm-size premium and occupational composition inside it. Because occupation and firm size are outcomes of the same career process themselves, the controlled estimations are interpreted as conservative, within-job-type returns rather than a replacement for the main specification.

3.4 Data

The data are sourced from the Indonesia Family Life Survey (IFLS), a longitudinal survey that re-interviews the same individuals over time. In this study, two waves of panel data are constructed from IFLS 4 (2007/2008) and IFLS 5 (2014/2015),

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the most recent waves of IFLS have. The features that IFLS has make it suitable for this research. Most importantly, it has a comprehensive retrospective employment history modules which record occupation, industry, and sector of each job and how long each tenure was held. This is useful in constructing the five experience measures (potential experience, employer tenure, occupational tenure, industry tenure, and sector tenure). However, since potential experience contains high measurement error, these extensions of experience measures are useful in addressing this endogeneity (Heckman et al., 2003). Other than having an employment module, IFLS covers informal and self-employed workers alongside their earnings (wage for employees and net business profit for self-employed). With this setting, the formal and informal sectors can be compared on a consistent measure, which greatly matters in Indonesia, where informal employment is a large share of the labor market. In addition, since the survey follows the same person across waves, its panel structure supports within individual fixed effects estimator, and differencing out time invariant ability and other unobserved characteristics.

3.4.1 Variables and Measurements

The outcome variable in this study is log real hourly earnings (ln_wage). Nominal earnings are deflated using the Indonesian CPI to a base year of 2010. For salaried employees, the real hourly wage is constructed from monthly income (or annual if monthly is unavailable), divided by hours worked. For self-employed workers, real hourly earnings are calculated by real net business profit from the IFLS

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BU module, divided by hours worked in the business. In order to reduce the effect of data entry error and extreme values, the outcome is trimmed at the 1st and 99th percentile within each wave. Meanwhile, the main explanatory variables are distinguished into five: (i) potential experience (age – schooling – 6); (ii) employer tenure (years with current employer); (iii) occupational tenure (years in current occupation); (iv) industry tenure (years within the industry); (v) years of employment in the same labor market sector, formal/ informal). Each measures enter as linearly and quadratically in the specification.

Sector classification and all tenure measures follow Marinescu & Triyana (2016)'s strategy. Since IFLS does not record the registration status of a worker's enterprise, formality cannot be observed directly and must be derived from employment status, medical benefits, firm size, and contract status. A worker's sector classification proceeds hierarchically. Employment status applies first, where government employees are formal by definition as their employment terms and insurance coverage are set by law, while the self-employed and casual workers are coded informal since their enterprise registration is unobserved and they rarely report medical benefits regardless of firm size. For private employees, medical benefits are the deciding criterion, where receiving them signals that the employer complies with labor regulation. Private employees who receive medical benefits are therefore coded formal, and those who report none, informal. When medical benefit status is unreported, firm size is another criterion. Since small firms are systematically less

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likely to provide social benefits (Perry et al., 2007), workers in firms with 20 employees or more are coded formal, and those with less than 20, informal. Although the legal mandate applies to firms with more than 10 employees, the threshold is set at 20 because the mandate is weakly enforced and 20 is the firm size category break in the IFLS questionnaire. However, where both medical benefit and firm size information are unreported, a written contract classifies the workers as formal. This last criterion extends Marinescu & Triyana (2016).

Education level, in turn, acts as a dummy, categorized into three: primary or less (reference), secondary, and tertiary. In OLS, it operates as a level effect. Whereas in the FE model, the level is absorbed into the individual fixed effect for non-switchers, and education operates through experience and education interaction terms.

Drawing from Dobbie et al. (2014), Marinescu & Triyana (2016), and Wattanasaovaluk (2020), the OLS controls are gender, marital status, urban residence, wave dummy, and province fixed effects. On the other hand, FE model controls only include marital status and urban residence, knowing that gender, education level, and province are absorbed by the individual fixed effect, and the wave dummy is absorbed by the wave fixed effect.

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Table 3.1: Summary of Variables

Variable	Symbol	Type / Measurement
Outcome variable		
Log hourly real earnings	ln_wage	Log of CPI-deflated (2010 Rp) wage per hour; for self-employed, net business profit per hour. Trimmed 1/99 within wave.
Primary explanatory variables		
Potential experience	exp, exp²	Continuous; age − schooling − 6 (years), and its square
Employer tenure	tenure, tenure²	Continuous; years with current employer (years operating current business for self-employed), and its square
Occupational tenure	occ_ten, occ_ten²	Continuous; years in current occupation, and its square
Industry tenure	ind_ten, ind_ten²	Continuous; years within same industry, and its square
Sector tenure	sec_ten, sec_ten²	Continuous; years of accumulated employment in the same labor-market sector (formal or informal), and its square
Moderating variables		
Sector status	formal	Binary; 1 = formal, 0 = informal
Education level	educlevel	Categorical; primary or less (ref.) / secondary / tertiary
Control variables		
Gender	male	Binary; 1 = male
Marital status	married	Binary; 1 = married
Urban residence	urban	Binary; 1 = urban
Survey wave	wave	Indicator; 4 = IFLS 4, 5 = IFLS 5 (wave FE in panel)
Province	province	Categorical; province FE in OLS (excluded from FE)

3.4.3 Sample Restrictions

One fixed estimation sample is used in every regression. In order to preserve identification and accurate comparisons, several inclusion and exclusion requirements are applied. Inclusion requires working-age individuals (15—64), paid work with

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available wage observations, at least 500 annual working hours, complete information on all five experience measures, and all control variables. The pooled OLS specifications use all person waves that satisfy these requirements (an unbalanced panel), but the fixed effects estimator requires two complete sample observations per individual. The constant sample is built first, then singletons are dropped afterwards since dropping incomplete rows can also create singletons.

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CHAPTER 4: RESULT AND DISCUSSION

4.1.1 Constant Estimation Sample

Table 4.1 reports the constant estimation sample that is used throughout the analysis. The sample contains 14,603 person-waves on 11,917 individuals; singletons comprising 9,231 observations contribute to OLS only; 2,686 individuals appear with complete information in both waves, and form the FE sample of 5,372 person-waves. Among them, 524 (19.5%) switched sectors between waves.

Table 4.1: The constant estimation sample

Sample	Count
Person-waves in constant (OLS) sample	14,603
Individuals in constant sample	11,917
Person-waves, IFLS4 / IFLS5	9,393 / 5,210
Person-waves, informal / formal	10,342 / 4,261
FE-usable person-waves (individuals in both waves)	5,372
FE-usable individuals	2,686
Singletons (in OLS, excluded from FE)	9,231
Sector-switchers among FE individuals	524 (19.5%)

Notes: age 15–64, paid work with no missing earnings data, ≥500 annual hours worked, complete information on all measures

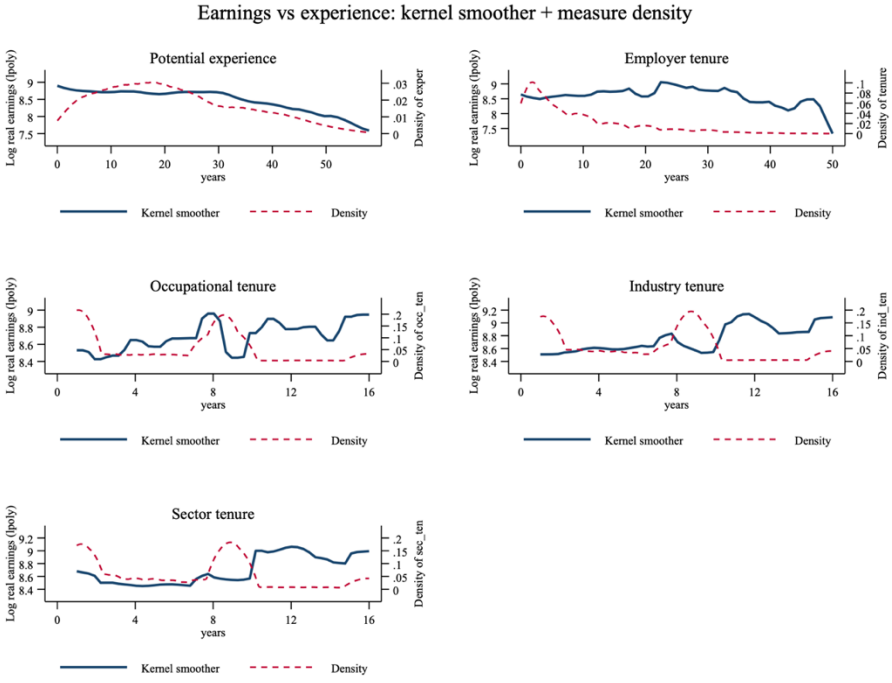
The sample tilts toward IFLS 4 (9,393 against 5,210 person-waves), because occupational, industry, and sector tenure are missing for roughly 29 percent of the panel, where nearly all of that missingness comes from IFLS 5 (around half of wave 5 wage earners, against roughly four percent in wave 4), so requiring all five measures roughly halves usable wave 5 observations.

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4.1.2 Data Visualization

Figure 4.1 plots mean log real hourly earnings against each experience measure, with a kernel smoother and density. Employer tenure is concave over its range, and because it is not capped it runs across the life cycle, while occupational, industry, and sector tenure are built from the same questionnaire grid, capped at 16 years, and jagged but overall are upward. Meanwhile, Figure 4.2 presents a quadratic fit with the kernel smoother. The quadratic tracks the smoother more closely for every measure, which supports the linear-plus-quadratic form used throughout.

Figure 4.1: Mean log real hourly earnings versus each experience measure, with kernel smoother and kernel density



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Figure 4.2: Mean log real hourly earnings versus each experience measure, with a quadratic fit and the kernel smoother

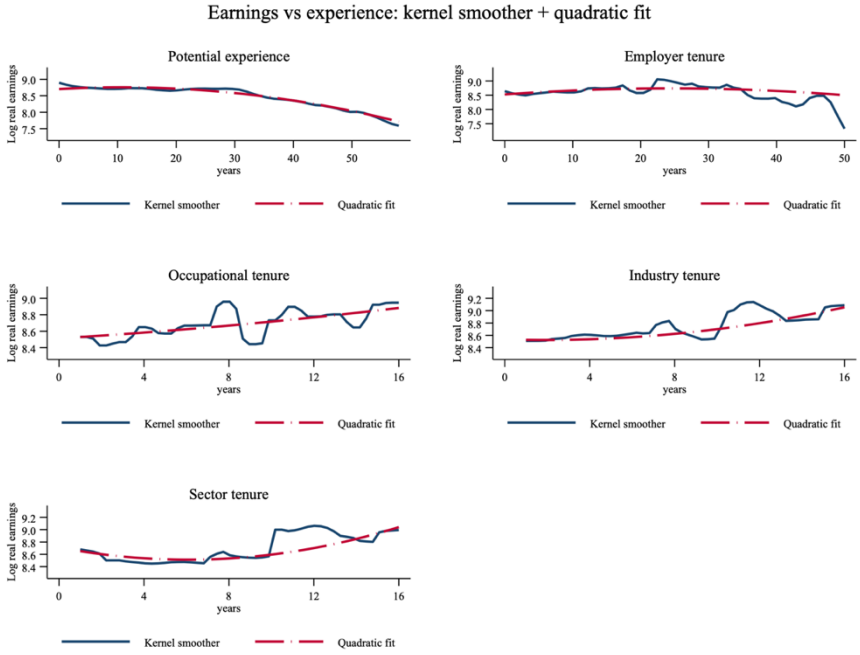


Figure 4.3 plots kernel densities of log real hourly earnings for all workers and by sector, where the formal density lies clearly to the right and the informal density is lower and more spread out. Figure 4.4 compares real and nominal log hourly wages by wave, where the real distribution shifts right from IFLS4 to IFLS5. This shows real earnings growth over the seven years, and the deflated distributions are more comparable across waves than the nominal ones.

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Figure 4.3: Kernel densities of log real hourly earnings, all workers and by sector

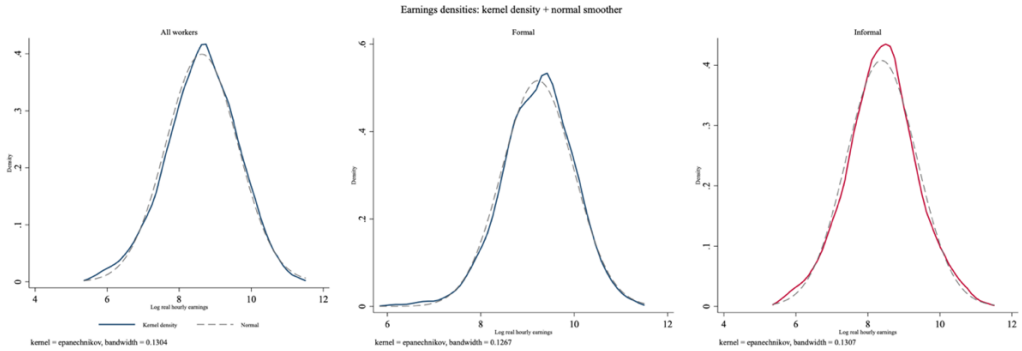
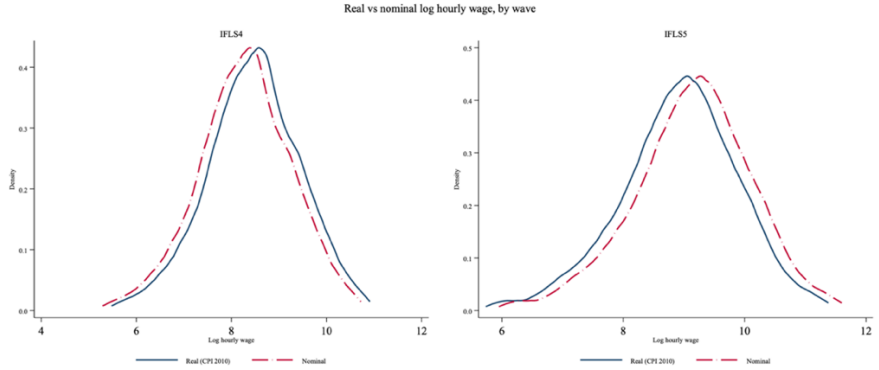


Figure 4.4: Real vs nominal log hourly wages, by wave



Looking at them altogether, these profiles confirm that earnings rise with tenure but at a decreasing rate, and that the three capped tenure measures behave similarly to one another. This supports the polynomial specification used throughout the analysis.

Table 4.2 shows the sector transition matrix for FE-usable individuals. From those informal in IFLS4, 81.3% of them remain informal and 18.7% move to the formal sector. Of those formal in IFLS4, 79% remain formal and 21% move to informal. Therefore, roughly one in five FE-usable individuals switches sector, and these switchers identify the sector terms within the person.

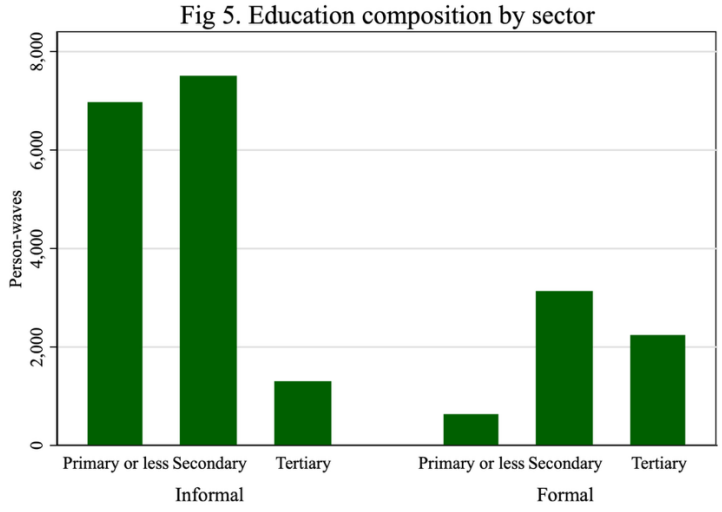
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Table 4.2: Sector transitions (FE-usable individuals)

IFLS4 status	IFLS5: Informal	IFLS5: Formal	Total
Informal	1,415 (81.3%)	325 (18.7%)	1,740
Formal	199 (21.0%)	747 (79.0%)	946
Total	1,614	1,072	2,686

Figure 4.5 shows the education composition by sector, where tertiary educated workers are 37.1% of formal person waves but only 8.5% of informal ones, while primary-or-less workers are 9.7% of the formal sector against 42.8% of the informal sector. This sorting is what motivates us to test Hypothesis 2 within the sector.

Figure 4.5: Education composition by sector



Lastly, Figure 4.6 compares the earnings densities of two informal subgroups: self-employed and salaried informal employees, and shows that earnings overlap in location, but the self-employed distribution is more skewed (since profit is noisier than wage), which motivates the heterogeneity analysis 1.

Figure 4.6: Earnings densities of the two informal subsamples

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Fig 6. Earnings: self-employed vs informal employees



4.1.3 Descriptive Statistics

Table 4.3 reports means by sector with formal-minus-informal difference from per variable t-tests. Formal workers who earn 0.84 log points more per hour are younger and less potentially experienced (16.7 versus 23.4 years), have slightly longer employer tenure, are more urban, and far more educated. Occupational tenure is balanced between both sectors, and the informal sector actually leads in sector tenure.

The employer tenure, which means being longer than the other tenure measures, is due to the differences in variable construction. Occupational, industry, and sector tenure were derived from the same IFLS questionnaire grid that has 16 years cap; thus, workers who have more than 16 years of experience are inserted as 16. Meanwhile, employer tenure was constructed differently and goes all the way to the worker's lifelong tenure.

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Table 4.3: Means by sector (constant sample)

Variable	Formal	Informal	Diff. (F − I)
Log real hourly earnings	9.22 (0.77)	8.38 (0.98)	+0.842***
Potential experience (yrs)	16.71 (10.43)	23.41 (13.38)	−6.694***
Employer tenure (yrs)	9.44 (8.62)	8.42 (8.67)	+1.028***
Occupational tenure (yrs)	5.53 (4.32)	5.66 (4.33)	−0.125
Industry tenure (yrs)	6.52 (4.59)	5.94 (4.37)	+0.579***
Sector tenure (yrs)	5.73 (4.83)	6.29 (4.43)	−0.557***
Age	34.89 (9.94)	37.54 (11.28)	−2.650***
Married	0.774	0.792	−0.017**
Urban	0.730	0.580	+0.150***
Male	0.629	0.626	+0.003
N (person-waves)	4,261	10,342	

*Notes: Standard deviations in parentheses. Difference column from two-sample t-tests. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Within the informal sector, the self-employed (5,161 person-waves, about half the sector) and salaried informal employees (5,181) have nearly identical mean log earnings (8.36 versus 8.4), but the self-employed are markedly more experienced (27.3 versus 19.5 years of potential experience) and longer tenured (10.6 against 6.3 years), and their earnings are net business profit rather than a wage, which is a caveat tested in the heterogeneity analysis 1.

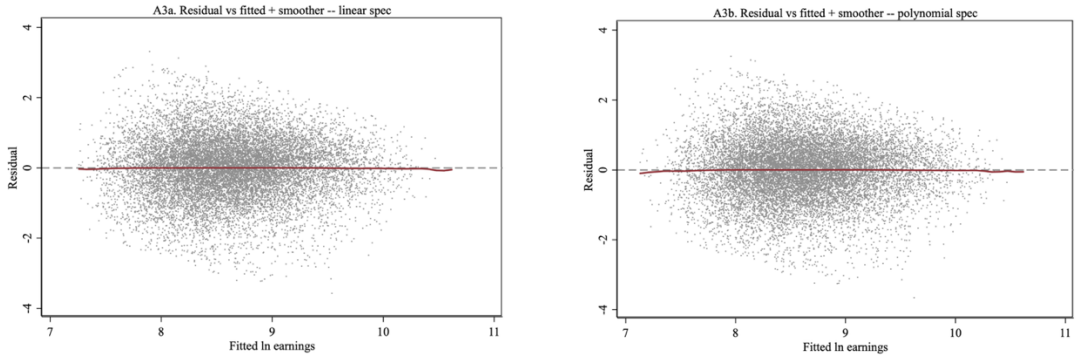
4.1.4 Diagnostics

Figures 4.7 and 4.8 illustrate residuals versus fitted values for linear and polynomial specifications. In both panels, the lowess smoother is flat along zero, across

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the full range of fitted earnings. Therefore, the conditional mean is well specified, and there is no systematic nonlinearity between experience and earnings that remains in the residuals.

Figure 4.7: Residuals vs fitted (linear); Figure 4.8: Residuals vs fitted (polynomial)



Across the whole panel, earnings are missing for 2% of observations, employer tenure for 2.5%, while occupation tenure, industry tenure, and sector tenure are missing for about 29% (29.3%, 29.1%, 29.3% respectively), concentrated in IFLS5. Although the sector tilt in this missingness is modest among wage earners (informal around 30%, formal 26%), the constant sample requirement does not distinctly select one sector. The outcome was trimmed at the 1st and 99th percentile within the wave during the cleaning stage. After trimming, log earnings run from 5.48 to 11.38; the median rises from 8.49 in IFLS4 to 8.97 in IFLS5.

On multicollinearity, variance inflation factors (VIF) test on the experience polynomials are high by construction (exp 92.7, exp^2 440.5, tenure^2 187.7). This is actually expected and harmless here; a variable and its square are mechanically

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correlated, so no conclusion in this research is based on a lone polynomial coefficient. Returns are always going to be read as cumulative 7-year quantities, alongside delta-method standard errors, and joint hypothesis tests. Beyond the VIF test, the Breusch-Pagan test is conducted, and the result rejects constant variance decisively (where $\chi^2(1) = 80.41$, $p < 0.001$), which supports cluster-robust standard errors in all specifications.

On sample attrition from FE estimation, the 9231 singleton person-waves are excluded, which leaves the 5,372 FE person-waves. However, the composition is stable across waves. Age (36.8) and male share (0.64 to 0.61) barely move, while the formal share rises from 25.6% to 35.5% and the urban share from 58.2% to 69.9%, which are partly real change and partly due to IFLS5 tenure missingness.

4.2 Main Findings

4.2.1 Preliminary Regressions

Each experience measure is first entered on its own (with full control set), and generates its raw return before the correlated measures compete. When entered alone, every measure except occupational tenure shows a positive and significant return, as shown in Table 4.4.

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Table 4.4: Cumulative 7-year returns, each measure entered alone (pooled OLS)

Measure	7-year return
Potential experience	+11.9%***
Employer tenure	+13.5%***
Occupational tenure	+0.4%
Industry tenure	+9.0%***
Sector tenure	+9.3%***

*Notes: Cumulative 7-year returns: percentage change in earnings from 0 to 7 years of the measure, $100(\exp(7\cdot\beta_1 + 49\cdot\beta_2) - 1)$, with delta-method inference. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

4.2.2 Build Up Analysis

In this step, experience measures are added sequentially to the constant sample (Table 4.5). In OLS (columns 1—5), the potential experience coefficient roughly halves as the tenure measures enter (0.0182 in column 1 to 0.0099 in column 5), part of what looks like a return to general experience, but is in fact accumulated tenure. Employer tenure stays positive and significant throughout, occupational tenure turns negative once it competes with employer tenure, and sector tenure basically adds nothing in the final column, which is also documented by Marinescu & Triyana (2016).

The fixed effects estimations on the other side (columns 6—10), show what survives within person. The linear potential experience is small and insignificant in every column, while its square is strongly negative. The highest contrast apparently occurs in employer tenure. Although it remains positive and significant in OLS, it shows negative with positive curvature in the FE build-up (−0.0104* in column 2), so it might be the case that OLS employer tenure mostly reflects better-paid workers selecting into longer employer spells, rather than within-person payoff. Meanwhile,

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occupational tenure becomes significantly negative once industry tenure enters (−0.0257** in column 4). Industry tenure is the only measure with a positive and significant result (+0.0189** in column 5). And again, sector tenure adds nothing.

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Table 4.5: Build up model (dependent variable: log real hourly earnings)

	OLS					**Fixed Effects**				
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Potential experience	0.0182***	0.0109***	0.0114***	0.0101***	0.0099***	0.0064	0.0143	0.0152	0.0142	0.0135
	(0.0024)	(0.0025)	(0.0026)	(0.0026)	(0.0026)	(0.0164)	(0.0167)	(0.0168)	(0.0168)	(0.0170)
(Potential experience)²	−0.00031***	−0.00029***	−0.00030***	−0.00028***	−0.00028***	−0.00077***	−0.00090***	−0.00092***	−0.00091***	−0.00090***
	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00015)	(0.00016)	(0.00017)	(0.00017)	(0.00017)
Employer tenure		0.0167***	0.0176***	0.0136***	0.0125***		−0.0104*	−0.0090	−0.0119**	−0.0113*
		(0.0028)	(0.0028)	(0.0029)	(0.0031)		(0.0057)	(0.0058)	(0.0059)	(0.0062)
(Employer enure)²		−0.00005	−0.00007	0.0000002	0.00002		0.00057***	0.00054***	0.00061***	0.00060***
		(0.00009)	(0.00009)	(0.00009)	(0.00009)		(0.00020)	(0.00020)	(0.00020)	(0.00021)
(Occupational tenure)			−0.0108**	−0.0142***	−0.0135***			−0.0169	−0.0257**	−0.0259**
			(0.0047)	(0.0051)	(0.0052)			(0.0107)	(0.0114)	(0.0115)
(Occupational tenure)²			0.00053	0.00031	0.00023			0.00038	0.00065	0.00066
			(0.00032)	(0.00036)	(0.00036)			(0.00039)	(0.00041)	(0.00041)
(Industry tenure)				0.0073	0.0091*				0.0187**	0.0189**
				(0.0050)	(0.0052)				(0.0080)	(0.0080)
(Industry tenure)²				0.00047	0.00029				−0.00074**	−0.00072*
				(0.00034)	(0.00036)				(0.00038)	(0.00039)
Sector tenure					−0.0026					−0.0014
					(0.0059)					(0.0095)
(Sector tenure)²					0.00040					−0.00002
					(0.00041)					(0.00059)
N	14,603	14,603	14,603	14,603	14,603	5,372	5,372	5,372	5,372	5,372

*Notes: OLS include education-level dummies, gender, marital status, urban residence, wave dummy, province fixed effects. FE columns absorb individual and wave fixed effects and include marital status and urban residence. * p < 0.10, ** p < 0.05, *** p < 0.01*

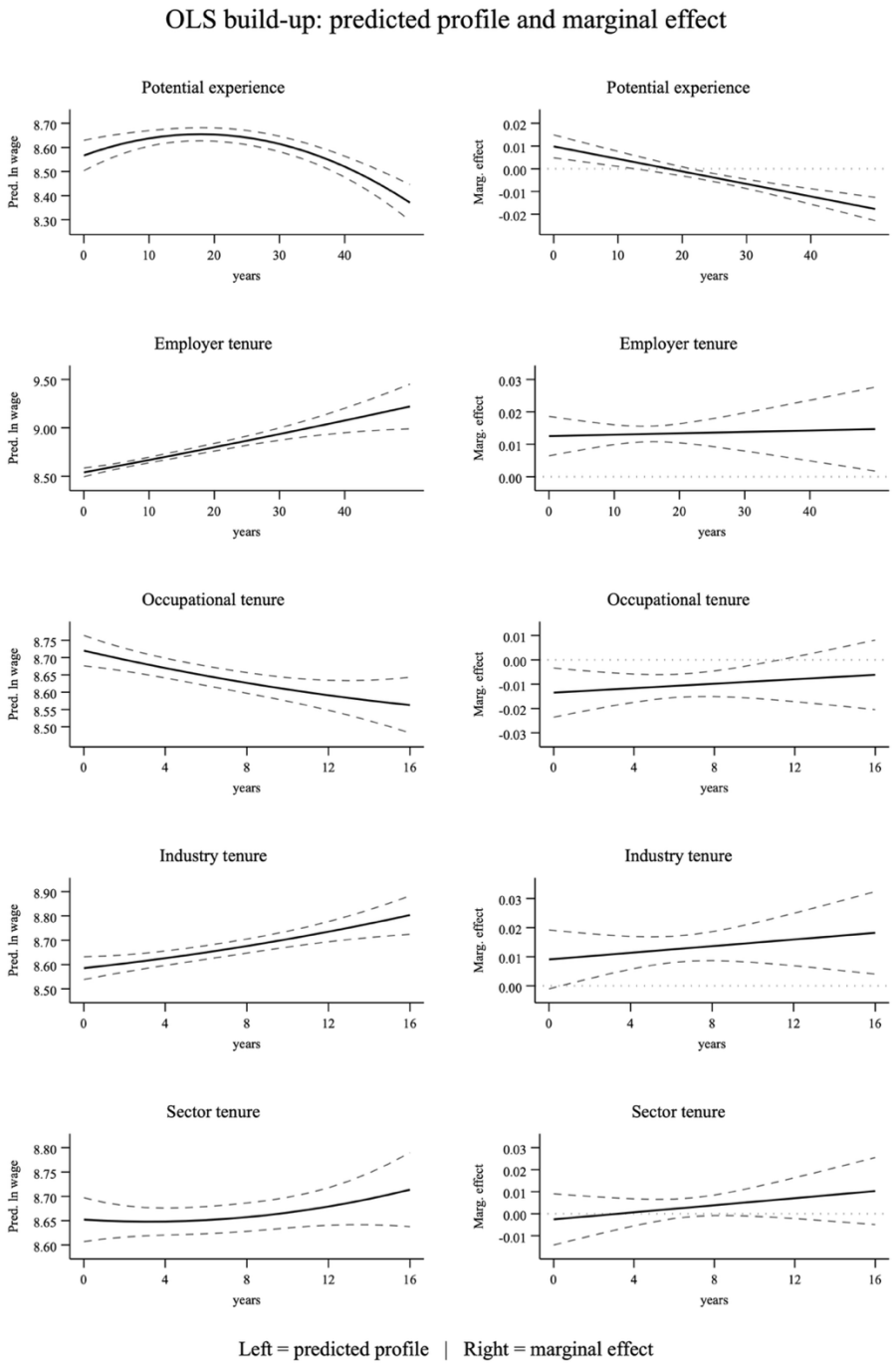
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Figures 4.9 and 4.10 plot the predicted earnings profile and the marginal effects for each experience measure in the full polynomial model, for OLS and fixed effects, respectively. In OLS (Figure 4.9), most profiles slope upward. Potential experience rises and then goes down in the usual concave shape, while employer and industry tenure climb steadily and keep positive marginal effects. Occupational tenure however, slopes downward once it competes with the other measures. On the other hand, the fixed effects profiles (Figure 4.10) are much flatter. Potential experience turns concave and its marginal effect falls below zero at higher years, employer tenure flattens with wide confidence bands, and only industry tenure has a clear upward slope within person. Taken together, the build-up table and the following figures imply that most of the OLS slopes reflect differences between workers that do not survive once individual fixed effects are applied, and industry tenure is the only measure that holds up.

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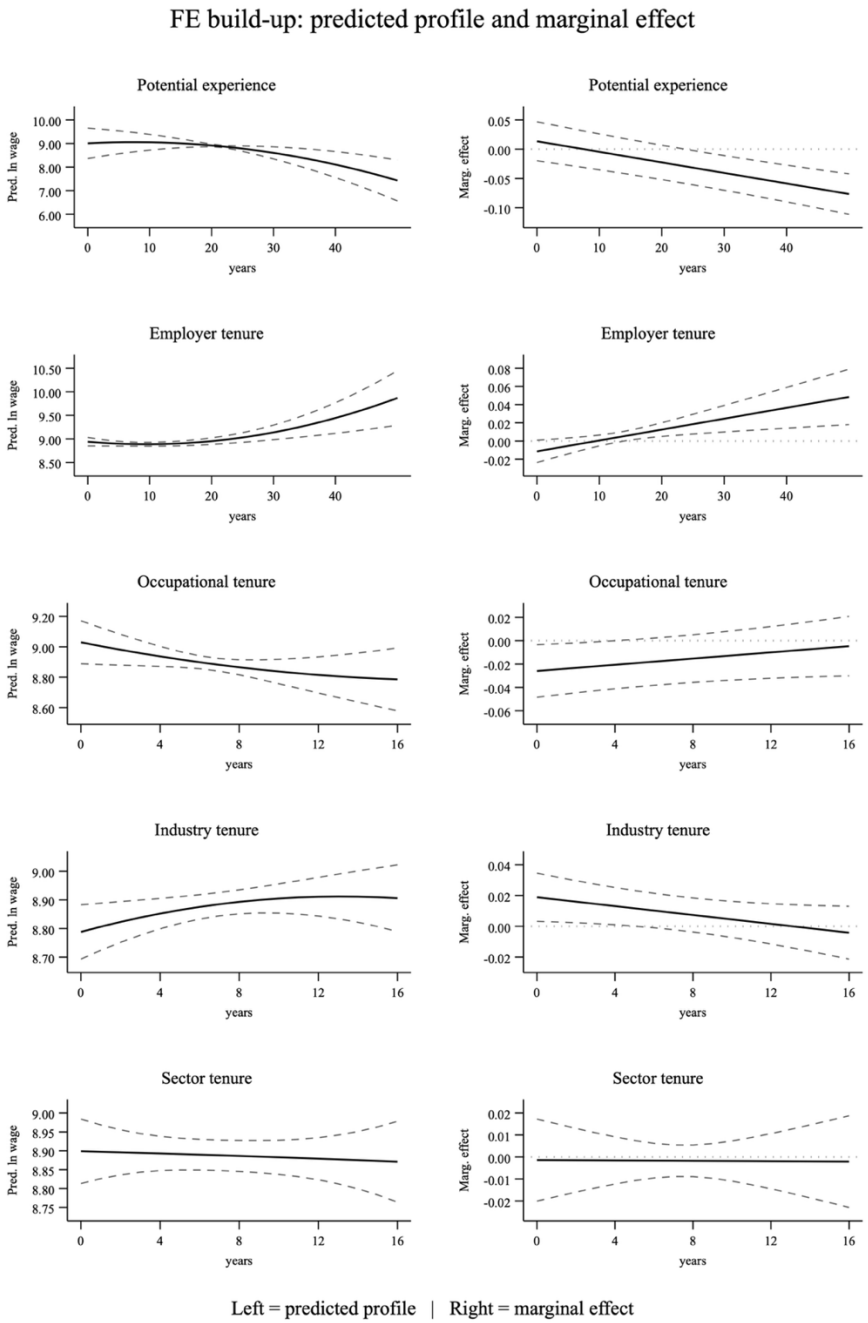
Figure 4.9: Predicted earnings profiles and marginal effects, full polynomial model (OLS)



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Nirbita Olga Ramadhanti, Gumilang Aryo Sahadewo, S.E., M.A., Ph.D.
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Figure 4.10: Predicted earnings profiles and marginal effects, full polynomial (fixed effects)



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4.2.3 Hypothesis 1: Returns by Sector

The full polynomial model is estimated separately on each sector (OLS) and also pooled with formal × experience interactions (FE), then interpreted with 7-year cumulative returns by sector and the cross-sector gap as presented in Table 4.6. In OLS, the joint Chow test that all ten interactions are zero gives $F(10, 11916) = 15.53$, $p < 0.001$, meaning that returns differ significantly by sector and Hypothesis 1 is supported. The returns are concentrated in industry and sector tenure, while informal returns are flat (with borderline significant at best). The negative formal employer tenure return (-6.7%) is a net of other tenure effects. Employer tenure on its own earned +13.5% in the preliminary regression.

Although, within-person estimation results show the other way. The FE joint test produces $F(10, 2685) = 1.68$, $p = 0.079$, borderline significant at best. So most of the large OLS sector returns imply selection into the formal sector rather than a real sector effect on experience returns. Although one within-person result survives, and it is the same measure that led the gaps in OLS, where in the formal sector, sector tenure still pays +14.7% over 7 years ($p = 0.03$).

Table 4.6: 7-year returns by sector and the cross-sector gap

	OLS		Fixed Effects	
Measure	**Formal**	**Informal**	**Formal**	**Informal**
Potential experience	+13.3%***	+2.0%	−5.4%	+7.7%
	(3.2)	(2.0)	(11.4)	(12.6)
Employer tenure	−6.7%***	+3.7%*	−4.5%	−7.8%*
	(2.4)	(2.2)	(4.4)	(4.1)
Occupational tenure	+0.3%	−4.7%*	−1.2%	−15.5%**
	(3.0)	(2.7)	(8.5)	(6.9)

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	OLS		Fixed Effects	
Measure	**Formal**	**Informal**	**Formal**	**Informal**
Industry tenure	+12.2%***	+2.9%	+5.9%	+10.5%*
	(3.3)	(2.9)	(6.4)	(6.1)
Sector tenure	+18.7%***	+2.3%	+14.7%**	−1.8%
	(4.3)	(3.1)	(7.2)	(6.1)

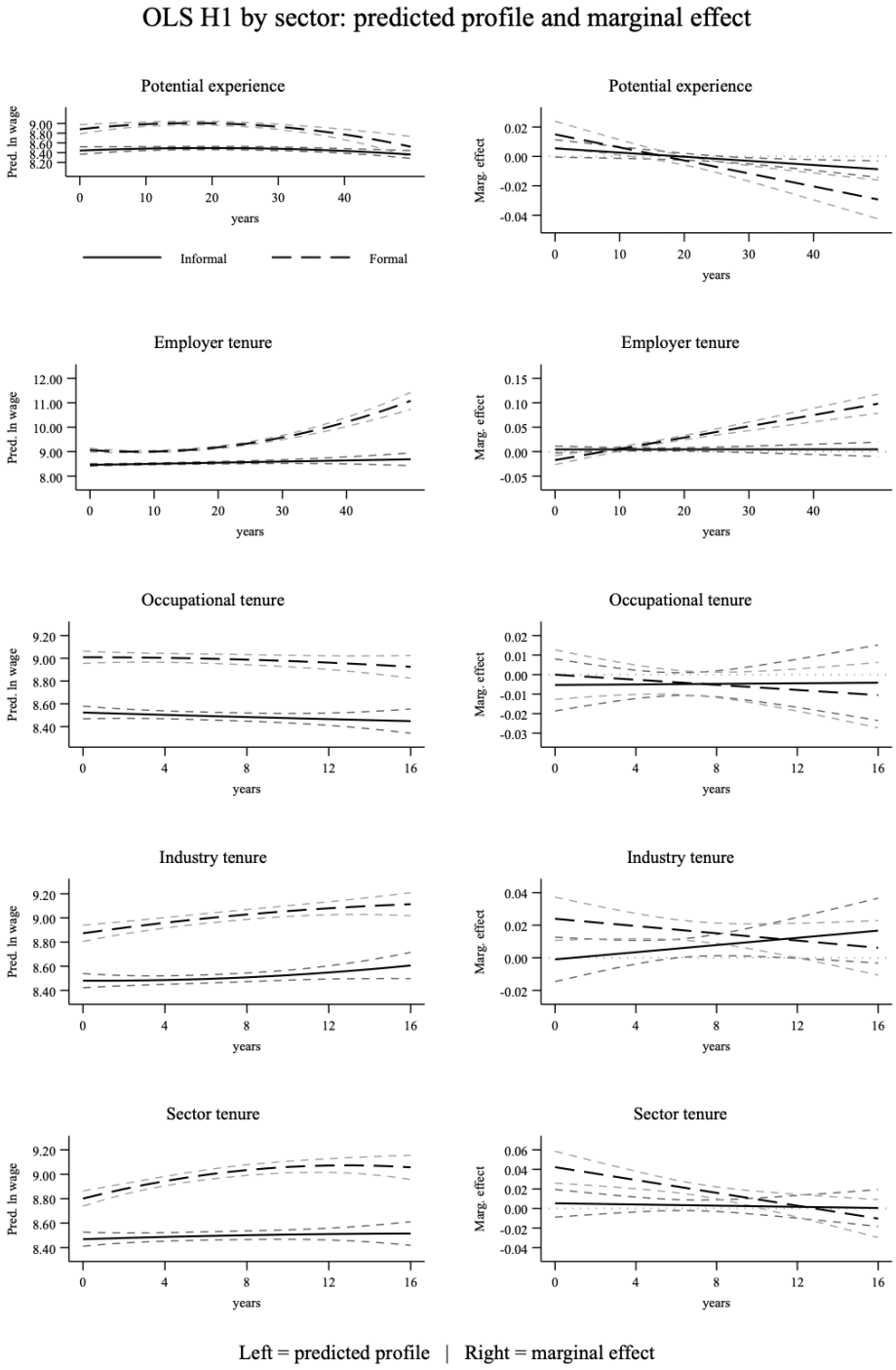
*Notes: Cumulative 7-year returns: percentage change in earnings from 0 to 7 years of the measure, $100(\exp(7\cdot\beta_1 + 49\cdot\beta_2) - 1)$, with delta-method inference * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

Figures 4.11 and 4.12 show the same profiles split by sector, formal versus informal. In OLS (Figure 4.11), the formal profiles sit clearly above the informal ones and slope up steeper especially for sector and industry tenure, while the informal profiles are close to flat. Visually, this is the large OLS sector difference. Once individual fixed effects are applied (Figure 4.12), the two sets of profiles move much closer together and their confidence bands overlap for most measures. The formal premium mainly disappears within the person. Although the formal sector tenure profile is the one that still rises.

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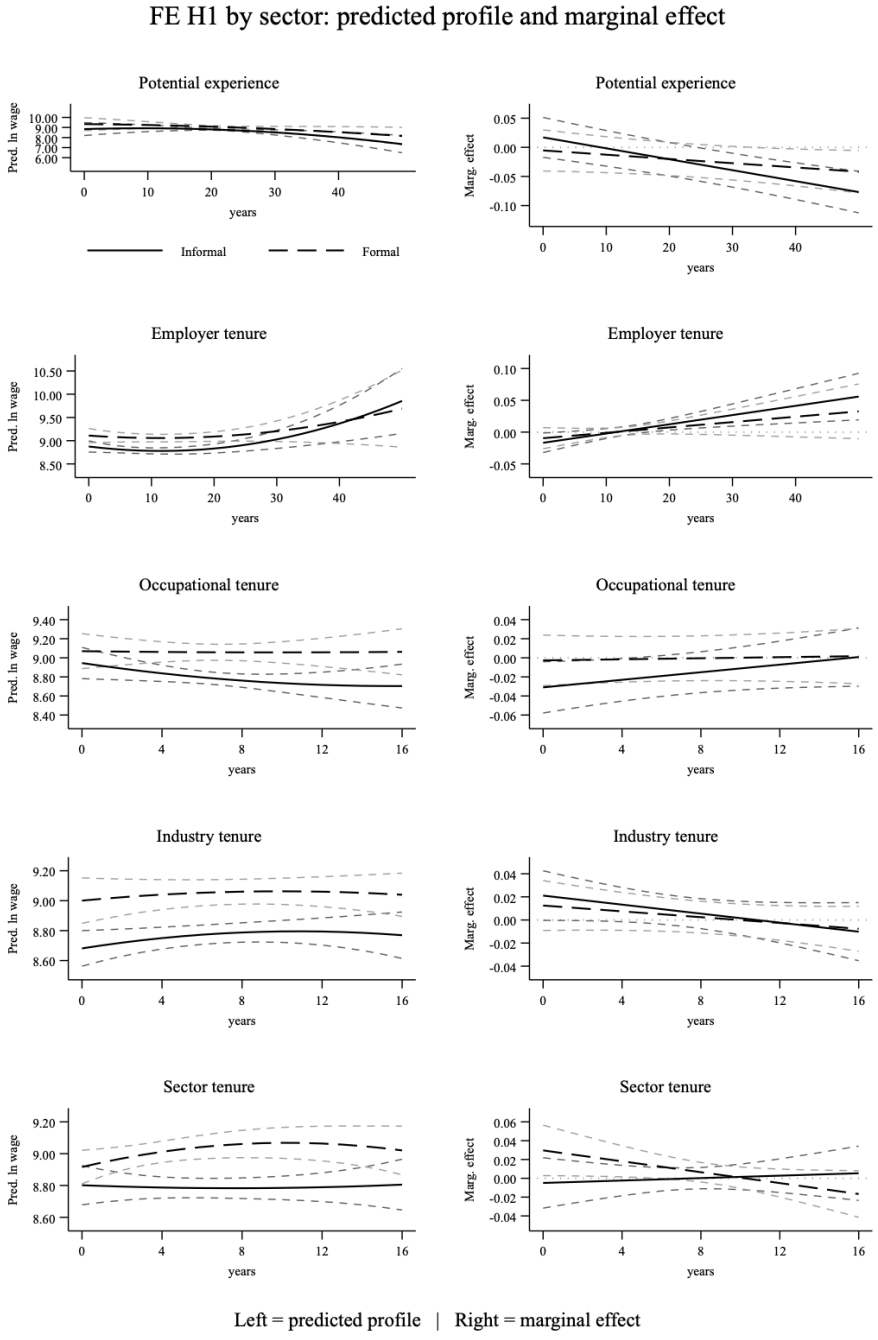
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Figure 4.11: Predicted earnings profiles and marginal effects, by sector (OLS)



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Figure 4.12: Predicted earnings profiles and marginal effects, by sector (fixed effects)



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4.2.4 Hypothesis 2: Returns by Education within Sector

Education × experience interactions are added one measure at a time within each sector. In OLS (Table 4.7), Hypothesis 2 is supported, and much stronger in the formal sector, where education significantly changes the return to every experience measure (all joint $p < 0.001$); in the informal sector only potential experience varies by education. For potential experience the formal profile is U-shaped in education, where primary-or-less workers earn +34.6% over 7 years and tertiary +36.8%, while secondary earn nothing, whereas for the tenure measures the returns rise with education (tertiary workers hold large premiums on employer, occupational and industry tenure).

Table 4.7: 7-year returns by education group within sector (OLS)

Measure	Primary or less (ref.)	Secondary	Tertiary
Formal sector			
Potential experience	+34.6%***	−2.8%	+36.8%***
	(12.9)	(3.5)	(5.7)
Employer tenure	+4.8%	+0.9%	+24.7%***
	(7.4)	(2.9)	(4.3)
Occupational tenure	−4.9%	+12.2%***	+19.6%***
	(7.7)	(4.2)	(5.5)
Industry tenure	+8.7%	+13.3%***	+47.7%***
	(9.1)	(4.0)	(7.6)
Sector tenure	+32.9%***	+14.3%***	+51.6%***
	(11.6)	(4.6)	(7.8)
Informal sector			
Potential experience	+19.1%***	−1.9%	+5.8%
	(4.3)	(2.6)	(6.0)
Employer tenure	+4.5%*	+3.2%	+8.4%
	(2.6)	(2.6)	(6.9)
Occupational tenure	+1.4%	−2.4%	−10.6%
	(3.6)	(3.3)	(7.4)
Industry tenure	+3.1%	+3.2%	−9.7%
	(3.7)	(3.4)	(7.9)

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Measure	Primary or less (ref.)	Secondary	Tertiary
Sector tenure	+8.9%**	−0.5%	+16.0%
	(4.5)	(3.6)	(10.4)

*Notes: Cumulative 7-year returns by education group; * p < 0.10, ** p < 0.05, *** p < 0.01*

In fixed effects estimation (Table 4.8), Hypothesis 2 is supported in the formal sector, and the results are more robust compared to Hypothesis 1. The education gaps survive on four of the five measures: the tertiary-primary gap is +26.8 points on potential experience, +24.5 on employer tenure, +26.7 on occupational tenure, and +34.3 on sector tenure, all significant at 5% or better; and the secondary-primary gaps are in the same direction. Industry tenure is the only exception (insignificant) in the formal result. The informal sector, on the other hand, collapse. No tertiary gap holds, and only secondary gaps on occupational and industry tenure survive, but has no clear pattern across education levels.

Table 4.8: 7-year returns by education group within sector (FE)

Measure	Primary or less (ref.)	Secondary	Tertiary	Gap Sec−Pri	Gap Ter−Pri
Formal sector					
Potential experience	−34.2%***	−17.5%*	−14.0%	+22.6***	+26.8***
	(9.1)	(10.6)	(12.1)	(6.2)	(7.3)
Employer tenure	−15.6%*	+5.4%	+7.9%	+22.1**	+24.5**
	(8.2)	(4.9)	(5.4)	(9.6)	(10.4)
Occupational tenure	−6.8%	+16.4%	+21.7%*	+22.2**	+26.7***
	(11.5)	(11.4)	(12.6)	(9.0)	(9.7)
Industry tenure	−5.3%	+4.1%	+11.7%	+9.5	+16.6
	(12.7)	(7.3)	(9.4)	(12.7)	(13.8)
Sector tenure	−12.9%	+12.7%	+22.8%**	+25.7**	+34.3***
	(10.4)	(7.7)	(10.2)	(11.4)	(12.8)
Informal sector					
Potential experience	+6.1%	+8.4%	−14.2%	+2.1	−21.3
	(21.0)	(22.0)	(20.9)	(7.3)	(13.7)

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Measure	Primary or less (ref.)	Secondary	Tertiary	Gap Sec−Pri	Gap Ter−Pri
Employer tenure	−7.3%	−2.0%	−20.6%**	+5.6	−15.5
	(5.2)	(5.6)	(8.4)	(7.4)	(11.8)
Occupational tenure	−22.3%***	−5.8%	−32.8%***	+19.3**	−14.5
	(7.8)	(8.6)	(8.7)	(8.1)	(12.5)
Industry tenure	−9.9%	+5.3%	−18.1%	+15.6*	−9.5
	(7.1)	(7.2)	(11.2)	(8.7)	(14.8)
Sector tenure	+5.5%	+4.3%	−18.7%*	−1.2	−26.0
	(10.5)	(7.9)	(11.1)	(10.7)	(16.3)

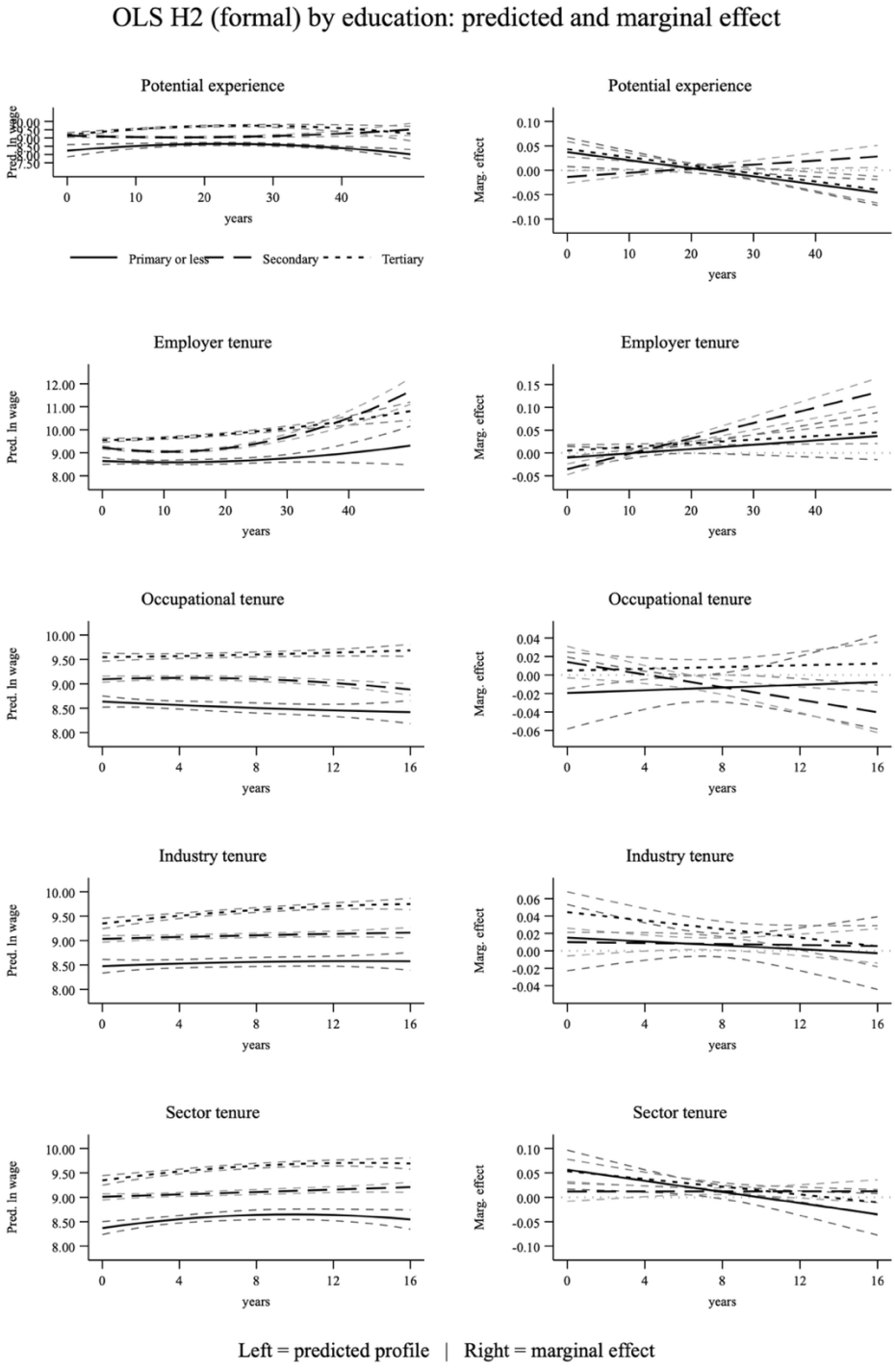
*Notes: Cumulative 7-year returns by education group; gap columns in percentage points on the education × experience interaction polynomial. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

Figures 4.13 to 4.16 present the profiles by education group within each sector. In the formal sector, under OLS (Figure 4.13), the three education lines fan apart, with tertiary workers holding the steepest profiles and the largest returns on employer, occupational, industry, and sector tenure, so education clearly steepens the formal experience profile. The informal sector under OLS (Figure 4.14) shows much flatter lines that sit close together, so education does not do much here. Under fixed effects, the formal sector (Figure 4.15) is noisier but still exists, with tertiary workers keeping steeper profiles on several tenure measures. Meanwhile the informal-sector profiles (Figure 4.16) are flat and imprecise with no clear education ordering. Overall, figures 4.13 -- 4.16 imply that the steeper pattern with education occurs in the formal sector, driven by tertiary workers, and it survives within the person. Whereas the informal sector shows no reliable results.

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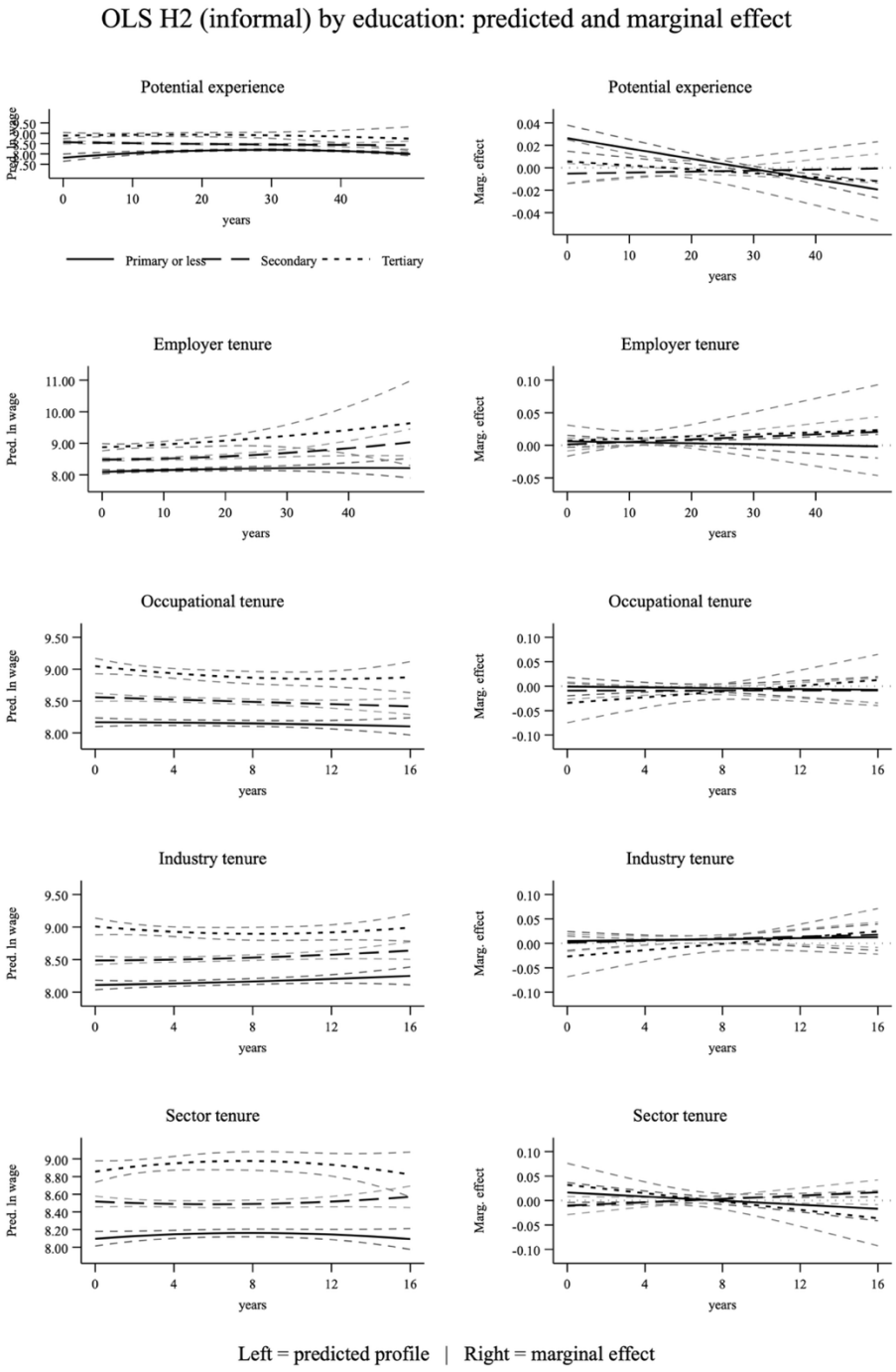
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Figure 4.13: Earnings profiles by education group, formal sector (OLS)



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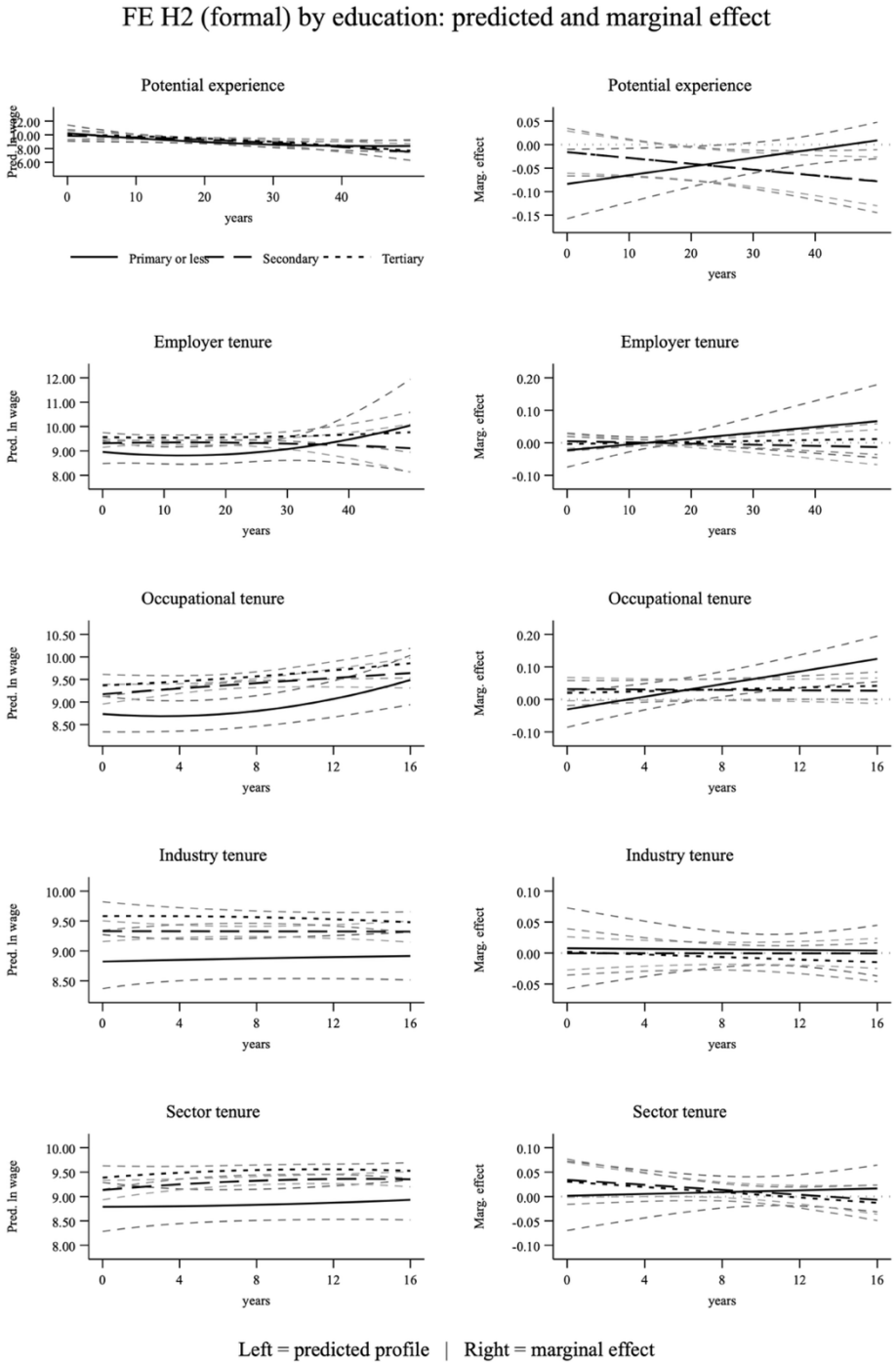
Figure 4.14: Earnings profiles by education group, informal sector (OLS)



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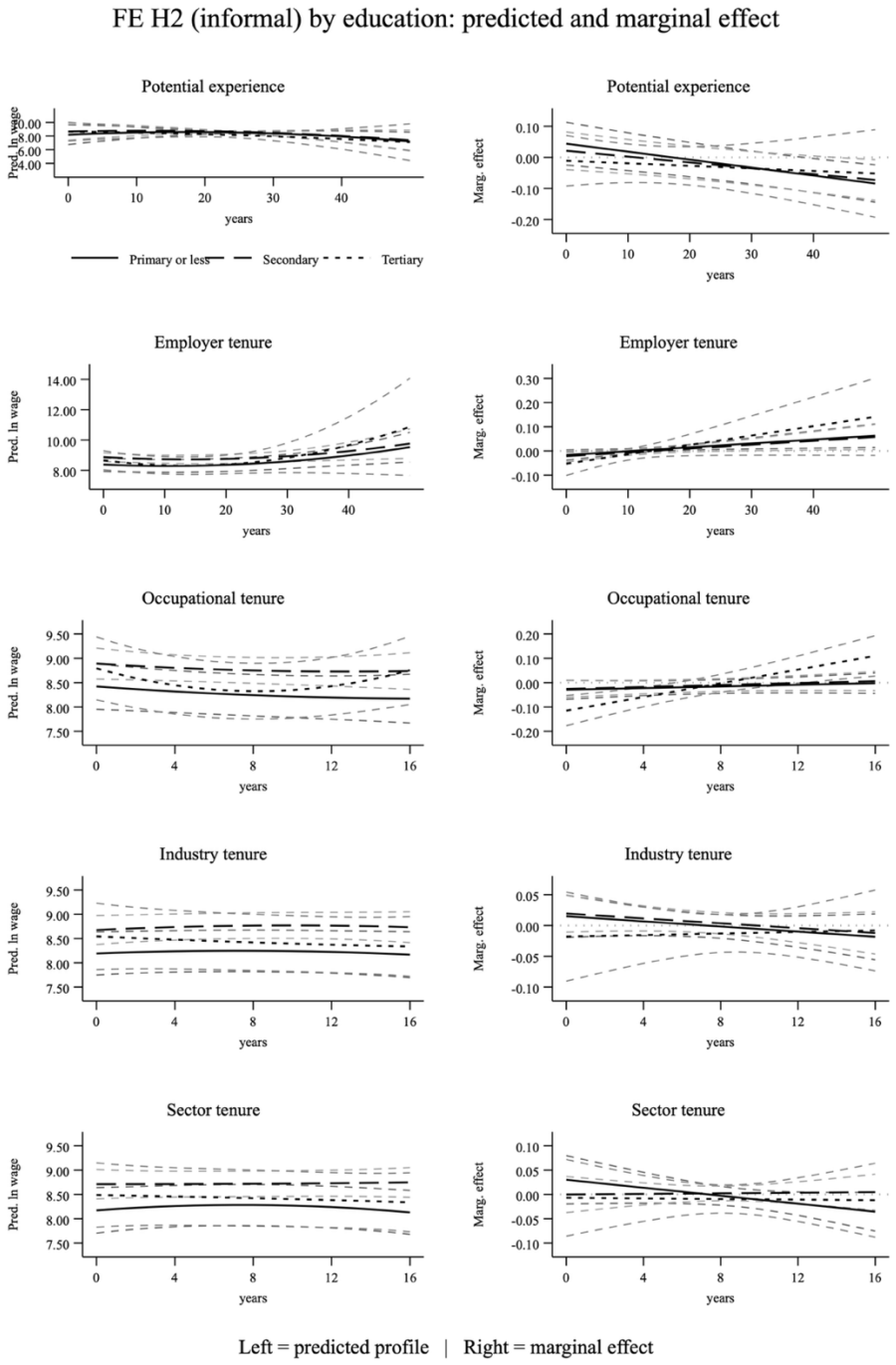
Figure 4.15: Earnings profiles by education group, formal sector (fixed effects)



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Figure 4.16: Earnings profiles by education group, informal sector (fixed effects)



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4.2.5 Heterogeneity and Robustness Analysis

Two heterogeneity analysis re-estimate the main specification on theoretically motivated subsamples, using only the fixed-effect model. The first splits the informal sector into the self-employed (whose earnings are net business profit) and informal employees (wage earners), to test whether pooling the two distorts the informal results. Meanwhile, the second splits each sector by gender, giving formal men, formal women, informal men, and informal women. *reghdfe* drops the subsample singletons automatically, so the FE samples are small (605 self-employed and 503 informal-employee individuals for R1; 457 formal men, 290 formal women, 977 informal men, and 438 informal women for R2). These within-person subsample analysis analyses are small samples and noisy, so they are read as direction checks only; Table 4.9 reports the FE 7-year returns. Meanwhile, the robustness check re-estimates Hypothesis 1 with occupation group and firm size controls.

On the informal split, the self-employed and informal employees behave differently. Occupational tenure is −29.9% ($p < 0.05$) for the self-employed but a flat +1.2% for informal employees, and employer tenure is −20.9% ($p < 0.01$) for informal employees but near zero for the self-employed. However, neither shows a reliable positive return to experience, so pooling them does not create the informal results. Hence, both are read as weak and unreliable informal returns.

On the gender split, the one within-person result that survived in the main analysis, the formal-sector return to sector tenure mostly comes from men, where

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formal men earn +24.5% over seven years on sector tenure ($p < 0.05$) and +27.9% on occupational tenure ($p < 0.10$), while formal women show no significant return on any measure. The negative informal estimates (for example, informal men's occupational tenure at −30.4%, $p < 0.01$) are again best read as measurement error noise in the capped tenure measures rather than real wage losses.

Table 4.9: Heterogeneity, FE 7-year returns by subsample

	Informal split		Gender within sector			
Measure	**Self-employed**	**Informal employee**	**Formal men**	**Formal women**	**Informal men**	**Informal women**
Potential experience	+61.9%	−33.4%	−22.9%	−15.9%	+34.6%	−21.6%
Employer tenure	−2.8%	−20.9%***	−1.9%	+2.3%	−10.6%*	−14.7%*
Occupational tenure	−29.9%**	+1.2%	+27.9%*	+19.5%	−30.4%***	−4.2%
Industry tenure	−12.2%	+8.3%	+5.8%	−20.5%	+12.2%	−4.2%
Sector tenure	+0.9%	+16.7%	+24.5%**	+1.4%	+0.1%	+17.1%
Individuals (FE clusters)	605	503	457	290	977	438

*Notes: Within-person FE 7-year for each subsample, in percent. R1 splits the informal sector into the self-employed (earnings = net business profit) and informal employees (wage earners). R2 splits each sector by gender. Significance is from the log-point (delta-method) test. * p < 0.10, ** p < 0.05, *** p < 0.01*

The robustness check is conducted by re-estimating Hypothesis 1 with two additional controls, occupation group and a firm size band, with the pooled FE interaction specifications. Both controls enter as dummies with a *not reported* category, so the estimation sample is identical to the main analysis. The Hypothesis 1 verdict does not change. The joint test on the ten formal × experience interactions stays marginal ($F(10, 2{,}685) = 1.64$, $p = 0.089$, against $p = 0.079$ in the main specification), so the within-person sector difference remains borderline once job type is held fixed. The surviving formal sector-tenure return weakens to +11.8% over seven years ($p =$

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0.062), from +14.7%, so it now holds at the 10% level only. The informal side on the other hand, behaves similarly as in the main analysis, where the significant estimates are negative (employer tenure −8.4% and occupational tenure −13.8%) and are again best read as measurement error noise in the capped tenure measures rather than wage losses. Since occupation and firm size are themselves outcomes of a worker's career, this robustness analysis is read as a conservative within-job-type check on Hypothesis 1, not a replacement of the main specification.

Table 4.10: Robustness check, adding occupation and firm size controls

	Fixed Effects	**Fixed Effects**
Measure	**Formal**	**Informal**
Potential experience	−4.6%	+9.3%
	(12.0)	(12.8)
Employer tenure	−3.9%	−8.4%**
	(4.6)	(4.0)
Occupational tenure	+0.9%	−13.8%**
	(8.6)	(7.0)
Industry tenure	+5.7%	+9.2%
	(6.1)	(6.1)
Sector tenure	+11.8%*	−1.2%
	(6.3)	(6.1)
H1 joint test	F(10, 2,685) = 1.64	
p-value	0.089*	

*Notes: Within-person FE cumulative 7-year returns by sector, in percent, 100(exp(7·β_1 + 49·β_2) − 1), with delta-method standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01*

4.4 Discussion

4.4.1 Sector differences are mostly selection, rather than segmentation

In OLS, the formal sector generates high returns on experience, but most of it is about who works there and not where they work. This return is concentrated in sector and industry tenure, while informal returns are flat. On its own, the pattern may seem

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like a dual labor market theory of Piore (2014) where the formal (primary) sector pays experience through internal labor markets and the informal (secondary) does not. Marinescu & Triyana (2016) found the same pattern in the Indonesian labor market, where formal sector tenure is the most important source of wage growth, and that there is no significant return to tenure in the informal sector.

However, the fixed effects estimation results say otherwise. When individual fixed effects remove time-invariant ability and other fixed traits, the joint test in Hypothesis 1 becomes marginal and insignificant at 5%. So most of the OLS sector gap is not a real sector effect, but rather a selection into the formal sector. This is the heterogeneity problem that Altonji & Shakotko (1987) argued about, where tenure is a wage relationship that looks like a reward for seniority, can mostly be better paid workers who sorts to longer and more stable jobs. Amaral and Quintin (2006) also agree, where formal workers earn more because they are more skilled, not due to a labor market barrier.

One result still survives within person estimation, and is the same measure that led to the OLS gaps. In the formal sector, sector tenure still pays 14.7% over 7 years of cumulative returns. Marinescu & Triyana (2016) found the same sector tenure result but with OLS estimations. Therefore, this thesis shows a within-person finding that this particular return is not only a selection but also a real effect. On the informal analysis, negative within-person results should not be read as real wage losses. Knowing that most tenure measures (occupation, industry, and sector tenure) are capped at sixteen

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years and are recall-based measures (Dobbie et al., 2014), the two-wave fixed effects in this analysis increases measurement error. So the safer reading is that the informal sector has no reliable results of within-person returns (Marinescu & Triyana, 2016), which still match secondary sector prediction, rather than that experience lowers infomal sector earnings.

Sakamoto and Chen (1991) reach a similar conclusion with the fixed effects result here, where returns look similar across sectors once selection is removed, and what really separates the primary sector is rationed access rather than different returns on experience. The 524 sector switchers (19.5% of FE) make this comparison possible because a sector-stratified FE would drop exactly the workers who carry the within-person sector variation, and this is why pooled interaction estimations are used.

4.4.2 Education steepens work experience profile

The inclusion of education and experience interaction terms changes returns to experience. Apparently, the results are stronger than the sector result (Hypothesis 1) since it survives in the fixed effects specification. In OLS, education shapes the return to every experience measure in the formal sector (joint $p < 0.001$), while in the informal sector only potential experience varies. This is consistent with the pattern argued by Connolly and Gottschalk (2000), where returns to experience and tenure rise with education, so less educated workers have flatter wage profiles. Brunello & Comi (2004) find the same in the European context, where tertiary education workers have steeper

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experience and earnings profiles, which is an advantage that grows with time in the labor market. Braga (2018) reports similarly by using actual experience.

The strong sorting between sector and education explains why Hypothesis 2 is tested within the sector. Based on the constant sample, tertiary educated workers are 37.1% of formal person-waves but only 8.5% of informal. Connolly and Gottschalk (2000) give the mechanism that for more educated workers, returns to tenure rise while returns to general experience fall, and because the tenure effect is larger, wage growth still increases with education. Wattanasaovaluk (2020) also agrees that, in Thailand, returns to experience are highest and most durable in high-skilled occupations.

Although there is an exception, which is potential experience in the formal sector where the OLS is U-shaped in education. Workers with primary-or-less education earn 34.6% more over 7 years, tertiary educated workers 36.8% more, while secondary education workers earn almost nothing. This evidence do not fit a simple human capital story where returns rise smoothly with education. One of the reason may be composition, because primary-or-less workers are a small and selected group inside the formal sector. Skills mismatch can also be the case in Indonesia (Allen, 2016). Chacaltana & Moreno (2025) found similar pattern in Peru, where the payoff of education depends on where it is used, where highest education returns show in formal employment and lower educated paying more in informal work.

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It is also worth noting on defining what "returns to experience rise with education" means here. Braga (2018) argues that potential experience mixes true experience with career interruptions, which is the standard caveat worth noting for. And this problem is larger for more educated and for women. The so called M-shaped career path describes a condition where women's employment rates peak in their early 20s, drop significantly during their late 20s and 30s for child rearing, and peak again afterwards as they re-enter the labor market (Bian & Wang, 2019).

4.4.3 General and specific human capital across the build-up

Heckman et al. (2003) set the conditions for reading the polynomial results, mainly that log earnings are concave in the human capital terms. The framework still relies on the Mincer (1974) earnings function, where experience is treated as post-school human capital investment, and on Becker's (1975) distinction between general and specific capital. This is why experience is split into five measures: general capital, captured by potential experience, and specific capital, captured by employer, occupational, industry, and sector tenure.

The build-up is what makes the split visible. In OLS, the potential-experience coefficient roughly halves once the tenure measures enter, falling from 0.0182 in column 1 to 0.0099 in column 5 (Table 4.5). In other words, part of what first looks like a return to general experience is really accumulated tenure that was hiding inside

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it. Marinescu & Triyana (2016) report the same evidence with IFLS data, and Kambourov & Manovskii (2009) report it for occupational tenure in the United States.

Employer tenure shows the clearest evidence of selection. It stays positive and significant across the OLS build-up columns and is worth +13.5% over 7 years on its own, yet in fixed effects it turns negative with positive curvature (−0.0104* in column 2) and the premium disappears. This implies that the OLS employer-tenure return mostly reflects better-paid workers sorting into longer jobs, rather than a real payoff to staying with the same employer. The pattern is in line with Dobbie et al. (2014), who find that job tenure becomes small and insignificant once heterogeneity is controlled, with large firms with internal labor markets as the only exception. The within-person counterpart here is the formal-sector return to sector tenure, which is the one effect that survives.

Industry tenure however, works the other way. It is small in OLS but becomes positive and significant within person (+0.0189** in column 5), which makes it one of the few returns that the fixed effects strengthen instead of weakening.

Occupational tenure is where this study differs most from the United States evidence. Kambourov & Manovskii (2009) find that occupational tenure carries most of the specific human capital, with 5 years raising wages by 12% to 20%. Here, the opposite happens, since occupational tenure is negative in both OLS and fixed effects once it competes with employer and industry tenure. Part of this is a data issue. The IFLS employment history grid caps occupational, industry, and sector tenure at 1 to 16

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years, far shorter than the long PSID histories, so the occupational signal is compressed and noisy. Kambourov & Manovskii (2009) themselves warn that mismeasured occupation switches bias the estimates. Another reason to read this negative coefficient with caution. On the other hand, Marinescu & Triyana (2016) do not find a positive return to occupational tenure in Indonesia either, so the result in this research is consistent with theirs.

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CHAPTER 5: CONCLUSION

5.1 Conclusion

This research aims to estimate the returns to work experience in Indonesia's formal and informal labor markets and to test whether those returns vary by education level. The framework is one where the sectoral gap is real on the surface but mainly about who works in each sector, while education is what truly shapes the experience profile.

Under Pooled OLS, returns to experience strongly differ by sector. The formal premium is concentrated in sector tenure and industry tenure, while none is significant at the 5% level for informal. On its own, this looks like a dual labor market story, where the formal sector pays experience through internal labor markets and the informal sector does not. However, once individual fixed effects remove time-invariant ability, the sector difference is only borderline (with a joint test of $p = 0.079$). So most of the formal sector premium is not a real sector effect, but selection into the formal sector, where abler and better-matched workers end up. One return still survives within the person, where sector tenure pays about +14.7% over seven years in the formal sector. Though this surviving return mostly come from men, since formal women have no significant return on any measures. On the other hand, the negative within-person returns (mainly in the informal sector) should not be interpreted as real wage loss. It is important to note that the three tenure measures (occupation, industry, sector tenure) are capped at sixteen years and potentially recall-biased. Furthermore, a two-wave

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fixed effects estimator amplifies measurement error. Hence, the safer interpretation is that the informal sector has no reliable return to experience. This conclusion also passes the robustness analysis, where adding occupation and firm-size controls to the fixed effects model keeps the joint test marginal ($p = 0.089$) and weakens the surviving sector-tenure return to +11.8% over seven years, significant only borderline.

Education, on the other hand, steepens the experience profile. This result is stronger than the sector result because it survives in fixed effects. In the formal sector, education changes the return to nearly every experience measure (all joint tests significant at $p < 0.001$ in OLS; most still significant under fixed effects), while in the informal sector, the pattern is noisy and only potential experience varies with education. The exception is potential experience in the formal sector (U-shaped in education), where primary-or-less workers earn +34.6% over seven years, and tertiary workers +36.8%, and secondary workers earn almost nothing.

The build-up model of the five measures, lets us see how general and specific experience substitute for one another. Much of what first looks like a return to general (potential) experience turns out to be accumulated tenure, since its coefficient roughly halves once the tenure measures enter. Employer tenure is mostly selection, as it is large and significant in OLS but turns negative in within-person estimation. Industry tenure is the one measure that fixed effects strengthen. Occupational tenure does not pay in this setting, which is the opposite of the United States finding (Kambourov & Manovskii, 2009), most likely due to the capped year and recall-based measures.

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Overall, returns to work experience do pay off in Indonesia, and differ between the formal and informal sectors. But the difference is mostly about who works in each sector rather than where they work. And what changes the payoff to experience in a within-person sense is education.

5.2 Policy Implications

According to the results, most of the formal sector premium turns out to be selection, so moving workers across the formal line will not by itself give them formal sector returns to experience. The return follows the worker's characteristics, not the job title. Hence, formalization that changes a contract but not a worker's skills, match quality, or job stability will do less for wage growth than the raw difference suggests.

Although formal sector tenure, which survives within personal estimation, shows where formalization can actually help. It implies that formal sector rewards accumulated sector tenure, which is a sign of stable and continuous employment. Policy should therefore aim to protect stable formal jobs and reduce job churning, rather than only pushing workers across the formal line (Bentolila et al., 2019). On top of that, widening access to education, especially at the tertiary level, raises lifetime earnings through the direct return to schooling and for tertiary workers by also making the later experience profile steeper (Connolly & Gottschalk, 2000; Lagakos et al., 2018). Hence, schooling should be paired with the creation of formal and productive jobs that can actually use it (Santoso et al., 2022; Chacaltana & Moreno, 2025).

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The informal sector shows no reliable return to experience on within a person. Therefore, experience does not translate into measurable wage growth, and policy should not count on informal experience to drive wage progression. For the self-employed, who make up about half of the informal sector and earn business profit rather than a wage, this points to social protection, credit, and capital rather than wage progression programs. In a labor force as large as Indonesia, improving the quality of employment and encouraging workers to invest in their own human capital matters as much as the formal-informal divide itself (Li & Gao, 2023).

Finally, the formal return mostly comes from men, while formal women show insignificant returns. Since men and women sort into the two sectors differently in Indonesia, policy should not assume the same effect for both.

5.3 Future Research

This work can be extended in several ways. First, the most prominent is to use more IFLS waves. A panel data with two waves only gives a short window, and the fixed effects are still exposed to measurement error, so more waves would give more robust within-person estimates and more wage observations. With a longer panel, an instrument for job-match quality can also be used to separate selection from a true causal return cleaner than fixed effects alone. Second, the seven-year returns estimated here are tied to a single period (from 2007/2008 to 2014/2015). Returns over a different period, or a longer horizon, need not be the same. Therefore, re-estimating as new waves arrive would show how stable they are. Third, formal and informal definition

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used in the literature is broad. Future research can test whether the results in this study holds under other definitions. One option is classification by BPS, which derives formality from the employment status category alone, and it is simple and matches official statistics. Another option is by the International Conference of Labour Statisticians (ICLS), an international standard used by many works in the literature. The most recent outcome was released on the 21st ICLS resolution, which involves resolutions concerning statistics on the informal economy (ILO, 2023). The resolution defines informal employment as any activity for pay or profit not covered, in law or in practice, by formal arrangements such as labor legislation, income taxation, or social security. The formality of the economic unit rests on formal recognition (registration, separate legal status, or complete tax accounts, rather than firm size), while for employees, the defining criteria of an informal job is the absence of employer's contribution to statutory social insurance. The classification in this study partly anticipate this standard, however, a full application requires data on enterprise registration and statutory social insurance contributions, which IFLS does not collect. Hence, re-estimating the sector returns under the ICLS definition is a natural extension once such data are available, and would show whether the formal and informal gap in returns depends on where the sector line is drawn. Fourth, the informal sector should be treated as two groups. The self-employed and salaried informal employees earn different kinds of income and respond to experience differently. Fourth, it is worth analyzing why some results are different from the developed country findings. For instance, occupational tenure, which carries most of the specific human capital in the

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United States (Kambourov & Manovskii, 2009), does not pay in this study. Lastly, Indonesia's labor market is highly heterogeneous; thus, a subgroup analysis by province or region would show whether these returns still hold across very different local economies.

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APPENDICES

Appendix 1

Joint test, sector × experience interactions = 0, H1

	OLS	**Fixed Effects**
F-statistic	F(10, 11,916) = 15.53	F(10, 2,685) = 1.68
p-value	<0.001***	0.079*

Notes: Joint test that all ten formal × experience interaction terms (linear and quadratic for each of the five measures) are simultaneously zero. OLS uses pooled regression with province fixed effects; FE removes individual fixed effects. * p < 0.10, ** p < 0.05, *** p < 0.01.

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Appendix 2

Joint tests, education × experience interactions = 0, H2 (p-values)

Measure	**OLS**	**OLS**	**Fixed Effects**	**Fixed Effects**
	Formal	**Informal**	**Formal**	**Informal**
Potential experience	<0.001***	0.0001***	0.003***	0.043**
Employer tenure	<0.001***	0.249	0.075*	0.438
Occupational tenure	<0.001***	0.661	0.022**	0.001***
Industry tenure	<0.001***	0.593	0.728	0.077*
Sector tenure	<0.001***	0.134	0.117	0.006***

Notes: Joint test that the four education × experience interaction terms (secondary and tertiary dummies interacted with the linear and quadratic terms of each experience measure) are simultaneously zero, estimated separately for each sector and measure. OLS includes education-level dummies, gender, marital status, urban, wave dummy, and province fixed effects. Fixed effects absorbs individual and wave fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix 3

Full build-up model - OLS (dependent variable: log real hourly earnings)

Variable	(1)	(2)	(3)	(4)	(5)
exp	0.0182***	0.0109***	0.0114***	0.0101***	0.0099***
	(0.0024)	(0.0025)	(0.0026)	(0.0026)	(0.0026)
exp²	-0.000307***	-0.000289***	-0.000296***	-0.000277***	-0.000275***
	(0.0000460)	(0.0000482)	(0.0000486)	(0.0000485)	(0.0000487)
tenure		0.0167***	0.0176***	0.0136***	0.0125***
		(0.0028)	(0.0028)	(0.0029)	(0.0031)
tenure²		-0.0000519	-0.0000731	0.000000212	0.0000214
		(0.0000886)	(0.0000892)	(0.0000903)	(0.0000934)
occ_ten			-0.0108**	-0.0142***	-0.0135***
			(0.0047)	(0.0051)	(0.0052)
occ_ten²			0.000531	0.000307	0.000229
			(0.000323)	(0.000355)	(0.000358)
ind_ten				0.00732	0.00907*
				(0.00503)	(0.00516)
ind_ten²				0.000471	0.000285
				(0.000339)	(0.000359)
sec_ten					-0.00258
					(0.00593)
sec_ten²					0.000402
					(0.000406)
Secondary	0.4152***	0.3757***	0.3744***	0.3696***	0.3693***
	(0.0212)	(0.0212)	(0.0212)	(0.0211)	(0.0212)
Tertiary	1.1481***	1.0640***	1.0648***	1.0516***	1.0512***
	(0.0266)	(0.0269)	(0.0269)	(0.0269)	(0.0269)
N	14,603	14,603	14,603	14,603	14,603
R-squared	0.268	0.280	0.280	0.282	0.282
Individual controls	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y

Notes: OLS regressions with education-level dummies, gender, marital status, urban, wave dummy, and province fixed effects. Education-level coefficients are now shown explicitly. Standard errors (clustered at the individual level) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix 4

Full build-up model - Fixed Effects (dependent variable: log real hourly earnings)

Variable	(1)	(2)	(3)	(4)	(5)
exp	0.0064 (0.0164)	0.0143 (0.0167)	0.0152 (0.0168)	0.0142 (0.0168)	0.0135 (0.0170)
exp²	-0.000766*** (0.000152)	-0.000905*** (0.000165)	-0.000921*** (0.000167)	-0.000910*** (0.000167)	-0.000900*** (0.000175)
tenure		-0.0104* (0.00573)	-0.00901 (0.00580)	-0.0119** (0.00588)	-0.0113* (0.00624)
tenure²		0.000568*** (0.000196)	0.000536*** (0.000199)	0.000609*** (0.000200)	0.000598*** (0.000209)
occ_ten			-0.0169 (0.0107)	-0.0257** (0.0114)	-0.0259** (0.0115)
occ_ten²			0.000375 (0.000392)	0.000650 (0.000405)	0.000663 (0.000405)
ind_ten				0.0187** (0.00800)	0.0189** (0.00798)
ind_ten²				-0.000740* (0.000377)	-0.000720* (0.000387)
sec_ten					-0.00138 (0.00952)
sec_ten²					-0.0000218 (0.000588)
N	5,372	5,372	5,372	5,372	5,372
Within R-squared	0.014	0.021	0.022	0.024	0.024
Marital & urban controls	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y

Notes: Fixed effects absorbing individual and wave fixed effects. Time-varying controls (marital status, urban) included. Education-level dummies are time-invariant and therefore absorbed by individual fixed effects. Standard errors (clustered at the individual level) in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

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Appendix 5

Full H1 regression - OLS and Fixed Effects (dependent variable: log real hourly earnings)

Variable	OLS	Fixed Effects
exp	0.0055* (0.0030)	0.0171 (0.0175)
exp²	-0.000141** (0.000056)	-0.000939*** (0.000205)
tenure	0.0045 (0.0036)	-0.0167** (0.0078)
tenure²	2.36e-06 (0.000107)	0.000727*** (0.000254)
occ_ten	-0.0053 (0.0068)	-0.0310** (0.0137)
occ_ten²	0.000036 (0.000486)	0.000994 (0.000612)
ind_ten	-0.000960 (0.0070)	0.0211* (0.0110)
ind_ten²	0.000551 (0.000503)	-0.000976 (0.000621)
sec_ten	0.0053 (0.0072)	-0.0049 (0.0137)
sec_ten²	-0.000150 (0.000497)	0.000322 (0.000812)
Formal × exp	0.0095* (0.0053)	-0.0224* (0.0122)
Formal × exp²	-0.000302** (0.000119)	0.000574** (0.000260)
Formal × tenure	-0.0219*** (0.0059)	0.0072 (0.0113)
Formal × tenure²	0.0012*** (0.000176)	-0.000304 (0.000382)
Formal × occ_ten	0.0053 (0.0092)	0.0283* (0.0147)
Formal × occ_ten²	-0.000364 (0.000648)	-0.000854 (0.000790)
Formal × ind_ten	0.0249** (0.0098)	-0.0086 (0.0152)
Formal × ind_ten²	-0.0011* (0.000673)	0.000348 (0.000825)
Formal × sec_ten	0.0370*** (0.0106)	0.0346* (0.0202)

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Variable	OLS	Fixed Effects
Formal × sec_ten²	-0.0015** (0.000697)	-0.0018 (0.0011)
Formal sector	0.2410*** (0.0485)	0.1841* (0.1052)
Secondary	0.2749*** (0.0212)	Absorbed
Tertiary	0.7729*** (0.0277)	Absorbed
Married	0.0881*** (0.0195)	-0.1020** (0.0471)
Urban	0.1063*** (0.0163)	-0.0069 (0.0524)
Male	0.3166*** (0.0156)	Absorbed
Wave 5	0.3260*** (0.0191)	Absorbed
Constant	8.6756*** (0.0557)	9.1061*** (0.3278)
N	14,603	5,372
R-squared	0.325	0.786
Within R-squared		0.039
Marital & urban controls	Y	Y
Education-level controls	Y	Absorbed
Individual FE	N	Y
Wave FE	Y	Y
Province FE	Y	N

Notes: H1 estimates the pooled formal-sector interaction model. OLS includes education-level dummies, gender, marital status, urban, wave dummy, and province fixed effects. Fixed effects absorbs individual and wave fixed effects; time-invariant variables are absorbed. Standard errors (clustered at the individual level) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix 6

Full H2 regression - OLS, formal sector (dependent variable: log real hourly earnings)

Variable	Potential experience	Employer tenure	Occupational tenure	Industry tenure	Sector tenure
Measure	0.0489***	0.0064	-0.0119	0.0088	0.0552***
	(0.0157)	(0.0127)	(0.0200)	(0.0195)	(0.0200)
Measure²	-0.000929***	0.000055	0.000683	0.000446	-0.0021*
	(0.000291)	(0.000393)	(0.0014)	(0.0012)	(0.0012)
Secondary × measure	-0.0569***	-0.0119	0.0348	0.0028	-0.0443**
	(0.0167)	(0.0137)	(0.0216)	(0.0211)	(0.0213)
Tertiary × measure	-0.000513	0.0264*	0.0258	0.0511**	0.0149
	(0.0171)	(0.0141)	(0.0223)	(0.0225)	(0.0224)
Secondary × measure²	0.0015***	0.000932**	-0.0016	0.000436	0.0033**
	(0.000336)	(0.000434)	(0.0015)	(0.0013)	(0.0013)
Tertiary × measure²	0.000404	-0.000228	0.000993	-0.0010	0.000556
	(0.000344)	(0.000429)	(0.0015)	(0.0013)	(0.0013)
Secondary	0.9298***	0.4590***	0.3700***	0.4431***	0.5375***
	(0.1921)	(0.0798)	(0.0603)	(0.0735)	(0.0705)
Tertiary	1.0104***	0.8281***	0.8486***	0.7573***	0.8778***
	(0.1967)	(0.0850)	(0.0680)	(0.0834)	(0.0789)
Married	0.1062***	0.1446***	0.2098***	0.1446***	0.1339***
	(0.0290)	(0.0269)	(0.0265)	(0.0262)	(0.0261)
Urban	0.0962***	0.0880***	0.0963***	0.0961***	0.0959***
	(0.0250)	(0.0252)	(0.0263)	(0.0257)	(0.0256)
Male	0.1119***	0.1449***	0.1455***	0.1511***	0.1493***
	(0.0216)	(0.0216)	(0.0226)	(0.0222)	(0.0222)
Wave 5	0.2898***	0.2874***	0.1904***	0.1781***	0.2519***
	(0.0184)	(0.0186)	(0.0247)	(0.0213)	(0.0255)
Constant	8.8614***	9.0482***	9.0693***	9.1720***	9.0392***
	(0.1952)	(0.0892)	(0.0737)	(0.0857)	(0.0881)
N	4,261	4,261	4,261	4,261	4,261
R-squared	0.367	0.368	0.320	0.340	0.348
Individual controls	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y

Notes: Each column estimates the education × experience interaction model separately for one experience measure within the sector. OLS includes education-level dummies, gender, marital status, urban, wave dummy, and province fixed effects. Standard errors (clustered at the individual level) in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

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Appendix 7

Full H2 regression - OLS, informal sector (dependent variable: log real hourly earnings)

Variable	Potential experience	Employer tenure	Occupational tenure	Industry tenure	Sector tenure
Measure	0.0280***	0.0074*	0.0020	0.0023	0.0192*
	(0.0058)	(0.0044)	(0.0089)	(0.0090)	(0.0100)
Measure²	-0.000446***	-0.000157	-0.000011	0.000291	-0.000999
	(0.000092)	(0.000130)	(0.000632)	(0.000627)	(0.000649)
Secondary × measure	-0.0311***	-0.0035	-0.0070	-0.0017	-0.0267**
	(0.0070)	(0.0063)	(0.0122)	(0.0123)	(0.0128)
Tertiary × measure	-0.0184	0.0040	-0.0292	-0.0284	0.0149
	(0.0113)	(0.0126)	(0.0224)	(0.0228)	(0.0242)
Secondary × measure²	0.000497***	0.000240	0.000234	0.000252	0.0020**
	(0.000135)	(0.000199)	(0.000871)	(0.000863)	(0.000844)
Tertiary × measure²	0.000225	0.000175	0.0016	0.0013	-0.000847
	(0.000285)	(0.000476)	(0.0015)	(0.0014)	(0.0016)
Secondary	0.6578***	0.2621***	0.2776***	0.2548***	0.3112***
	(0.0889)	(0.0344)	(0.0366)	(0.0383)	(0.0427)
Tertiary	1.0039***	0.6747***	0.7834***	0.7991***	0.6782***
	(0.1088)	(0.0604)	(0.0637)	(0.0685)	(0.0690)
Married	0.1050***	0.1037***	0.1220***	0.1113***	0.1081***
	(0.0246)	(0.0223)	(0.0219)	(0.0219)	(0.0221)
Urban	0.1061***	0.1076***	0.1057***	0.1086***	0.1083***
	(0.0201)	(0.0200)	(0.0201)	(0.0201)	(0.0201)
Male	0.3976***	0.3910***	0.3953***	0.3943***	0.3901***
	(0.0197)	(0.0197)	(0.0198)	(0.0198)	(0.0198)
Wave 5	0.3487***	0.3466***	0.3532***	0.3273***	0.3431***
	(0.0187)	(0.0187)	(0.0219)	(0.0202)	(0.0219)
Constant	7.4732***	7.8101***	7.8246***	7.8141***	7.7819***
	(0.0909)	(0.0497)	(0.0507)	(0.0520)	(0.0557)
N	10,342	10,342	10,342	10,342	10,342
R-squared	0.172	0.172	0.170	0.171	0.171
Individual controls	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y

Notes: Each column estimates the education × experience interaction model separately for one experience measure within the sector. OLS includes education-level dummies, gender, marital status, urban, wave dummy, and province fixed effects. Standard errors (clustered at the individual level) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix 8

Full H2 regression - Fixed Effects, formal sector (dependent variable: log real hourly earnings)

Variable	Potential experience	Employer tenure	Occupational tenure	Industry tenure	Sector tenure
Measure	-0.0646*** (0.0211)	-0.0314* (0.0180)	-0.0421* (0.0237)	-0.0146 (0.0272)	-0.0328 (0.0250)
Measure²	0.000693*** (0.000266)	0.0010 (0.000652)	0.0046*** (0.0014)	0.000971 (0.0013)	0.0019 (0.0013)
Secondary × measure	0.0399*** (0.0109)	0.0413** (0.0179)	0.0651*** (0.0218)	0.0213 (0.0269)	0.0555** (0.0249)
Tertiary × measure	0.0464*** (0.0127)	0.0436** (0.0194)	0.0697*** (0.0228)	0.0360 (0.0295)	0.0726** (0.0280)
Secondary × measure²	-0.0011*** (0.000318)	-0.0014** (0.000665)	-0.0048*** (0.0016)	-0.0011 (0.0013)	-0.0027* (0.0014)
Tertiary × measure²	-0.0012*** (0.000367)	-0.0012* (0.000702)	-0.0045*** (0.0016)	-0.0018 (0.0015)	-0.0034** (0.0015)
Secondary	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Tertiary	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Married	0.0537 (0.0659)	0.0701 (0.0664)	0.0927 (0.0645)	0.0804 (0.0658)	0.0564 (0.0653)
Urban	0.1277* (0.0768)	0.1338* (0.0772)	0.1447* (0.0764)	0.1422* (0.0794)	0.1420* (0.0781)
Constant	9.8296*** (0.3310)	9.1586*** (0.0877)	9.0267*** (0.1195)	9.1321*** (0.1179)	9.0793*** (0.1040)
N	1,494	1,494	1,494	1,494	1,494
R-squared	0.843	0.841	0.842	0.840	0.842
Within R-squared	0.032	0.020	0.025	0.014	0.025
Marital & urban controls	Y	Y	Y	Y	Y
Education-level main effects	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Individual FE	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y

Notes: Each column estimates the education × experience interaction model separately for one experience measure within the sector. Fixed effects absorbs individual and wave fixed effects; education-level main effects are absorbed, while education × experience interactions remain estimable. Standard errors (clustered at the individual level) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix 9

Full H2 regression - Fixed Effects, informal sector (dependent variable: log real hourly earnings)

Variable	Potential experience	Employer tenure	Occupational tenure	Industry tenure	Sector tenure
Measure	0.0147 (0.0288)	-0.0152 (0.0099)	-0.0409** (0.0179)	-0.0120 (0.0159)	0.0249 (0.0208)
Measure²	-0.000888*** (0.000249)	0.000623* (0.000318)	0.000689 (0.000865)	-0.000419 (0.000878)	-0.0025** (0.0011)
Secondary × measure	0.0032 (0.0125)	0.0103 (0.0132)	0.0311* (0.0182)	0.0245 (0.0194)	-0.0168 (0.0231)
Tertiary × measure	-0.0345 (0.0253)	-0.0310 (0.0227)	-0.0616** (0.0299)	-0.0260 (0.0335)	-0.0636* (0.0373)
Secondary × measure²	-0.000022 (0.000312)	-0.000331 (0.000452)	-0.000504 (0.0012)	-0.000314 (0.0012)	0.0022* (0.0012)
Tertiary × measure²	0.000586 (0.000901)	0.0013 (0.0010)	0.0058*** (0.0021)	0.0018 (0.0020)	0.0038* (0.0022)
Secondary	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Tertiary	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Married	-0.1964** (0.0786)	-0.0578 (0.0742)	-0.0955 (0.0753)	-0.0929 (0.0747)	-0.1187 (0.0762)
Urban	-0.0993 (0.0789)	-0.1006 (0.0791)	-0.0910 (0.0795)	-0.0986 (0.0793)	-0.0928 (0.0789)
Constant	8.9986*** (0.6623)	8.6207*** (0.0859)	8.7653*** (0.1136)	8.6669*** (0.0926)	8.6524*** (0.0992)
N	2,830	2,830	2,830	2,830	2,830
R-squared	0.712	0.709	0.711	0.709	0.710
Within R-squared	0.019	0.009	0.017	0.009	0.015
Marital & urban controls	Y	Y	Y	Y	Y
Education-level main effects	Absorbed	Absorbed	Absorbed	Absorbed	Absorbed
Individual FE	Y	Y	Y	Y	Y
Wave FE	Y	Y	Y	Y	Y

Notes: Each column estimates the education × experience interaction model separately for one experience measure within the sector. Fixed effects absorbs individual and wave fixed effects; education-level main effects are absorbed, while education × experience interactions remain estimable. Standard errors (clustered at the individual level) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.